

## Automatic for the factory

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### **Automation systems are striving to close the data gap between enterprise business systems and the factory floor, reports Pamela H. Derringer**

Automation isn't just about robots anymore. State-of-the-art plants today have automated conveyor lines, work cells and inventory systems, self-diagnostic machines, advanced ethernet networking and communications systems, even touchscreens with work instructions on the factory floor. These plants have been optimized, leaned, six sigma-ed, and have taken steps to synchronize production with incoming orders, the supply chain, and other plants within the enterprise. They have implemented manufacturing execution systems (MES) for the plant floor and enterprise resource planning (ERP) for business systems and dabbled in RFID and wireless communications.

But the bar of automation keeps being raised. Unrelenting ROI and cost pressures, the rise of the global factory, the dominance of Wal-Mart and new trends such as mass customization, flexible manufacturing, and supply chain integration point to a glaring truth: despite all the advances in automation, self-diagnostics and communication, business enterprise systems are not in sync with the plant floor. These systems don't talk to one another. And this is a huge problem. "We have to create the appropriate environment to drive demand signals through the business system to the shop floor," said Jeff Nestel-Pratt, marketing director with Brooks Software, a division of Brooks Automation. "In order to manage and plan operations and produce the right product at the right time and at the right price, corporations need to go beyond forecasting to demand-driven manufacturing; they need to become a real-time enterprise."

Sujeet Chand, chief technical officer with Rockwell Automation, stressed a similar theme last fall at the annual Automation Fair in St. Louis, MO. "One of the biggest trends driving manufacturing today ... is the integration of the factory floor with business systems," Chand said. Driving this integration, in turn, are two other trends: tighter integration of the supply chain and the growth of customer-driven flexible manufacturing, such as customized medicine and special packaging for different markets.

The constant demand for lower costs and optimization places increasing pressure on the factories, Chand points out, and, in turn, on their automation systems. Automation systems are rising to the challenge with more advanced diagnostics and controls, tremendous growth in software sophistication and connectivity, new communications systems like RFID and wireless, and advanced nano materials and coatings, he said.

Rockwell Automation's answer to the challenge is a three-way linkage of its Logix Architecture of plant automation controls on the factory floor with its new FactoryTalk MES layer of design, data, and production controls in the middle, and, in turn, with enterprise applications such as ERP, PLM, CRM, and supply chain functions on the top.

SAP's solution, on the other hand, is to partner with Brooks Software to create a standard, out-of-the-box bridge between its ERP and Brooks' MES systems. In addition, SAP acquired LightHammer to add analytics and a dashboard visualization tool to its NetWeaver ERP application, creating the only ERP system with a unified view "from the shop floor to the top floor," according to Ray Homan, vice president of SAP's High Tech Industry Business Unit.

LightHammer's functionality, rebranded as SAP's xMII application, will enable manufacturers to monitor, measure, and control the performance of people, processes, assets, and plants in real time from a dashboard, added Andy De, an SAP senior director in applications solutions management. "That's a huge value proposition," he said.

Simon Jacobson, a program manager with AMR Research, remains somewhat skeptical of vendors' connectivity claims. All the major MES/automation vendors are following the same roadmap, he said; they are all trying to bridge the plant floor/ERP data gap. But their "unified architectures" aren't as unified as they claim. On the other hand, most automation systems are now more or less interoperable, essentially reducing automation to a commodity, so the choice comes down to a preference of integrating best-of-breed offerings or opting for the simplicity of a single vendor solution, Jacobson added.

Rockwell Automation, which already owns the plant floor, is uniquely positioned to offer a one-vendor solution but is, in fact, playing "catch-up" with its Logix Architecture, which nevertheless, said Jacobson, is a "very interesting" offering. Rockwell's latest splash is simply putting it on a marketing par with its rivals, who are all scrambling to out-pitch each other. However, Rockwell's plant scheduler, which enables plant managers to simulate factory operations before they run, is helpful, he added.

On the other hand, SAP's purchase of LightHammer last year was a "very strategic" effort to tie ERP and MES data closer together. Although the unified, demand-driven manufacturing enterprise has yet to be achieved, automation and MES vendors are making progress toward the goal, as Eagle Technologies Group of Bridgman, MI, would attest.

Two years ago, the \$30 million automation OEM/integrator was the first beta customer of Rockwell Automation's FactoryTalk MES application, more than a year before the

application's formal debut last fall. Eagle Technologies used FactoryTalk and other new Rockwell products to design and build a \$6 million, fully automated assembly system for a Tier One automotive supplier under a seemingly impossible 32-week deadline. A project of this size and complexity would typically require 50 weeks, according to Mike Zimanski, Eagle Technologies' project manager.

Eagle Technologies jump-started the project, cutting the initial data specification phase from 12 weeks to six by, for the first time, reusing its engineering designs. Instead of designing data specifications for machine interfaces individually, Eagle Technologies' virtual design team members all used the same templates, which were stored in a central database, said Zimanski. Engineering re-use has now become standard practice for Eagle and has saved even more time and money for subsequent customers.

Eagle Technologies' automated system was not just faster to design; it was better for the customer. For example, FactoryTalk's metrics record all downtime so an automated cell that is not functioning optimally can be fixed in the next scheduled maintenance instead of causing a costly work stoppage, Zimanski said. In addition, the system can numerically track individual assemblies, essentially producing a "birth certificate" for components. This enables the manufacturer to pinpoint faulty product and, in turn, limit the scope of recalls to precisely the number of cars with the defective parts. This is particularly important to Tier One auto suppliers, who increasingly will be responsible for warranty costs involving their components.

But, Zimanski said, the addition of the FactoryTalk controls database was the most significant advance that Eagle Technologies installed for its Tier One customer. "The biggest change in the industry is getting factory data into the business system, and we're seeing this happen through the Rockwell suite," he said. "As orders come in, production and manpower are allocated, parts are ordered, and product goes out the door. Scheduling of personnel and materials is all integrated in the same backbone. We've talked about this for 10 years, and it's happening now." Although it's hard to quantify all the benefits, the automotive supplier now has less scrap, lower work-in-process costs, and, according to an internal study, 20 percent less overhead.

But automation systems are not a fait accompli. The drive for further optimization continues, with more sophisticated diagnostics, controls and communications systems always in design, according to Rockwell's Chand. For example, he said, UPS has been experimenting with a self-configuring conveyor line that automatically adjusts to seasonal changes in package volumes; the Navy is researching how to reroute water in cooling systems with autonomous, intelligent agents; and a food company is extending the life of seals on syrup pumps with sophisticated monitoring controls that automatically reduce the flow as the seals begin to wear.

As for communications, the adoption of RFID and wireless systems has created more buzz than adoption on the plant floor. With RFID, the tag costs are still too high, can't be recouped through higher prices, and there have been RFID signal interference problems with metals and liquids that are yet unsolved. These issues notwithstanding,

manufacturers might derive greater efficiencies from RFID if they apply the tags in the factory instead of the warehouse so they can associate all the process data with the individual product, which would be useful for tracking shrinkage and other trends.

Wireless networks, similarly, have yet to transform manufacturing, said Chand. Although useful for specialized purposes such as overhead cranes or human machine interfaces (HMI), wireless systems are still too difficult to link into existing wired networks. Low-power radios and energy harvesting from factory movement show early promise for helping manufacturers avoid the cost of having to replace thousands of batteries every other year from sensors and other equipment.

Automation systems of the future will be more modular, adaptable, smart, and efficient, Chand concluded.