# **Operationalizing The Connected Enterprise**

### **Highlights of Automation Fair 2014**

Industry Forums • Automation Perspectives • Process Solutions User Group

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### **OPERATIONALIZING THE CONNECTED ENTERPRISE**

Enabling Faster Time to Market, Lower Total Cost of Ownership, Improved Asset Utilization and Better Enterprise Risk Management

by Mike Bacidore

eith Nosbusch is bullish on the potential for connectivity to transform industry. For the first time in his decade-long tenure as chairman and CEO of Rockwell Automation, he believes the automation giant's vision of The Connected Enterprise can be a game-changer, transforming the industrial landscape. "These are exciting times," said Nosbusch, who set the stage for the company's Automation Fair event this week in Anaheim, California, in his keynote address to assembled media. "The value at stake is enormous."

Automation Fair, the company's flagship customer event, is focused on solving realworld problems and adding tangible value for industry, explained Nosbusch. "What's driving our customers today?" he asked. "We're finding these four value drivers: faster time to market, lower total cost of ownership, improved asset utilization and better enterprise risk management. The Connected Enterprise is focused on rapid value creation across all four drivers."

With 22,500 employees in more than 80 countries and almost \$7 billion in 2014 fiscal sales,

Rockwell Automation is the largest company in the world focused solely on industrial automation and integrated control, said Nosbusch. "We have a long history—111 years—of servicing customers with technology innovation, deep domain expertise and a culture of integrity and corporate responsibility. The progress we're making in realizing The Connected Enterprise now is transformational."

Secure networks and contextualization of the data helps to create information that can be shared. This results in an enterprise that can be quantified, said Nosbusch. "We're at an inflection point for The Connected Enterprise," he explained. "It's enabled by integrated control and information. To realize The Connected Enterprise, there must be a convergence of IT and OT. Operations technology (OT) is the world of industrial equipment, such as machines, controllers, sensors and actuators. Information technology (IT) includes ERP, finance, HR, logistics, quality and CRM. Critical to the OT side is realtime data that drives control and safety. It's typically acted upon in milliseconds or microseconds."

Because many operations need to run continuously 24/7 and cannot shut down for software updates, IT might have a different determination of what's critical. But both IT and OT are critical for the success of an industrial enterprise. And in



"The value at stake is enormous." Keith Nosbusch, chairman and CEO of Rockwell Automation, believes the time is ripe to realize the longpromised potential of the Connected Enterprise.

the past, most approaches to convergence have been expensive and unscalable, said Nosbusch.

"We've made tremendous progress in bringing forward an IT-OT solution through our partnership with Cisco," he said. "This flatter, more open approach delivers a level that wasn't possible with the previous generation of technology, and it enables IT and OT convergence."

Nosbusch noted several major industry trends that help to identify a great opportunity. According to a Rockwell Automation survey conducted with Industry Week, nearly three-fourths of U.S. plants are more than 20 years old, and less than 14% of these manufacturers have tied their machines to the enterprise network, he reported. Further, manufacturing has generated 2 exabytes of big data, according to a McKinsey report. Plants are experiencing losses of \$20 billion annually due to unscheduled downtime, and updating obsolescent automation systems will cost industry \$65 billion, according to studies from ARC Advisory Group.

These opportunities are perfect scenarios for optimization of production through The Connected Enterprise via the convergence of IT and OT, and it's enhanced by modern trends such as the Internet of Things. "Rockwell Automation and our partners are applying our industrial expertise to realize The Connected Enterprise through processes and business models," explained Nosbusch. "It will unleash untapped value. Modern technologies are helping us to connect smart assets to the rest of the enterprise via a secure

IP-based infrastructure, enhanced by the industrial environment. The data from these smart assets will be processed and analyzed and delivered at the point of most value. That could be at the controller, at the edge or in the cloud."

Rockwell Automation delivers The Connected Enterprise through three core platforms—integrated architecture, intelligent motor control, and solutions and services. "The integrated architecture is highly scalable and capable of differentiating high-performance machines," said Nosbusch. "For intelligent motor control, our entire lineup is enabled by the integrated architecture to speed performance. Solutions and services include consultative design, support and services. We complement and extend these platforms with our partner network." All integrated control and information start with smart assets, both in the field and in the plant. "In many heavy industries, remote monitoring is enabled by smart assets in the field," explained Nosbusch. "Smart assets in the plant have more computing power available than distributed assets. But the distinctions between smart assets in the field and in the plant are not always black and white."

Distributed smart assets in the field, such as oil pump jacks, tank farms and mine-based conveyors need to be placed where the natural resources are, sometimes inhospitable environments, explained Nosbusch. "Today through technology such as cellular and satellite communications, it's much more cost-effective to enable the management of these assets," he said. "Most remote assets' applications should involve a man in the loop to create real-world insights and decisions for what action to take."

An example of remote asset management is LNG refueling stations, which are forecasted to increase by 60% over the next few years. "Rockwell Automation is working with Chart Industries and Shell on the refueling stations," said Nosbusch. "We are deploying cloudbased solutions for asset management and site performance. Energy markets are expanding, and energy companies are very sensitive to the environment. We're deploying more smart assets to remote locations and optimizing them to perform. The objective of The Connected Enterprise in the digital oil field, for example, is to speed up all decision-making processes and enable innovation in uptime and efficiency. Where should the next well be drilled? How do I get the right personnel or repair parts to support an operation or maintenance activity?"

Plant-wide integrated control and assets include machines, lines, process equipment and controllers, which all generate a significant amount of data. "At one of the world's largest food processors, machines from multiple manufacturers are being connected with a standardized set of functionality," explained Nosbusch. "All machine communications are in real time over the open IP-based infrastructure using CIP, the Common Industrial Protocol. Data centers are in each plant, and the information is shared via the cloud to allow visibility. When complete, a network of over 100 plants around the world will be the core of this manufacturer's Connected Enterprise."

### **RETHINK YOUR EXPECTATIONS OF A DCS**

The Modern DCS Must Deliver More than I/O, Control and HMI

by Paul Studebaker

onnectivity is a hidden value amplifier," said John Genovesi, vice president and general manager, Information Software and Process Business, Rockwell Automation, to the more than 760 process automation specialists gathered in Anaheim, California, today for the kickoff of the company's Process Systems User Group (PSUG) conference. "By leveraging modern technology, we bring people closer to the process and drive productivity by unlocking the potential of real-time decisions."

For Rockwell Automation the modern distributed control system (DCS) not only runs a process, but it also drives efficiency, reduces total cost of ownership and helps users prepare for the future by enabling the connected enterprise, Genovesi said.

Experts expect the Internet of Things (IoT) to drive \$19 trillion into global economies, Genovesi said. "Leveraging the industrial Internet of Things in manufacturing represents a full onethird of that. Much like the smart phone's computing power, applications and Internet connectivity have empowered people in business, the modern DCS can connect and empower individuals in an industrial facility," Genovesi said.

"Any DCS supplier provides the base level of functionality—control, I/O, HMI. We have a tremendous portfolio covering these areas, but if Rockwell Automation's DCS offering looks like a 'me, too,' why should you switch?" he asked. "The company's PlantPAx differentiates itself by giving its users faster time to market, lower total cost of ownership, improved asset utilization and reduced risk."

These capabilities depend on solutions in four critical areas: design, operations, maintenance and security.

Engineering and design are speeded by an integrated development and design environment that uses an expanding library of process objects as well as reference architectures. By building with proven components," Genovesi said, "You know it's just going to work."



"Any DCS supplier provides the base level of functionality—control, I/O, HMI," said John Genovesi, from Rockwell Automation, on the company's PlantPAx process automation system, which differentiates itself by offering users reduced time to market, lower total cost of ownership, improved asset utilization and reduced risk.

The company has made rapid progress in virtualization with open templates, preconfigured systems and images that can "run on any server," he added. Templates significantly reduce the time required to integrate, for example, skids, which for conventional systems, "can add as much as 50% to 70% to the cost of the skid. In some cases, you're nearly doubling the price of a skid just to integrate it."

Having one unified architecture "from power through process control to packaging" not only speeds design and build, it reduces spare parts and maintenance training requirements, Genovesi said. And while Rockwell Automation has "thousands of engineers who would like to integrate PlantPAx systems for you," it also has thousands of engineers working for systems integrators, effectively doubling the company's capacity to integrate and support systems.

Integrated control and information systems offer high visibility of, among other things, energy consumption. "You can see right to the asset what your energy usage is," Genovesi said, "so you can hold people accountable and execute your energy strategy."

For process optimization, "We've

spent a lot of time bringing APC (advanced process control) solutions closer to control," Genovesi said. "Our industry experts drive applications that bring 4% to 8% improvements in productivity and pay for themselves in less than a year—sometimes in as few as four months."

Security is "the single largest thing that keeps CEOs up at night," Genovesi said. They need "to keep data and intellectual property from being stolen." But you also need cloud access and mobility. "You can't seal up the plant."

Risk management technologies implemented with and through Cisco networks offer layered security, that is, "defense in depth that meets government standards," Genovesi said. Safety and critical control systems can be viewed on the PlantPAx operating station and offer "unique packages that generate cause-and-effect logic."

For plants that need to migrate from legacy systems, Genovesi said, "We build tools that allow you to do this easily," including database conversion and scanner tools. And if the situation calls for it, Genovesi added, Rockwell Automation has the partnerships and expertise to deliver the modern DCS completely from scratch. ■

### OIL & GAS FORUM: USERS ORGANIZE BIG DATA, OPTIMIZE OPERATIONS

Energy Companies Apply Rockwell Automation Solutions to Enable More Profitable Decision-Making

by Jim Montague

f you want to capture the output from a bunch of fire hoses, you're going to need a really big bucket. And if all that water is actually operational data from multiple oil and gas wells, offshore platforms and other process applications, you'll need an automatic, super-fast way to organize all that information and retrieve salient details for better, more profitable decision-making. Doing these data gathering and analysis jobs by hand is not an option.

"We must comply with local regulations and requirements and protect the environment with spill prevention and control technologies," said C. Kisha Herbert, staff electrical engineer at QEP Resources, a leading, independent crude oil and natural gas exploration and production firm based in Denver. "Reliable and accurate process controls and fast communications also are necessary to fix upsets as they happen and to optimize production," Herbert said. "However, where we traditionally used remote terminal units (RTUs) to manage our wells and drilling pads, our construction schedules are so aggressive now, and we're bringing so many wells, controls and I/O into our central control pads that it's no longer efficient to use RTUs only."

QEP has 1,000 employees working in eight states, and operates mostly in the Williston Basin in North Dakota, the Permian Basin in West Texas and in the Pinedale Anticlime. Uintah Basin and Haynesville regions. Herbert reported that QEP has built 32 drilling and production facilities since July 2012, each with between 160 and 220 I/O points. Each employs a variety of automated valves, manifolds and skid equipment. To help automatically and quickly manage all the new data coming in from its new wells, pads, sensors, controls and other components, QEP recently adopted ControlLogix PLCs from Rockwell Automation.

"On a typical QEP pad and production facility, well locations are protected through constant monitoring of protective shutdown devices; alarm



"Reliable and accurate process controls and fast communications also are necessary to fix upsets as they happen and to optimize production." Kisha Herbert of QEP Resources discussed the benefits of replacing traditional RTUs with ControlLogix PLCs at its distributed well pads.

and event logs are used to review and track specific information and recent events. Standardized ControlLogix PLCs and RSLogix software are helping us meet our aggressive schedules and maintain safe, standard process controls," explained Herbert. "Understanding local regulations and requirements upfront and having good controls is a big help, but ControlLogix enables the remote I/O points at our remote pads to provide useful information to our central control pad. This is easier than using the RTUs because they required a lot of linear programming to run their loops, routines and subroutines."

Herbert was the first of several presenters at the Oil and Gas Industry Forum held today at Automation Fair, in the Anaheim Convention Center in California. The forum was moderated by Luis Gamboa, global oil and gas market development manager at Rockwell Automation, who reported, "The oil and gas industry is facing some very challenging times in the next decade. We're seeing increasing capital and operational costs; faster responses needed to rapidly changing market conditions; incorporation of new technologies such as cloud, fog and edge computing to improve business results; loss of workforce expertise due to retirements; increasing need for cyber and physical security; and added regulatory pressures. More real-time data flows and the Internet of Things (IoT) are bringing operational technology (OT) and information technology (IT) together, and The Connected Enterprise from Rockwell Automation is enabling it in the oil and gas industry to help users achieve the availability, production performance, cost savings, safety and other operational excellence they depend on."

The second end-user presenter, Nestor Cautiño Ramirez, account manager at ICG Group Automation, reported that his system integration firm in Coatzacoalcos, Mexico, has been integrating and optimizing the Dos Bocas TMDB marine oil storage, transportation and distribution terminal for Petroleos Mexicanos (Pemex). The terminal receives heavy Mayan oil from rigs in the Gulf of Mexico, dehydrates and desalts it, and then transports it for further refining.

"Oil from offshore facilities has a lot of water and salt in it, which can hurt production quality and wear out and damage process production assets," said Ramirez. "So we use a fourstage process to dehydrate and desalt the oil. Our project's main goal is to ensure continuous oil transportation throughout these processes, but our existing control system had some issues. These included complicated failure diagnostics, redundancy backup that no longer worked, control system design and programming that wasn't user-friendly enough for maintenance, and obsolete hardware and software."

The Dos Bocas terminal decided to undertake a phased migration to PlantPAx based on Allen-Bradley ControlLogix 5570 series programmable automation controllers and 1756-SRM2 modules for enhanced redundancy. It also added EtherNet/IP, FOUNDATION fieldbus and Modbus networking, and installed redundant power supplies and redundant HMI servers. ICG also used FactoryTalk Studio software to develop and deploy 3D HMI graphics at the terminal to improve its operators' user experience and efficiency.

"These improvements really enabled us to achieve our goals for this upgrade project, which included reduced downtime risk and improvements in overall availability and reliability, extended lifecycle, compliance with applicable regulation and reduced learning curve for operators and maintainers," said Ramirez. "Not only did we improve the availability and reliability of the terminal's servers, controllers and power supplies, but we also reduced its system recovery time from a full day to just a couple of hours."



### MODEL-PREDICTIVE CONTROL WITHOUT THE LAB COATS

Odds Are MPC Can Optimize Productivity, Materials and Energy in an Industry Near You.

by Paul Studebaker

s the advanced control and optimization arm of Rockwell Automation, Pavilion is a combination of people, products and a process. "We have talented chemical engineers, process guys and a powerful

model-predictive controller (MPC) with an established presence and reputation in the traditional process industry applications like chemical plants and refineries," said Jim Miller, Pavilion business director, Process Business, Rockwell Automation. The company's MPC capabilities are on display this week at Automation Fair in Anaheim, California.

"Now we're extending MPC into other industries that Rockwell Automation serves, including natural gas liquids, mining and consumer packaged goods (CPG), where MPC hasn't been commonly used."

"The objective is to simplify MPC and offer it in different form factors," said Stephen Pulsifer, director of process marketing, Rockwell Automation, "without the lab coats." Rockwell Software Pavilion8 Model-Predictive Control software makes MPC easier to implement. "When you look at advanced control, you typically see a lot of math," Miller said. "We put the engineering into the software and make it easy to tune, to select data sets and model sets. The customer is more comfortable, and they're able to use it."

PlantPAx MPC allows users to put MPC in the control layer—to use the control system instead of a server to process the data. "It's easy to understand and maintain, and you can afford to go after smaller projects where you might not think it's worthwhile to use MPC," Miller said. For example, applying a 3 x 3 matrix on a chocolate tempering machine has resulted in a 30% improvement in productivity.

PlantPAx MPC can handle as many as five 10 x 10 matrices. For some applications, MPC can be used to perform multi-variant regulatory control. "Running at sub-second speeds, it can replace PID to directly control a difficult process," Miller said.



"We're extending MPC into other industries that Rockwell Automation serves, including natural gas liquids, mining and consumer packaged goods (CPG), where MPC hasn't been commonly used." Jim Miller of Rockwell Automation outlined the company's activities, capabilities and plans for helping users reap production, material and energy efficiencies with model-predictive control. MPC applications range from more traditional optimization saving a percentage of an expensive chemical used in a mining operation that added up to \$100 million per year, to optimizing a multiple unit process line in a consumer packaged goods plant. "Where's the bottleneck? Is it the freezer? The fryer? It's not always the same. It moves around, depending on how the plant, equipment and product are running," Miller said.

In that CPG plant, using MPC for realtime constraint management increased production 6-8% while reducing energy consumption about the same amount, Miller said. "It functions as a 'quality controller' that identifies the bottleneck and automatically does what's needed to relieve it."

Pavilion real-time optimization (RTO) has been used in many facilities to manage utilities. It can reduce energy costs, typically 10%, by optimizing the selection of turbines, fuels and loads to run at any given moment based on production requirements and the current prices of electricity and fuels.

In the works for future release are realtime models for chiller, boiler and turbine energy efficiency that users will be able to simply "attach to the data and retune on the fly," Miller said. Optimization runs automatically and operators are encouraged to keep them engaged by faceplates that show in real time the costs of operations and how much the advanced controls are saving.

Traditional issues with keeping models tuned and operating correctly are addressed by proactive "value-based support," Miller said. Pavilion experts provide quarterly reports to clients on how much their operations are saving, and can remotely dial in, monitor and tune systems as needed. "As we embed more of this capability into the controller, plants will be able to do this themselves."

Rockwell Automation is offering turnkey MPC as a "ValueFirst" methodology, making proposals that speak directly to return on investment (ROI). "We send in the engineers, they review the process and quantify the performance improvements available by reducing variability. They predict the economic ROI, and clients can see that before they buy," Miller said. Many cases show paybacks of less than a year, sometimes one or two months.

"The studies easily convince the process and controls people. The challenge is to articulate it to the C level. There, we use success stories—examples where we've done it before. We show them power of the technology, and they usually sign up," Miller said. Plants often start with a smaller project and then build on the results. ■

### GLOBAL OEM FORUM: USER-CENTRIC DESIGN IMPROVES OPERATOR EFFICIENCY

Pearson Packaging Systems Helps End Users Leverage Automation without the Steep Learning Curve

by Mike Bacidore

he Connected Enterprise today is pretty much where the smartphone was 10 years ago, according to Dan Aubertin, senior product manager, Pearson Packaging Systems. "What did it take to get to this point where we take them for granted?" he asked attendees of the Global Machine & Equipment Builders Forum this week at Automation Fair. "The infrastructure, the networks, had to be there. The standards that we're operating under today were designed and written in the 1990s. We're at the same place today in this industry that smart consumer devices were then. Machine devices are getting smarter. We're at that inflection point. It took 15 years for that consumer acceptance in cell phones to come together."

While its packaging systems continue to get smarter, Pearson's customers face issues with operator training and competency, explained Aubertin. To help address this issue, Pearson wants to make its systems as easy to use as a smartphone, and has turned to usercentric design principles often used for consumer devices. "It's what we use at Pearson to help end-user operators be more efficient and effective." Pearson is a 59-year-old secondary automation solution provider, specializing in machines that erect, pack, seal and palletize. The OEM focuses on overall labor effectiveness (OLE) to improve OEE for its customers. "Operators really struggle with operating equipment effectively," he said. "Can they do tasks quickly? Are they causing scrap and rework? When we look at user-centric design, we look at the human interaction with our automation solutions."

"We want to make solutions more intuitive, productive and efficient," said Aubertin. "When we buy a piece of technology, we don't want to read the manual or go through a long learning curve. With user-centric design (UCD), we aim to improve efficiency, enabling fast and accurate achievement of specified goals. We also want to improve effectiveness, prevent errors, shorten the learning curve, and improve engagement."

To better understand how the users of its machinery interact with the automation, Pearson spends a lot of time interviewing its own service organizations, as well as customers and end users, especially operators and maintenance technicians. "We analyze and foresee users' interactions with



"Operators all have smart phones and are familiar with iconic representation, so we use a graphical approach with our interface." Dan Aubertin described Pearson Packaging Systems' user-centric design at the Global OEM Forum this week at Automation Fair 2014. the products," said Aubertin. "We validate assumptions using real-world tests with actual users. And we find and understand hidden or hard-toverbalize user needs using contextual inquiry. We design, test, fix and design again."

At Pearson, this is now part of the design process. "Our first UCD release was focused on maintenance and operators," explained Aubertin. "We want to improve set-up speed and accuracy, and improve fault recovery time."

Part of UCD is leveraging existing knowledge. "Operators all have smartphones and are familiar with iconic representation, so we use a graphical approach with our interface," said Aubertin. "We standardized on large color screens, icons, symbols and terminology, and we reduced the number of screens. It's intuitive, and we make it as graphical as possible because many operators don't speak English. For fault recovery, we provide a device status map with sensor location and state, an interactive fault map, and recovery instructions."

The other big operator issue is changeover, from one packaging set-up to another. "We know that it's a big challenge for our customers and a big learning curve for operators," said Aubertin. "The focus for us is lowering total cost of ownership with user-centric design. It reduces maintenance costs and changeover time, and can increase production too." ■

# BEVCORP, CORNING ENVIRONMENTAL TECHNOLOGIES RECOGNIZED AS SAFETY LEADERS

Winners of Manufacturing Safety Excellence Awards Demonstrate Value of Safety Programs that Go Beyond Simple Compliance by Keith Larson

orning Environmental Technologies and Bevcorp claimed top honors in the Rockwell Automation Manufacturing Safety Excellence Awards for 2014. The annual awards commemorate the world's safest manufacturing companies, specifically those that realize the widespread benefits of a holistic approach to safety. Representatives of the two companies were recognized in an awards ceremony at the End-User Safety Forum this week at Automation Fair in Anaheim, California.

"Rockwell Automation created the awards to raise awareness of plant-floor safety and recognize best-in-class manufacturers that make safety a core business value," said Mark Eitzman, safety market development manager, Rockwell Automation. "When safety helps achieve business goals, it's no longer viewed as a costly obligation, but as a barometer of company success. This year's winners focused on keeping workers safe, while also using safety to enhance production efficiency and company profitability."

The Corning Environmental Technologies division of Corning

Incorporated received a silver award for its division-wide safety program. The division provides ceramic substrates and particulate filters to manufacturers of emissions control systems that are used in automotive and diesel engines, as well as power plants, chemical processing plants, refineries and generators.

The division's commitment to safety aligns with the company's strong culture of safety, which is embraced from the top down. Corning Incorporated safety metrics are measured globally, directly affect compensation for all senior managers and are a key indicator of business profitability and success.

The Corning Environmental Technologies division, in particular its diesel facility in Painted Post, New York, has set a benchmark for other Corning facilities with its rigorous adoption of global safety standard ISO 13849 and use of contemporary machine safety technologies that help maintain a safe working environment while improving operational efficiency.

"A global standard like ISO 13849, combined with our design

standards, has allowed us to develop a common approach to designing machine safety solutions for our plants around the world," said Tom Moag, environmental division controls manager and engineering associate, Corning Incorporated. "We perform risk assessments on machine designs, verify that the safety systems perform as intended and validate that the safety functions do what they are designed to do—all in accordance with ISO 13849."

To help improve plant productivity, the division uses distributed safety I/O and programmable automation controllers that integrate safety and standard control. The system provides operators with visibility into all machine events—including safety events—via the operator interface. With the diagnostics provided by the integrated system, operators can monitor safety system performance and quickly return machines to full production.

"Beyond compliance and technology, perhaps one of the simpler keys to the plant's success is the Monday safety huddle," said Mike Rehmert, plant controls engineering manager, Corning Incorporated. "Engineering and EHS employees at all levels meet to explore a particular safety topic with a focus on reviewing safety metrics and identifying ways to improve. This is just one example of how Corning makes safety a priority for all employees."

Bevcorp, a supplier of filling and blending equipment and services for the beverage industry, received a gold award for its company-wide focus on safety. The company goes beyond compliance to design safety systems that improve machine operability for its customers.

"Many of our customers come to us with compliance issues," said Eric Hendrickson, manager of engineering and R&D, Bevcorp. "But if we can provide machines that maximize uptime in addition to complying with appropriate safety standards, we're able to add value and become a true business partner."

To that end, Bevcorp designs contemporary safeguarding and automation controls into every machine to help its customers achieve significant productivity gains. For example, integrating the safeguarding system with electronic, bowl-level controls eliminates the need to shut the machine down to make manual adjustments. On average, Bevcorp estimates that this helps reduce downtime associated with product changeovers by 30 percent. "Bevcorp believes that it is important to design safety into every machine to help keep people safe, while also improving plant productivity and adding business value," Hendrickson said.

In addition, Bevcorp provides extensive safety and technology training for its customers to help them create a safer work environment and improve production throughput.

The Manufacturing Safety Excellence Award winners make people and machinery safety a core business value by incorporating the three key pillars of a comprehensive safety program—a strong safety culture, established compliance policies and procedures, and capital



Eric Hendrickson of Bevcorp (right) struck gold in the 2014 Manufacturing Safety Excellence Award and was congratulated by Mark Eitzman of Rockwell Automation.



Mike Rehmert (right) and Tom Moag (center) of Corning Environmental Technologies were awarded silver in the 2014 Manufacturing Safety Excellence Awards and were congratulated by Mark Eitzman of Rockwell Automation.

investments in automation technologies that help improve worker safety and plant productivity. Past winners include General Motors, Procter & Gamble and the PepsiCo divisions of Walkers Crisps and Pepsi Flavors. ■

### WALKING THE TALK OF THE CONNECTED ENTERPRISE

How Rockwell Automation Restructured Its Own Supply Chain to Turn Data into Better Business Decisions

by Mike Bacidore

ockwell Automation provides controls and technology to many of the world's manufacturers. But it's easy to forget that Rockwell Automation is a global manufacturer in its own right and shares many of the same challenges that its global customers face. Martin Thomas, senior vice president, operations and engineering services (OES), at Rockwell Automation, explained the progress and success of his company's own Connected Enterprise journey during his Automation Perspectives keynote address at Automation Fair in Anaheim, California.

The Rockwell product catalog has grown to 387,000 stock-keeping units (SKUs) ranging from \$100 configurable stacks of tower lights delivered in two or three days to \$500,000 mediumvoltage drives with a lead time of several months. Average product life is 20 years, and the average order is 200 line items.

To improve visibility across its global operations, the company embarked on

a corporate-wide ERP implementation at the enterprise level, together with an extensive standardization of manufacturing execution system (MES) workflow processes based on the company's own FactoryTalk ProductionCentre platform. Meanwhile, the company committed to maintaining or improving the service level its customers had come to expect.

"The journey started in 2005," said Thomas. "It was a journey we took at Rockwell Automation to restructure our global supply chain, which turned out to be much more. When we looked at our supply chain, it didn't matter which metric we looked at. It all pointed in the same direction. We had to redesign and refootprint our supply chain. The challenge was to create a five-year plan. We had to move 70% of our factories all over the world, and today we have only 2,100 of the 3,000 suppliers we used to have. We had to redesign all of the MES."

The team also developed a detailed playbook that identified the one and only way to do things. "As you're getting



"We had to move 70% of our factories all over the world, and today we have only 2,100 of the 3,000 suppliers we used to have." Rockwell Automation's Martin Thomas explained the path his company took to become a Connected Enterprise.

ready to fire 1,000 suppliers and relocate operations, you have to do it without alarming your customers," said Thomas. "We had a very U.S.-based supply chain. We had tremendous difficulty finding the talent. And when we could find it, we couldn't afford the costs to replicate our U.S. talent in other parts of the world."

To help alleviate the situation, Rockwell moved to standardize its global processes. "Employees with 20 to 30 years of experience have the knowledge to decide what type of equipment is best and how to run that equipment," said Thomas. "But you couldn't start up all these factories around the world and let every plant decide. We had to go to global processes. Our factories have always been excellent at machine-level control. Every factory in Rockwell Automation was running its own ERP system, and none of them were talking to each other at the enterprise level." And the connectivity from the machinery to ERP varied greatly, with some plants having no connectivity at all, some with a homegrown MES solution, and some with industrial software.

When the enterprise standardized on its own FactoryTalk ProductionCentre to connect equipment to SAP, it eliminated human intervention wherever possible. "We now have the ability to watch every

machine around the world on a daily/ hourly/weekly basis," said Thomas. "In the past, every factory had to do everything themselves. But we can now plan our inventory around the world from Wisconsin. In 2005, we had 120 days of inventory. That's a lot of cash sitting on the balance sheet. And we were at 82% time to delivery. We're now at 98% on-time delivery, and productivity has increased 4-5% per year. People ask about the costs to implement these systems; but we've found they're self-funding. Our product types include stock, configureto-order and engineered-to-order items. Eighty-five percent of our orders come through our stock business and are shipped in two days or less. Fourteen percent are configured to order and are shipped in 14 days or less. The remaining 1% of our products are engineered to order. That means 99% of our products are shipped in 14 days."

From an operations point of view, silos of information are scary. Now decisions are made faster than ever before. "To make sure you're ready for this change, know this journey never ends," warned Thomas. "We're now nine years into the journey. We still hold monthly meetings with all plant managers from around the world."

### SAFETY FORUM FOR OEMS: A FRANK ASSESSMENT OF MACHINE SAFETY

Bevcorp Shares Its Views on the Business Value of Integrated Safety for OEMs

by Mike Bacidore

eet Frank, a 30-year-old husband and father who worked at a beverage distributor. He woke up at 11:30 a.m. and joined his extended family for lunch at 1:00. Later in the afternoon, he played with his children, who begged him to stay home from work, so he could spend the evening with them playing games. Frank explained to his children that his job was what allowed them to have the nice life they led.

In the evening, he punched in for his shift right on time, as usual. He soon began his scheduled task of cleaning the filling equipment, picking out cans and sanitizing the machine with the guard open because it needed to run at a slow rotation for cleaning. It was chilly, so Frank wore a loose-fitting jacket. He noticed one last can. When he bent down to pick it up, he felt his jacket being pulled into the machine. The e-stop button was too far away to reach, and, in a matter of seconds, he was pulled through a 6-in space not designed for human passage. He would not be playing with his children any more.

"Perspective improves clarity when making decisions," said Eric Hendrickson, engineering manager, electrical and mechanical, at Bevcorp. Based in Willoughby, Ohio, Bevcorp makes rotary fillers and labeling machines for the beverage industry and was a winner in the Rockwell Automation 2014 Manufacturing Safety Excellence Awards.

Hendrickson related the tragedy of Frank and talked about his company's transition to enhancing machine value for improved business performance and profitability at today's Automation Fair Industry Forum on Safety for OEMs. "Safety can and does add value for both OEMs and end users," he said. "Some of the same struggles are shared by all OEMs."

According to the U.S. Bureau of Labor Statistics, industrial fatalities have been on a downward trend from 1992 to 2012, explained Hendrickson. But the primary goal of a firm or organization is to maximize profit. Social responsibility,



"Safety can and does add value for both OEMs and end users." Bevcorp's Eric Hendrickson explained why safety is all about sending employees home to their families and a smart business investment.

not to be confused with social obligation, is a business intention to do the right things and act in ways that are good for society. "Generally the primary goal and social responsibility are in conflict with each other, according to those definitions," said Hendrickson.

"Do compliant-safe machines provide value?" he asked. "Compliance alone won't necessarily add value. Compliance is the minimum. You have to understand the responsibility between the end user and the OEM, conduct effective risk assessments and use accepted methodologies. Acceptable risk is a grey area."

Bevcorp has used technology to create its own valueadded safety solutions. "There's a system for maintaining the level of our bowl," explained Hendrickson. "Normally, that is a guard, and the operator has to stop the machine and do an adjustment and then close the door and engage the guard. They might have to do that multiple times in a shift. We've created a system where you can adjust the bowl level from the outside and save production time."

OEMs deal with a variety of challenges, said Hendrickson. "To mitigate variability in acceptable risk definition, we put language in proposals to protect Bevcorp and inform customers," he explained. "Safety produces value. There's often resistance due to production concerns, and there are often variations between plant and corporate decision makers. Plants are driven by production, so, when you go to them with a proposal, or they're asking for a machine, it won't be looked at financially the same way the corporate level would. A plant manager might not be as attuned to total cost of ownership, so we provide the proven value proposition, which might include the advantages of diagnostics."

Total cost of ownership includes design changes, installation, cleaning, maintenance and troubleshooting, operating efficiency, product changeovers, spare parts, legal fees, insurance premiums and "flexcraft" workers, explained Hendrickson.

In the past, industry, companies and people were making their own decisions on how to protect machines and workers, explained Hendrickson. But safety standards have evolved. "EN 954 came along, and we have redundant contactors," he said. "Then came EN ISO 13849 and IEC/EN 62061. Safety with innovation does add value. Integrated safety didn't exist a few years ago. Integrated safety reduces cost. For dedicated safety relays and network safety relays, they start out at a low total cost of ownership. Then came integrated safety PLCs and dedicated safety PLCs. In an integrated system, you only have to deal with one software package, so changes are easier. When machines running 1,500 products per minute are down, every minute saved is precious."

Hendrickson advised his fellow OEMs to embrace the standards. "But don't just look at it as a thing we have to do," he advised. "We're part of the industry that's developing them. Use the latest technology. Look at alternative solutions. Understand the payback. Exceed compliance and leverage sales and service."

For their efforts, OEMs will get lower frequency of accidents and more business growth, said Hendrickson. "Lastly, we drive innovation," he explained. "If we didn't innovate, we'd still be back in the relay days. We all need to learn from history. It's up to us. We owe it to Frank."

### INTEGRATING IT AND OT PROVES A MANUFACTURING GAME-CHANGER

The Connected Enterprise Leverages Newer Technologies to Boost Productivity and Profitability, While Mitigating Risk

by Leslie Gordon

he goal of creating what Rockwell Automation calls The Connected Enterprise is to improve the productivity and profitability of both discrete and process plants. And for a panel of experts that spoke today during the Automation Perspectives media event at Automation Fair, this endeavor is enabled by what one speaker called "the perfect storm of technology innovation, an example of which is the Internet of Things." Speakers on the panel included John Nesi, vice president market development, Rockwell Automation; Frank Kulaszewicz, senior vice president architecture and software, Rockwell Automation: Bret Hartman. vice president and chief technology officer, security business group, Cisco; and Samiran Das, executive vice president and head of technology operations, Dr. Reddy's Laboratories.

What exactly is The Connected Enterprise? Rockwell Automation and other companies believe that it is best exemplified by the convergence of information technology (ERP, CMS, quality, financials, logistics, supply chain management) and operational technology (sensors, machines, controllers, actuators), where the traditional line of demarcation between the two silos becomes blurrier, thanks in part to networking technologies such as EtherNet/IP, an industrial Ethernet network that combines standard Ethernet technologies with the media-independent CIP (Common Industrial Protocol). As Das succinctly put it, "Connected Enterprises connect their business and their production floor environments in such a way as to mine data from both that can be turned into actionable intelligence. This approach includes everything from intelligent devices such as smart sensors and machines, scalable computing technology, and proper analyticsall within the confines of a secure environment."

According to Kulaszewicz, "The Connected Enterprise idea has been around for 30 years, but is actually a reality today. Enterprises that



Samiran Das, of drug-maker Dr. Reddy's Laboratories (right) joined Cisco's Bret Hartman (left) and Rockwell Automation co-panelists Frank Kulaszewicz and John Nesi to discuss the benefits of Connected Enterprise implementations. are connected give the developed world the opportunity to be more efficient and the developing world to progress. Of course, we must understand how to manage the risk that results from connecting all the smart IoT devices together."

As to be expected, there is a downside. For example, consider the problem of cyber threats. "IT personnel are generally better trained on cybersecurity, but OT brings with it different risks, such as loss of life or equipment failure, said Kulaszewicz. "Therefore, figuring out how to connect the two worlds is increasingly imperative. Subject matter experts in the IT world need to leverage the knowledge of subject matter experts in the IT world, and vice versa."

Added Cisco's Hartman, "Fortunately, as manufacturing systems become more connected, firms are developing better firewalls and intrusion detectors. Our ongoing challenge is how do we innovate to stay one step ahead?" Another consideration is undertaking behavioral analytics. "Company insiders can inflict damage, either on purpose or inadvertently. Addressing this might mean developing a mechanism for role-based access control, for instance."

There are a variety of industries where Connected Enterprises find trackability and traceability capabilities helpful, and life science is a good example, said Das. "Having digitized information available lets companies ensure they are in compliance with regulatory standards. For instance, a connected DCS and MES system enhances operational transparency, which, in the final analysis, helps ensure patients are always getting the right product. Why? Because the system tracks the complete chain from manufacturer to pharmacy, which helps in understanding the root cause of incidents and thus better address and improve processes. The approach also results in the production of higher guality medications and fewer recalls, as well as helps eliminate problems such as the tainted baby formula recently made in China. Many connected systems still involve a 'man in the loop' to adjust and improve processes, but data points are increasingly being picked up and put into batch management technologies in an automated manner," he said.

One consideration is that there are a lot of legacy systems, some that go back to the late 1980s, and the challenge will be how to connect these to a common platform. "Common methodologies are needed to connect older disparate systems. The good news is the most recent technology is capable of giving us the functionality we need for a truly connected enterprise," said Hartman.

The Connected Enterprise takes an ongoing journey of turning data into knowledge and knowledge into wisdom, added Hartman. "When IT technologies can talk to OT devices to make sense of data that then becomes actionable—this is the wisdom." ■

### EMPOWER EMPLOYEES WITH USER-CONFIGURED MOBILE INFORMATION

Operators, Managers and Technicians Can Access, Format and Share Information, in a Matter of Seconds. by Paul Studebaker

Sers of the Rockwell Automation PlantPAx process automation system, FactoryTalk VantagePoint EMI and ProductionCentre MES packages are now benefiting from mobile technology that allows them to create, modify, personalize and access their own displays of business and process information, in the office, at the machine, at home or on virtually any mobile device."

In the industrial software world "What has been primarily a machine and product focus is becoming systems thinking," said Ryan Cahalane, director of software product development, control and visualization business,

Rockwell Automation, during a guided tour today of the Information Software booth at Automation Fair in Anaheim, California. "This has been common for some time in the process industries and now it's everywhere." People want to layer in context and collaborate across sites, whether it's a multi-facility global food and beverage conglomerate, a pharmaceutical manufacturer contracting out a plant, or an industrial machinery OEM that wants to see how its equipment is operating around the world.

The ability to view, navigate and share information is being combined with portability and mobility to make it so operators, engineers, and managers "never have to leave their work," Cahalane said. With smart phones, tablets and laptops they can access their choice of content, subscribe to feeds, personalize their own dashboards with the exact machine, system and business information they need or want to do their job in the best possible way for them, he said. "So mobility and portability are now a philosophy across all of our product lines."

The philosophy is being applied to conventional operations and information technology (OT/IT), but also for management. "In mining, you have your factory on wheels. The owners can monitor it, and so can the equipment suppliers," said Cahalane. "In automotive, suppliers of turnkey lines can see their equipment all over the world, to determine and share best practices for operation and maintenance."



"HTML 5 is great, but it's just the ante. We're leveraging true mobile design to support the user." Ryan Cahalane explained how Rockwell Automation software is now reducing the "cost of curiosity."

It's also important for mobile assets that range far from the plant. For example, "LORAM uses it on railroad track grinders," said Keith McPherson, director, market development, Rockwell Software. "Managers and technicians can remotely locate, assess and troubleshoot the condition of mobile equipment."

The VantagePoint Manufacturing Intelligence suite has now been redesigned to run on mobile. Displays dynamically adjust to screen sizes and types: on a smart phone, the display automatically stacks for scrolling, on an iPad in landscape, there's no need to scroll. It's easy to navigate, and you can create your own content.

"Everybody is going to HTML 5 for automatic reformatting on Apple, Android and Windows devices," said Cahalane. "HTML 5 is great, but it's just the ante. We're leveraging true mobile design to support the user." This reduces or eliminates the "cost of curiosity," he said, by allowing the user to quickly and easily try out different data, displays and configurations. "They can do it in a matter of seconds, not hours, and there's no need to call IT or a developer," he said.

"We make it easy with user-friendly names for parameters and data," said Damon Purvis, product manager,

Rockwell Automation, who demonstrated the new features of VantagePoint. "They can see it, save it, and make it public. They can create it on an iPad and see it on their iPhone—or on an Android device."

For example, say you're working in a plastic extruding company. "As a manager, your main concern is, is my line running?" Purvis said. "If an extruder has gone down, you want to know if it's back up, but it doesn't help the technicians make the repair if you keep asking them. Now you can just go in and look."

Users can select parameters, create a graph, and save it in their own "playground," Purvis said. They can edit it in Composer, combine content easily and do it quickly, in a few seconds, not an hour. "If you're not completely happy with the result, you can iterate it instantly and get it right," said Cahalane.

The approach empowers operators to have the displays they want and need to do their jobs most effectively, to satisfy their curiosity and find ways to do their jobs better, to run the equipment a better way. "They can create it on an iPad and see it on a phone," Purvis said. "The widgets know how to present themselves on different displays.

"When I'm happy with it, I can put it in my Favorites, and go straight there without having to open the development environment. Once I'm there, I'm back in the model so I can make further changes if I want."

Cahalane expects this kind of access to help people leverage their experience, and their companies to leverage their most experienced people, who might not be right there at the machine. "They might be at home or even retired, and can still lend their knowledge and experience to people in the plant," he said.

System designers can regulate access. "Even those people who are steeped in Excel, love it and do it in their sleep, they see this and get into it," Purvis said. "It's a new paradigm for visualization and reporting." Similar capabilities work the same way in MES environments where having mobile operators further eases the work and still enforces process workflow.

Similar tools will be available for the popular FactoryTalk SE HMI software later next year. This will allow PlantPAx operator interfaces to be displayed on iPads and other devices. You can drill down to diagnostics, and access historians and databases. "Mobility lets you do things you can't do with desktops, to enable users and support workflows," said Mike Pantaleano, business manager, Rockwell Automation. "It lets you add value without coding."

For MES, "FactoryTalk ProductionCentre R10 can run on the cloud with thin clients, on any browser, any device, using HTML 5 with add-ins," said Brandon Henning, product manager, Rockwell Automation. "Quality Management and Performance Management MES AppSolutions are now all thin-client."

Mobility and portability are part of the latest upgrades of FactoryTalk VantagePoint EMI, ProductionCentre and other Rockwell Software applications to keep pace with rapid developments in IT and OT technology, Cahalane said. "It's now part of Rockwell Automation's philosophy, to support evolutionary revolutions."

### POWER & ENERGY MANAGEMENT FORUM: TRIM YOUR POWER BILL BY 10% OR MORE

Any Industry That Effectively Manages Energy Can Reduce Its Costs Significantly

by Paul Studebaker

G lobal energy consumption is projected to increase 50% by 2035. "How will we do this?" asked Mary Burgoon, market development manager, Rockwell Automation, and moderator of today's Power and Energy Management Forum at Automation Fair in Anaheim, California. We need to make more with less, to optimize our manufacturing facilities' energy performance all over the world, with optimized machines and secure supplies of energy, she said.

"Global energy and manufacturing industries are incredibly dynamic and poised for tremendous transformation over the coming years," said Matthew Littlefield, president and principal analyst, LNS Research. Change will be driven by shifting cost structures for energy, labor and capital as well as broad adoption of "disruptive technology and innovation paradigms."

To help industrial companies navigate this changing world, LNS Research has completed a year-long benchmark research study of more than 250 industrial companies that highlights the potential for industrial energy management. Forum attendees saw benchmark data of energy intensity by unit of production, energy efficiency gains and how following best practices can drive improvements in energy efficiency.

"The perception of sustainability has evolved from environmentalism and carbon to a more holistic view of energy efficiency, waste management and corporate social responsibility," Littlefield said. "The most sustainable companies are also the most successful companies. The triple bottom line people, planet, profit—focuses beyond profit, but it also focuses on profit."

Reductions in greenhouse gases and energy are driving financial performance, and the reductions are in total costs as well as energy costs. Ford has adopted a goal of reducing energy intensity—the energy to produce a vehicle—25% by 2016. Unilever has avoided materials, energy, water and waste disposal costs totaling more than



"The most sustainable companies are also the most successful companies. The triple bottom line—people, planet, profit—focuses beyond profit, but it also focuses on profit." Matthew Littlefield of LNS Research discussed how companies can drive both productivity and profit with industrial energy management.

€300 million so far.

In energy-intensive industries such as chemicals and petrochemicals, metals and cement, the cost of energy comprises as much as 50% or more of the cost of production. Even low-energy-intensity industries like automotive and food and beverage spend as much as 10% of their procurement costs on energy, and all industries could save 10-40% of their energy costs by improving efficiencies.

The challenges for energy management include obtaining useful energy metrics, data collection systems, culture, visibility, executive support and lack of collaboration to drive goals throughout the business.

Energy managers know the keys to success are leadership, a formal program, a cultural of awareness, metrics (including energy intensity, with the ability to drill down to the machine level), enlisting procurement and operations, and technology. Littlefield said, "We do pretty well with the first two, leadership and a formal program, but tend to fall down on the rest."

Detailed guidance can be found in Energy Star and ISO 50001 programs. "You really need continuous monitoring to develop and execute long-term strategies, to not just hop from one low-hanging fruit (lighting, motors, compressed air) to another," Littlefield said.

Companies need enterprise-level programs

and reporting to measure energy use and savings and to prioritize investments in efficiency across the enterprise. But they also need granular measurements, by material, machine and product, to influence procurement and operations to work together more effectively and move energy from a fixed facility cost to a production input. Only then can you give operations the understanding they need to effect change.

"You have to transform the business process to drive energy all the way down to the bill of materials," Littlefield said. He left the audience with a set of actionable recommendations:

- Focus on leadership and a formal energy management program as a foundation for success
- Transform business processes to connect operations with procurement for energy management
- Support business processes with investments in energy management software
- Ensure both energy and production data is collected with sufficient granularity to provide the analytical capabilities for measuring energy intensity of specific products and assets
- Focus on KPI visibility and the connection between energy consumption and production performance to drive a quick ROI. ■

### USER INPUT DRIVES ROCKWELL AUTOMATION PROCESS ROADMAP

PlantPAx Connects and Grows to Fill Its Role as a Plant-Wide System

by Paul Studebaker

he flagship PlantPAx process automation system of Rockwell Automation is more than a distributed control system (DCS). With its myriad capabilities and access to the full portfolio of the company's power, safety, networking and programmable logic controller (PLC) products, it's part of an ever-evolving set of tools for connecting and controlling the enterprise.

The session, "PlantPAx and the Process Solutions Roadmap," at the Rockwell Automation Process Solutions User Group (PSUG) conference this week in Anaheim, California, highlighted recent additions and improvements, as well as plans for further enhancements in 2015.

"People too often think in terms of PLC versus DCS, to use the one here and the other there, when what they really want is plant-wide systems," said Kris Dornan, PlantPAx integration and characterization manager, Rockwell Automation. "We're not just a hardware supplier. We want to go beyond plant control to answer customer questions and meet their needs. They want to decrease time to market, increase automation productivity in design and operations, and adopt new system capabilities."

"We continue to invest in our modern

DCS platform, making major strides to achieve our goal of providing the most highly distributed, cost-effective and performance-driven system on the market," said Jason Wright, PlantPAx system marketing manager, Rockwell Automation. "The extended capabilities further enhance the PlantPAx system, helping simplify design and integration, reduce risk, and streamline operations and engineering efficiency across a user's enterprise."

This year's new features are predominantly in batch management, virtualization, safety and integrated motor control.

FactoryTalk Batch 12 is intended to help users manage change and flexibility by handling the recipe approval process, which saves a lot of time for engineers who manage a lot of recipes. The updated software preserves and locks recipes from changes. Later, the recipe can be checked out as a work in progress and is automatically assigned a new version. The system automatically stores each version, allowing users to review their genealogy.

The batch system also provides additional protection from intellectual property theft. With security-authority binding, it helps protect recipes and



"We continue to invest in our modern DCS platform, making major strides to achieve our goal of providing the most highly distributed, costeffective and performance-driven system on the market." Jason Wright laid out 2014's progress and 2015's plans for PlantPAx and related systems. equipment models. This extra layer of security helps ensure that important information is inaccessible for viewing, editing or executing by unauthorized users.

Rockwell Automation has also updated the PlantPAx batch and sequence manager to reduce engineering time by allowing users to configure sequences directly in the controller. Incorporating batch management and optimizing continuous sequencing, the batch and sequence manager is well-suited for both skid control and standalone process units, such as mixers, blenders and reactors.

For advanced control, an updated Pavilion8 model-predictive control makes it easier to visualize, tune and maintain models with a step-by-step tuning wizard, and PlantPAx MPC (model-predictive control) now can run a 10 x 10 linear model right inside the chassis for applications that don't justify a

server-driven solution.

Virtualization allows users to extend PlantPAx system lifecycle and improve availability. "We took the sizing guide and embedded it into the core documents, because virtualization is almost becoming the default mode," said Wright. "We expanded the templates for faster deployment and added ones for a historian server and an application server."

"Rockwell Automation has also released a new packaged safety instrumented system called OptiSIS," said Wright. "This is a SIL3certified logic solver for a process safety solution that is easy to install, wire and configure with no programming required."

Integrating PlantPAx with motor control devices such as drives, starters and overload relays now eases motor control configuration and delivers advanced diagnostic information directly to the operator at the HMI level. "This helps ease maintenance activities and allows operators to diagnose issues before they occur," Wright said.

"We have a million tags and data points, and they're all very important, but we need to be able to take the right information from these devices to let the operator be more effective," Dornan said.

#### Design, Alarm, Network and Go Mobile

This year included a major release of Studio 5000 to make it easier to manage and design code. "With previous versions, code was organized in the way it was executed, an execution process view," said Wright. "In version 24, we also provide a logical view. You can organize the code in a way that makes sense for that process, in addition to execution. This allows you to reuse code more easily by copying and pasting into a new process. Or you can add it to a library for other future projects. We have also made modifications to allow public parameters, so you can take them to another project."

One also can create folders that make more sense, for example, a "process" or "I/O status" or "system status" folder, and dragand-drop programs into the folders. "Say you want to just go to your 'tanks' area and see what you need to do there to develop and maintain that code. Now you can do that," said Dornan. "We're trying to make it easier, to let the designer and operator be more productive."

For FactoryTalk Alarms and Events, FactoryTalk View 8, released in July, has enhancements including dynamic severity linked to the controller, alarm log viewer filter by time, sounds by priority and options to hide out-of-scope alarms.

In networking, new ArmorStratix 5700 switches can be deployed on machines and in extreme environments, and Stratix 5100 wireless access points feature a work group bridge. "By allowing engineers to connect up to 19 IP addresses simultaneously, it helps reduce design time when integrating machines and equipment into the network," said Wright

For mobility, FactoryTalk VantagePoint 6.0 automatically recognizes the type of device and reformats displays to fit. The addition of Mobile Favorites means it can follow users and offer their favorite applications no matter what device they happen to be using at the moment, and a native Windows 8 application allows users to share information to drive decision-making.

#### More on the Way in 2015

During the next year, "Studio 5000 will address an integrated system view of elements, visualization and control," said Wright. "Integrating Process Object inside Studio 5000 will mean fewer steps. And bulk configuration tools will help engineers who do a lot of similar projects." A new release of FactoryTalk View will include a library of process objects (with the option to switch languages), control strategies and application specifications to drive consistency across projects.

FactoryTalk ViewPoint 8.1 moves from Microsoft Silverlight to HTML 5 and opens applications to Apple and Android devices, and Stratix 5400 and 5410 are new DIN- and rack-mount layer 3 switches.

"There will be new firewall and intrusion protection system offerings, and a new industrial data center for smaller applications," said Wright. "We'll also bring out complete network virtualization."

Last but not at all least, "PlantPAx 4.0 is coming in late 2015 with these and other changes to give enhanced control, automation productivity, and new technical and system capabilities," Wright said.

It's all part of the user-driven process for Rockwell Automation, Dornan said. "We value your input. We take your views and drive them into the products. What will we do next? It's up to you."

### FOOD & BEVERAGE FORUM: HOW TO STAY SAFE AND SECURE

Cisco and Microsoft Describe Food Optimization; Grantek Covers FSMA; Covectra Shows Serialization for Track and Trace

by Jim Montague

f you want to make an omelet, you have to break some eggs. If you want to make and distribute a few million aseptically packaged, microwaveable, shrink-wrapped omelets, then you've got a few more steps in your recipe. The bad news is that food processing machines, production lines and distribution avenues are getting increasingly complex and heavily networked at the same time that food safety regulations, requirements and concerns are growing more stringent and difficult to enforce across international boundaries and geographical regions.

Fortunately, automation tools, components and software, communication and Internet-based networks are all helping to solve these problems, especially when they're aided by Rockwell Automation and its many partners. Several of these experts from Cisco, Microsoft, Grantek and Covectra showed food processors how they can use the Internet of Things (IoT), smart devices, compliance with the Food Modernization and Safety Act (FMSA) and serialization to provide safe and secure food products to more consumers worldwide, and do it with the highest efficiency and the least hurdles.

"Recent research by McKinsey indicates that consumer spending is going to increase by \$8 trillion as more people worldwide move into the middle class, and they're going to want better food and water," said Todd Montpass, market development manager at Rockwell Automation, who moderated four presentations at the Food and Beverage Forum today at Automation Fair in Anaheim, California. "The value stake for manufacturing in this picture is about \$3.8 trillion, and The Connected Enterprise is how we can secure some of that value by integrating supply chains, collaborating globally, distributing best practices worldwide and maintaining food safety with better tracking and tracing."

To turn this vision into reality for its customers, Rockwell Automation is cooperating more closely than ever with its partners, notably Cisco. "Manufacturing is the number one industry that can benefit from IoT, but these potential gains must be based on security and safety," said Randal Kenworthy, director of business transformation at Cisco. "The health of our loved ones is paramount to everyone in our industries, and so the main question is how to deliver safe products to them. This requires tracing the products end-to-end through their entire digitized and virtual supply chains, but most production equipment and other assets that touch on these products are still dark and unavailable or only available in isolated silos."

Kenworthy reported that leading food and beverage firms are enhancing traceability by connecting, securing and virtualizing their manufacturing systems. "The good news is that IoT supports better business outcomes for manufacturers." added Kenworthy. "Converged, plantwide Ethernet architectures can connect dark assets and get the right data to the right people at the right time. Some other modern plant optimization techniques include installing cameras on plant floors and in tanks; using videos to download product changeover instructions; automatic ordering of consumables; machine builder remote access; and using audio and video for troubleshooting."

To handle all the data coming in from sensors and increasingly cheap devices such as RFID tags, Kenworthy said food and beverage firms (and pretty much all other manufacturers) will need to add a layer of intelligence to organize and help analyze this voluminous information into useful and profitable decisions, but also deploy security policies and devices to protect them. A few of these measures include routinely updated passwords, segmented networks with firewalls and other managed Ethernet switches, intrusion detection and response capabilities, secure virtual private networks (VPNs), traffic-filtering devices to detect unusual network traffic or activity, and endpoint security implementations.

"There is no silver bullet, but a good defense-in-depth program, an identity services engine and role-based access control can help users achieve converged plant security," said Kenworthy.

Rohit Bhargava, CTO of worldwide manufacturing and resources at Microsoft, agreed that IoT and cloud-based computing services such as its Azure platform are transforming how food manufacturers go to market and do business. "Technology is bringing even more computing power down onto the plant floor, enabling users to develop deeper and more continuous engagements with their products and customers," Bhargava said. "IoT services and architectures like Azure can also compare more performance variables, help users detect added patterns and catch anomalies at every level, turn that information into meaning, and achieve greater operational excellence."

Though not accelerating as fast as IoT, there's plenty of activity on the regulation front, according to Mike Lohmeyer, vice president of sales and marketing at Grantek Systems Integration. The FSMA was passed in 2011, but several important sections are still being written. Copies of the law are available via www.FDA.gov.

"FSMA is about capturing the right data about materials and processes at the right points in the supply chain," said Lohmeyer. "It's about not bringing bad materials in, not



"Most production equipment is still dark and unavailable or only available in isolated silos." Cisco's Randal Kenworthy on the need to connect and integrate food and beverage production machines in order to enable traceability throughout the supply chain.

sending bad products out, and putting them in the right packaging."

FSMA's four pillars are preventive controls, inspection and compliance, imported food safety and response requirements. This summer, the act also released definitions for critical tracking events (CTEs) and key data elements (KDEs), which cover what food production data must be captured and when. "One of the main unsettled issues is how rapid responses will have to be from producers when an incident happens, but that period will almost certainly be shorter than it is now," said Lohmeyer.

Finally, Steve Wood, president and CEO of Covectra, reported that today's serial numbers in 2D barcodes can be added to individual bottles or containers and then progressively nested within the codes on cartons, cases and pallets. This means knowing the barcode on a pallet will tell users about every other serial number in that pallet. "Serialization and The Connected Enterprise can bring better tracking and tracing to every level of the supply chain," explained Wood. "This capability coupled with the cloud allows us to complete an entire custody chain and repository for all barcodes on products produced by a manufacturer and track-and-trace them throughout their supply chain. This will be very useful because all U.S. pharmaceutical products will have to be serialized by 2017." ■

### OPPORTUNITY, UPHEAVAL AHEAD IN TECHNOLOGY-DRIVEN FUTURE

Connectivity Will Transform Society and the Ways in Which We Work by Jim Montague

his may hurt a little, or a lot, but it will get better. No kidding. Thomas Frey, executive director and senior futurist at the DaVinci Institute estimates that billions of jobs will disappear in the next 15 years due to the Internet of Things (IoT) and many associated technological advances, but these extreme and accelerating changes will also create many new industries and countless new jobs to replace those they've eliminated.

"We're living in an increasingly connected world, and Rockwell Automation is right on the cutting edge of these breakthroughs," said Frey. "We humans are very backward-looking because all our evidence and information is historical. However, we're all going to spend the rest of our lives living in the future, so how can we turn this around? How is the future created? It's in our minds and those of everyone around us. The future creates the present because visions of the future determine our actions today. So if we change our visions of the future, then this will change the actions we take in the present."

Frey presented "The Future of Work" on the opening day of Rockwell Automation's Process Solutions User Group (PSUG) today in Anaheim, California. PSUG is being held in the days leading up to Automation Fair 2014 at the Anaheim Convention Center.

#### Wake Up and Transition

Frey reported that "catalytic innovations" like electricity, telephones, automobiles and airplanes created multi-billion-dollar industries and millions of jobs in past decades, but most of these fields are now on or near the downward slope of their lifecycle bell curves. Meanwhile, these technologies' peak demand has been preceded by declines in the number of people needed to produce them as efficiency and automation have taken hold.

"Peak demand for steel is estimated to occur in 2024, and then decline as composites and other materials take its place. However, peak employment in steel production already occurred in the 1980s, and so employment can indicate what the future will bring," explained Frey. "I predict that more than 2 billion jobs will disappear by 2030. This needs to be a big wake-up call that we must transition to new kinds of jobs faster then ever before. Those jobs are going away, but this change also frees up human capital. We're not going to run out of work to do, but where is the next generation of jobs going to come from? They will come from all of the future industries that are already emerging."

Similarly, Frey cites Cisco's estimate that the IoT will include 50 billion devices by 2020, which will be assisted by an astounding 100 trillion sensors by 2036. "These sensors will be increasingly tiny, cheap and ubiquitous and will allow more and more people to participate in creating the future," added Frey. "This means just a few individuals will be able to develop innovations and then quickly get them into the mainstream for everyone else to use. We're getting further into this age of hyperawareness and speeded-up information flows."

Some of these IoT-enabled "enchanted objects" may include trash cans that can scan package barcodes and order new items; caps on medical prescription packages that can light, chirp and send reminder texts: ambient umbrellas that alert users when bad weather is predicted: biometric coffee makers than can brew according to user preferences; smart chopsticks that can test for food safety; smart contact lenses that will provide HMIs and data flows like Google glass; and countless other undreamed of solutions. All of these new industries and their products will need people to design, manufacture, market, deliver and maintain them.

#### **3D-Printed and Drone-Delivered**

Two of the biggest enablers of the loT-based future will be 3D printing or additive manufacturing and drone technologies, according to Frey. "3D printers are already producing complex textiles and shoes, automobiles and even concrete housing units," he said. "This will create a lot of needs for designers, and so everyone can get involved. In fact, you can already buy a 3D house-printing kit for \$16,000 from BetAbram in Slovenia, so I think we'll soon see these devices switching between concrete, glass and materials for plumbing and wiring."

On a more mobile front, Frey believes drones are going to take the automated, quided vehicle (AGV) industry into the air. "Drones are going to in 1,000 different directions," added Frey. "Drones will be used by first responders, rescuers and new organizations. They'll monitor forest for hot spots, and put potential forest fires out when they're easier to extinguish. Huge solar-powered drones from Titan and Ascentra will be able to serve as a cross between very high cellular towers and very low satellites, and allow far more people to access the Internet in developing areas. This will be another huge infrastructure project and employer. We're really entering a periods of unprecedented opportunity, and the future is ours to write."



"We're living in an increasingly connected world." Futurist Thomas Frey anticipates that the industrial Internet will spawn undreamed of new industries even as today's cornerstone industries face inevitable decline.

### MINING, MINERALS & CEMENT FORUM: A RICH VEIN OF AUTOMATION INNOVATION

BHP Billiton Streamlines Conveyor Isolation; Arrium Expands Steel Streams; and Anglo American Standardizes Continuous Process and Batch Controls

by Jim Montague

n the mining industry, dramatic drills and diggers get much of the credit. But it's the unassuming lifters, conveyors, crushers, concentrators, furnaces and smelters that do most of the work. To give these essential material handling and processing applications some much-needed support, three mines in Australia and South Africa recently implemented several different process control and safety upgrades. The three presented details of their projects at the Mining, Minerals & Cement Forum this week at Automation Fair in Anaheim, California.

For example, Mike Lane, managing director at Remsafe, reported that maintenance staff at BHP Billiton's iron ore mine in Port Hedland, Western Australia, had long been forced to waste hours isolating and de-isolating sections of its conveyor system to perform maintenance, make repairs and avoid potential arc flash hazards at the same time. To move ore from the mine to the port for shipping, a

16-mile-long, crescent-shaped

conveyor had previously surrounded the port. To streamline ore movement, the company built a tunnel under the port's main channel between Finucane Island and Nelson Point. The P702 conveyor in the tunnel can move 8,000 tonnes per hour and has already transported 2.2 million tonnes since it was commissioned in early September.

However, despite its improved infrastructure and performance, Lane added that the P702 conveyor's section in the under-harbor tunnel was still causing delays because it took 90 minutes for operators to isolate and lock out/tag out (LOTO) one section of the belt and then drive to the other end to isolate it. To overcome this problem, the mine installed Remsafe's field isolation stations and remote isolation panels, which also protect against arc flash. Remsafe uses GuardLogix and ControlLogix controllers and POINT I/O components from Rockwell Automation.

"In his weekly notes, the mine manager reported that, 'The installation and commissioning of the remote isolation



"This system was commissioned on a Monday, and paid for itself by Thursday." Remsafe's Mike Lane on the outsized returns achieved with the application of Rockwell Automation technology.

system will reduce isolation time from 1.5 hours to just 3 minutes. This will not only save the business time, but also significant money each time the belt is isolated,' " said Lane. "The manager added that the financial savings will be generated as BHP Billiton is able to keep production going without the conveyor's former interruptions. He also said isolation is one of the catastrophic risks for the port, and the new isolation system has allowed the mine to reduce associated risks inherent in the conveyor. This system was commissioned on a Monday and paid for itself by Thursday."

As a result, Remsafe is exploring more isolation-enabling projects for BHP Billiton involving conveyors, car dumpers, crushers, mills, pumps sets, ship loaders, stackers and railroad turnouts. "They also want to use our Remtranet remote isolation network for shutdown functions," added Lane. "We say that Remsafe is a safety system that generates revenue."

A little further downstream conceptually, Arrium Mining and Materials runs two ore streams, magnetite and hematite, at its facilities in Whyalla, South Australia. The company's raw materials come from the nearby Middleback and Southern iron-mining regions, but while Arrium also owns and operates the area's rail and port facilities, it outsources the mining work to six major contractors. Arrium has 420 employees, and the contractors have more than 1,000 employees.

Jonathan Delaou, principal control system engineer at Arrium, reported the magnetite process at Whyalla uses crushers, concentrators, filters and flux to produce pellets for making iron and steel products. The hematite process produces ore and pellets for export. Arrium and its contractors run 17 pits, six crushing plants with 10 fixed and two mobile crushers, two ore beneficiation plants, one concentrator and one pellet plant.

Arrium sold 12.5 million tonnes of iron ore in its 2014 fiscal year and was on track to produce 13 million tonnes per year (Mtpa) through the first quarter of its 2015 fiscal year. However, the firm's already been planning a larger plant and 30% production expansion to 18 Mtpa, and Delaou said it needs updated control systems to make it happen. ■

### FIVE STEPS TO PROCESS WISDOM

Virtual Support Engineer and vMonitor Move Data into the Cloud, Where It Can Help to Optimize Processes

by Mike Bacidore

M anufacturers have been collecting data from single assets for quite some time, but now the ability to aggregate and analyze that data gives enterprises the opportunity to make predictive decisions and optimize processes. A variety of new hardware and software on display at

the Rockwell Automation Solutions & Services booth this week at Automation Fair 2014 in Anaheim, California, bring that opportunity into the realm of possibility.

According to Doug Weber, business manager, remote monitoring services, Rockwell Automation, turning data into wisdom involves five steps:

- Instrumentation and automation, which the company's been providing for decades;
- 2. Data collection and aggregation, where the data is contextualized;
- Intelligent operations, which take the data into the cloud for collective comparison and trending;
- 4. Data analytics and reasoning, in

which organizations can make predictive decisions on how to run production, based on intelligence;

5. Optimization of processes, or wisdom.

"Remote monitoring and remote access are completely compatible with the Cisco-Rockwell infrastructure," explained Weber. Rockwell Automation has built its cloud software on top of the Microsoft Azure platform. It falls under the Virtual Support Engineer product umbrella, which can be used by mediumvoltage-drive customers or as an OEM solution that offers secure connectivity using IT-approved communication, real-time alarming, data collection and analytics.

"In the cloud, IT issues are reduced," explained Weber. He offered an example. Shell is now selling LNG through its refueling stations. "They see 851 data points pulled every second at each refueling station," said Weber. "The system can go to milliseconds. They're also able to monitor the drives and pumps, and they can manage inventory



"They're also able to monitor the drives and pumps, and they can manage inventory by monitoring the levels and rate of usage." Doug Weber explains some benefits of the Virtual Support Engineer at the Rockwell Automation Solutions & Services booth in the Automation Fair exhibit hall. by monitoring the levels and rate usage."

Rockwell also offers remote access to controls. "Access is separate from monitoring," explained Weber. "We sometimes load the agents on the same computer, but there are two separate pieces of software. With our remote access solution, you also can do some monitoring. I can set up limits so the system alarms if a tag goes out of bounds or a switch drops a certain number of packets. That's available with the remote-access technology. In the cloud we're building dashboards and reports."

Rockwell Automation also is helping companies transition to the digital oilfield through its vMonitor solution. The monitoring and control solutions for wellhead and upstream applications combine wireless instrumentation and communication with visualization software. A common engineering, deployment and integration methodology has been developed to deliver actionable information across the enterprise to drive more-informed decision-making and improved production. Wireless telemetry, hardware, software and sensors allow for integration of solutions with minimal engineering and conceptualization.

"Thousands of these already are installed, mostly in South America for

now," explained Andy Weatherhead, manager of global engineering and technology, global solutions business, for Rockwell Automation. "The cloud-based piece will be available in December, and the analysis portion is being worked on at the moment." Once the data is in the cloud infrastructure, he said, distributed workflow can be used to initiate well tests based on parameters rather than on an arbitrary schedule.

"There are a number of large players in the field optimization space, and this offers us a way to connect to their systems for data collection and aggregation," said Weatherhead.

"If you have a lot of OEM skids, you can immediately grab and contextualize that data for the maintenance schedule. for the production schedule and for the full enterprise for managing capital expenditures," explained Pat Murray, director of commercial marketing, Solutions & Services, Rockwell Automation. "With vMonitor and the digital oilfield, if we're able to grab information from the instrumentation and the controls, we're able to run models, such as three-phase and black-oil models. Now you can control that from a central location and can continually provide information on the size and quality of the field."

### CONNECTED ENTERPRISES MEAN OPPORTUNITY, RESPONSIBILITY FOR OEMS

Data Ownership Among the Many Issues at Stake

by Mike Bacidore

he Connected Enterprise dramatically increases the amount of data available for analysis. It enables a variety of opportunities for improving business models and performance for OEMs, from reduced downtime and optimized capacity to improved machine design and monitoring capabilities.

"Downtime cannot be reduced to zero, but it is the direction we're heading," said Bruno Alberti, innovation and technical director at CT Pack in Ferrara, Italy, who participated in an Automation Perspectives panel discussion today in the run-up to Automation Fair in Anaheim, California. "We can use remote monitoring. We are creating a standard base for communicating the data from our machines to our customers. What's important is what information we're sending to the customer, not so much how we're doing it. At first they were asking for OEE (overall equipment effectiveness) and other KPIs (key performance indicators), and now they're asking for things like power consumption. We can do much more."

Remote connection allows CT Pack to connect each new machine to its site. "If

I can see the consumption, I can see the stoppages," explained Alberti. "If I can see the historical data, we can think about a machine that can ask for spares. And think about training. For us it's difficult to make training available because we are a small company, and we are in Italy."

In terms of the value drivers, machine builders are keenly interested in faster time to market, said Blake Moret, senior vice president, control products and solutions. Rockwell Automation. "Whether it's faster line integration or skid integration in process applications, faster connectivity brings value," he explained. "A lot of times, downtime lasts longer than it needs to because you can't have an expert everywhere. The Connected Enterprise can bring that person in remotely, which lowers the total cost of ownership. Every time you have downtime on an asset, it's going to cost a process customer upward of \$30,000/ hr. Often that downtime is going to last five hours. Enterprise risk is mitigated when you're able to remotely operate and monitor equipment; you're able to keep an operator out of harm's way."



First Solar's Mike Sweet (left), along with co-panelist Bruno Alberti of CT Pack.

First Solar, a provider of photovoltaic energy solutions headquartered in Tempe, Arizona, also is an EPC firm for its own operations, and it uses a follow-the-sun support model for its remote monitoring and service. "We have our own operations and maintenance (O&M) business," explained Mike Sweet, director - MES at First Solar. "With our fleet, we have 99.9% availability. When I first started seven years ago, we were operating on spreadsheets, and now we're operating on SAP. In our long-term strategy, we think in terms of capabilities. But at first, we were focused on tactical. It was frustrating because we would start down a path, and then we would change. Other than adding O&M and adding EPC, all of the other capabilities we had in place are still there."

First Solar also has made significant increases in production capacity during Sweet's tenure, moving from 200 MW when he joined the organization in 2007 to 1.8 GW today. "I'm not really a numbers guy, but most people measure by the numbers," said Sweet. "First Solar is a young company. We didn't know what we were doing. We put together a Connected Enterprise because we thought it was a good idea. Our numbers are a result of a company that's doing well. But what we're really doing is changing the world."

Rockwell Automation has been talking about integrated architecture for quite some time, explained Moret. "In the past, you installed a piece of equipment, and if it met the production requirements, that was enough. But today you have to make that data and that information available to improve the organization, where decisions can be made," he said.

Making actionable information available where and when it's needed is at the core of The Connected Enterprise. Whether it's providing realtime information to operators on the line or sending the data to the cloud for analysis, the value is in the context. "I have some controversial opinions on cloud and IoT in general," offered Sweet. "We collect terabytes of data. We added 1,800 new connected devices last year. We collect data on over 50,000 data screens. We also collect data from our power plants, so we get very high-frequency data. It's important for us to tie that data back to the manufacturing process. We warranty our product for 25 years, so we have a pretty big exposure if we don't know what we're doing."

The aspect of the IoT that keeps Sweet up at night is security. "An island of information has perimeter security," he explained. "But as we move to the cloud, perimeter security hasn't been thought out yet. The cloud is ideally where I can build QA environments and test them. I started in IT and went to OT, and now I'm a blend. Normally MES came from process, instrumentation and control. It's no longer that. They put MES inside of IT. We still have a collision, not a convergence, between IT and OT at First Solar, but it's getting better. The Internet of Things is driving IT people into the manufacturing space."

Younger workers today know what plug-and-play looks like, added Moret. "There's a place for real-time control," he said. "There's a place for analysis at the edge. There's a place for collecting the big data to compare non-intuitive data sets and to look at a different degree of analysis in the cloud. The concept of The Connected Enterprise reinforces a message we've used with our traditional products for a long time. The other piece is the brand-new value that you see. It brings us into new applications. Five or 10 years ago, how much would Rockwell Automation have been talking about retail LNG dispensing, which we're working on now with Shell? It's founded on the basic expertise that we have. We're monitoring our own machines in thousands of locations. We're bringing data back on voltage information and other process information to complex monitoring of machines."

CT Pack sees many opportunities, including cost savings and security, said Alberti. "But our customers don't want to share data," he said.

"Sometimes the owner will say, 'That's my data,'" agreed Sweet. "As more companies begin to understand the value of the data, there will be less willingness to share the data or allow access to the data. To talk about not connecting should not even be on the table. As technology has moved on, it's enabled certain things. In our overall IT department, we're 80% virtualized. We provided customers with a virtual landing pad, and then we can control better what they're able to do. Even our controls engineers are using virtual laptops. That was a milestone." ■

### HOLCIM MEXICO PAVES WAY FOR GLOBAL CEMENT MAKER

Reductions in Downtime, Maintenance Costs to Help Boost Plant Competitiveness by Keith Larson

ith 80,000 employees and operations in 70 countries around the world. Holcim has an understandable need for standards. The Switzerland-based company is a global leader in the production of cement, aggregates, concrete and asphalt, and its internal standards apply to how its many production facilities are automated, even how often those controls should be evaluated for upgrade. Several years ago, the 1980s-era controls at its Macuspana cement plant in Tabasco, Mexico, were deemed to have reached the end of their useful life, according to Fernando Hernandez, automation and control supervisor. "We needed to migrate to a new generation system that would be faster to react and control."

And while the need to modernize was first acknowledged in 2007, the global economic downturn delayed action until 2012, when the plant embarked on an 18-month, phased effort to bring the plant's aging infrastructure up to speed, modernizing older PLC-5 and RSView visualization software to PlantPAx technology from Rockwell Automation. Hernandez described his company's journey in a presentation today at the Rockwell Automation Process Solutions User Group (PSUG) meeting held in Anaheim, California, during the run up to Automation Fair 2014.

Before the migration, the plant's automation architecture consisted of PLC-5 controllers linked to remote input/ output racks via Remote I/O (RIO) protocol. ControlNet was used for peer-to-peer controller communications as well as for integration with supervisory level systems. The slow speed of the RIO networks in particular had begun to hamstring operations, Hernandez said. In the new architecture, ControlLogix controllers have replaced the PLC-5s; ControlNet has replaced RIO; and EtherNet/IP is used for integration with higher level systems.

EtherNet/IP might have been used throughout, Hernandez added, but corporate standards again came into play. In particular, ControlNet had been approved for implementing the peerto-peer interlocks among process units and should be adequate for the plant's near-term needs. "That may change in a year or two," he said. Hernandez



"We needed to migrate to a new generation system that would be faster to react and control." Holcim's Fernando Hernandez on the company's recent cement manufacturing modernization effort.

also noted that the PlantPAx system's library approach to control logic and visualization templates worked particularly well with Holcim's corporate standards for common cement manufacturing operations.

The new system already has begun to pay off. "With the new HMI control system and diagnostic tools, the plant is having fewer unplanned stoppages," Hernandez said. "The new platform also provides more diagnostic tools in case of failure and lower maintenance costs, and it will result in a higher level of competitiveness for the company." In the future, the plant plans to tap the as yet unexploited power of the new control processors to achieve better power and thermal control, Hernandez said.

With its new controls in place, plans are in the works to share the plant's modernization experience with operating units around the globe, for example, in Australia and South America where PLC-5s are still in use. The Mascuspana plant has set a new standard for Holcim, "a success that we'll now take to plants in other countries," Hernandez said.

### EPC FORUM: CONTRACTORS MEET CHALLENGES WITH INTEGRATED SYSTEMS

Delivering Massive Projects Is More Practical with a Unified Architecture and a Little Help from Your Friends. by Paul Studebaker

s much of the globe comes out of recession, capital is being expended, and project sizes are rising. It's a good time for engineering, procurement and construction firms (EPCs), but it's not the good old days. "We see a lot of changes and trends in EPC," said Scott Hamilton, director, industry business, Rockwell Automation, to attendees of today's Engineering and Consultants Forum at Automation Fair in Anaheim, California. "Owners are sticking to their core expertise due to a lack of top talent and the need to get work done in remote locations. They're contracting with EPCs to outsource more turnkey facilities, including the entire scope of supply."

For instance, 10 years ago Kraft had a team of 100 people whose job was developing facilities. "Now they prefer to focus on their core competence—making really good cookies," Hamilton said. "We're seeing this more in oil and gas, and in brownfield applications. They're outsourcing the full scope of supply to maximize savings in capex, to reduce risk, speed installation and startup, and ultimately, to improve cash flow."

Inside the plants, similar skills shortages are driving more automation. "There's a real shift going on with the challenges of the skilled workforce, a convergence at the project level," said Donald Fraser, North American industry equipment manager, Rockwell Automation. Operations people have more input into what to automate, and "IT people are in from the beginning, including both operational IT and traditional IT."

Fraser said he used to know for a given plant how many drawings it would take, a list of equipment, and what it would take to put it together. "Now, with convergence, it's not the same," he said. "What you need to know and to make decisions on is much greater. You need to know networks, data and communications. It's not just I/O. It's networks and IT, not islands of automation." An example of the kind of project Fraser and Hamilton described was detailed by David Musto, managing partner, Thermo Systems LLC, a Rockwell Automation Solution Partner. Thermo Systems specializes in PLCbased process control solutions for chemical and process industries, critical HVAC/BAS for life sciences and data centers, as well as life sciences manufacturing, utilities, boilers, cogeneration and chilled water plants.

"The challenge was to develop a plan, or in this case, an automation master plan (AMP), to engineer, procure and construct a homogenous, sitewide process control system across 14 disparate process buildings that were being designed by eight separate process engineering firms," Musto said.

Molycorp Inc., a leading global manufacturer of rare earth and rare metal products with 26 locations in 11 countries, was reconstructing its facility in Mountain Pass, California, to restart mining operations and build a new, state-of-the-art processing facility. The project included crushing, milling and leaching/cracking plants, three separations facilities, and precipitation, chlor-alkali, electrical and steam generation, water treatment, chemical storage, truck unloading, tailings and utility water distribution facilities. The schedule was 18 months from design to commissioning.

The project required concurrent design and commissioning phases, integrating process and electrical designs from eight different process engineering firms. The processes and process automation were to migrate from islands to a plant-wide integrated architecture.

Molycorp partnered with Thermo Systems to develop the AMP and to be the automation engineer of record. "The AMP defined all things automation sitewide," Musto said, including naming conventions, instrument standards, cabling standards, PAC and remote I/O panel standards, IT infrastructure standards, software specifications, PAC programming standards, inter-PAC communication standards, SCADA and OIT standards, a security plan and risk analysis.

Both proprietary and non-proprietary solutions were evaluated. "A traditional DCS approach did not meet the owner's requirements for a non-proprietary solution, so three non-proprietary vendors were considered," Musto said. "A scalable, homogenous platform was given priority because we needed to integrate multiple levels of control under one manufacturer: high-performance redundant systems, non-redundant systems and vendor skidlevel systems." ■



"The challenge was to develop a plan to engineer, procure and construct a homogenous, site-wide process control system across 14 disparate process buildings that were being designed by eight separate process engineering firms." David Musto of Thermo Systems described one example of the increasingly complex projects undertaken in today's EPC climate

## YPÉ USES PLANTPAX, MES TO CLEAN UP PRODUCTION

Brazil-Based Detergent and Fabric Softener Maker Simplifies Operations Integration with SAP

by Jim Montague

lose, simple and efficient integration of plant-floor controls and enterprise-level systems is much desired by many manufacturers, but too often it remains just a dream due to integration complexities and other obstacles.

Well, engineers and innovators at Ypé Quimica Amparo in Sao Paulo, Brazil, report they're living that dream at their new factory in Anapolis. The facility took just 12 months to build, is located about 600 miles north of its headquarters and produces liquid detergents and fabric softeners. Founded in 1950, Ypé also makes bar soap, powdered detergents, steelwool pads, multi-surface cleaners and scrubbing sponges.

Ypé recently and successfully integrated the Anapolis plant's operations with its SAP-based enterprise system by implementing PlantPAx process automation systems with help from lastech, a local system integrator and Rockwell Automation Solution Partner since the program was started in 1990. lastech reports it has completed more than 1,800 projects in the life science, food and beverage, and chemical industries since it was founded.

"Our innovation department focuses on engineering Ypé's manufacturing execution system (MES), instrumentation, mechatronics and automation," said Cláudio Fernando de Jesus, Ypé's innovation manager. "We research and build new technological models; approach, integrate, facilitate and connect people to processes and equipment; research new technologies and techniques; carry out development projects; and look to the future to realize these dreams. In the department's 14 years, we've developed and built more than 200 projects, including 115 specialized machines and 10 factories. For the new plant in Anapolis, we needed a main core that integrated our MES and the plant's operation and centralized SCADA system. PlantPAx gave us an all-integrated solution that shortened our development time and gave us much better production."

De Jesus and Rafael Pezzella Chiea, lastech's sales manager, presented "Cleaning Up Production with PlantPAx and MES" today at the Rockwell Automation Process Solutions User Group (PSUG) meeting in Anaheim, California. PSUG is being held before Automation Fair 2014 at the Anaheim Convention Center.

The Anapolis plant's MES manages its raw material storage, dishwashing liquid detergent and warehousing functions, while its SCADA system runs its utilities, liquid softener, IT and SAP tasks. The dishwashing liquid detergent and liquid softener areas consist of separate dosing units, mixer units, storage and filler lines, while its utilities area includes air, water treatment and steam equipment.

The factory's organizational levels include level 4 with its corporate management and SAP enterprise resource planning (ERP) system. Level 3 has the MES with its Microsoft Windows Server 2008 Hyper V and five physical HP Proliant BL460C computers running Microsoft SQL Server, Rockwell Automation FactoryTalk and other software. Level 2 is occupied by automation processing functions, and level 1 is the plant floor.

"PlantPAx helps integrate all four of these levels," said de Jesus. The plant also uses two ControlLogix 5562 PLCs for overall control, five CompactLogix L35E PLCs to automate its filling lines and a dozen PowerFlex 40 motion controllers to run its conveyors and other equipment. Plant-floor devices are networked with a combination of 10 DeviceNet networks and three ControlNet networks, while the upperlevel enterprise systems are networked with Ethernet. The facility's total I/O count consists of 1,032 digital inputs, 792 digital outputs, 92 analog inputs, 160 analog inputs running HART and 60 analog outputs.

"We also use FactoryTalk View Site Edition Server 100 Display with RSLinx and 11 clients," added de Jesus. "This lets us view screen shots of our liquid detergent preparations, storage tank, demineralized water, integrated filler lines and other processes, quickly generate production and overall equipment effectiveness (OEE) reports, and even view them on our smart phones. And our close integration between MES and controls means we can view and take orders right from SAP, immediately input them right into the production system and discharge the raw materials needed to produce them. PlantPAx's full integration with SAP means greater system reliability and better control over our orders and production. It made it possible for our dream to become real."

### MODEL-PREDICTIVE CONTROL SMOOTHES WATER DISTRIBUTION

Windsor's Water Distribution System Slashes Water Main Breaks 21% by Using PlantPAx Embedded MPC

by Jim Montague

old winters and pressure spikes add up to popped pipes in municipal water distribution systems everywhere. But, while chronic water main breaks are an unavoidable, occupational hazard for most cities and towns, engineers and operators in Windsor, Ontario, have found a way to drastically reduce these costly and timeconsuming incidents by using the soonto-be-released PlantPAx Embedded MPC (model-predictive control) technology from Rockwell Automation.

"Cold winters increase the frost depth in the ground, and this stresses pumps and allows resulting pressure variations to cause breaks in the mains," said Garry Rossi, water production director at EnWin, which provides management, maintenance services and staff for Windsor Utilities' water distribution system. "We decided to investigate MPC because we were losing about 17% of our water, and so we weren't getting paid for it. This was one of the highest non-revenue water rates in Canada, and even reached 24% in the third year prior to our upgrade project. The cost of this lost water was compounded by the fact that our electricity bill was increasing by an average of 5–6% per year."

Rossi and Edward Scott, process optimization lead for Canada in the Information Systems and Process Business at Rockwell Automation, presented "EnWin Utilities Reduces Water Main Breaks by 21% with MPC" today at the Rockwell Automation Process Solutions User Group (PSUG) meeting in Anaheim, California. PSUG is being held right before Automation Fair 2014, hosted by Rockwell Automation this week at the Anaheim Convention Center.

The city gets its water from the Detroit River and distributes about 92 million gallons per day to about 280,000 customers in Windsor and the nearby communities of LaSalle and Tecumseh. The utility also has 31 million gallons of reservoir storage, two treatment plants, three pump stations, two elevated storage tanks, and operates 690 miles of water mains with 66-psi average pressure at the pump. The average age of these pipelines is 44 years old, but some are as old as 80



"Our return on investment for the whole project was less than one year." EnWin's Garry Rossi explained how model-predictive control has enabled more stable pressure control in Windsor, Ontario's water supply mains—reducing electricity and chemicals costs as well as water main breaks in the process. years; their age and mineral build-ups make them brittle and susceptible to breaks. Rossi says Windsor experiences about 238 water main breaks per year, which Rossi reports is second only to Toronto.

To start reducing breaks and plugging leaks, Rossi reported that EnWin started out by installing 17 pressure control stations over the past four years that feed data back to the fully redundant SCADA system it also installed in 2010. This whole system is connected via a fiberoptic ring network. The utility also installed two variable-frequency drives (VFDs), including one at its second-largest pumping facility.

"We began researching what MPC could do for us because, while our 10 operators all produce excellent product, they all operate slightly differently, and these slight inconsistencies produce inefficiency," explained Rossi. "We also have fewer operators monitoring far more parameters than in the past, and many of them can influence each other. For instance, flow rates can have a direct effect on chemical requirements and turbidity. We also did lots of training and have volumes of procedures, but our former PID-based algorithms could only look at one input and output at a time."

To examine and analyze multiple parameters and variables, EnWin began by developing a definitive model for its MPC program, which allows its controllers to estimate expected future performance and adjust setpoints earlier. "PID loops look at deviations from setpoint, but they can only handle one input and output," explained Scott. "Users tell an MPC what target they want to maintain, and then the MPC has the controllers push adjusted setpoints down to the DCS. This means MPC can look at all relevant inputs and outputs and adjust back to the target before the overall system begins to move." Consequently, EnWin adopted PlantPAx Embedded MPC to adjust the constraints in Windsor's distribution system sooner, and then smooth out and reduce its formerly chronic pressure spikes. Based on Pavilion8 technology, PlantPAx Embedded MPC will be formally launched by Rockwell Automation in 2015.

Rossi reported that one of Windsor's water towers used to run at 62-74 psi when it was operated manually, a relatively large 12-psi pressure range. However, adding the VFD in Phase 1 of the upgrade, which also integrated data flows between pressure station and pump station, reduced the variability to 5 psi. Further, implementing MPC in Phase 2 enabled the VFD to actually dampen the effects of valves opening and pumps starting and stopping, further reducing variability to just 1 psi. This is the source of many if not all of Windsor's greatly reduced water main breaks.

"We reduced water main breaks by 18% during January, February and March 2014 compared with the past eight years, even though 2014 was colder than almost all of them," added Rossi.

In the future, Rossi reported that EnWin is going to seek further gains by using sensors with 0.1-psi sensitivity to produce better setpoints; its present sensors are accurate to only 0.4-psi. Also, Windsor is going to add a VFD to its largest pumping station and probably enable MPC at its reservoir as well.

"This will allow us to run our production at a steady state and further improve our chemical and electrical efficiency," added Rossi. "So far, better pressure control has saved us 28% or \$125,000 on chemicals and electricity. We reduced our standard deviation on water pressure by 29% overall, and this saved us another \$125,000. As a result, our return on investment for the whole project was less than one year."

### END-USER SAFETY FORUM: TOP MANUFACTURERS FIND THAT SAFETY PAYS FOR ITSELF

Best-in-Class Manufacturers Practice Safety Methods that Result in a Lower Worker-Injury Rate, Less Unscheduled Downtime, Fewer Risks and Higher Production

by Leslie Gordon

raditional industry thought holds that to implement safety measures necessitates sacrificing productivity. But for experts who spoke this week at the Safety Industry Forum for end-user attendees of Automation Fair in Anaheim, California, this belief is incorrect. "In actuality, our studies show a very strong correlation between safety and manufacturing excellence," said Mark Eitzman, market development manager, safety, Rockwell Automation, during his context-setting presentation. "The majority of manufacturing enterprises still do not have a culture of safety, and unfortunately statistics bear this out. According to the International Labour Organization, every 15 seconds a worker dies from a workrelated accident, and over two million people are injured every year," he said. Also providing context for the safety topic at the forum was Chris Brogli. business development manager, safety, Rockwell Automation, while Kerry White, engineering and safety, Michelin Tires, explained how his company

implemented safety methods that have slashed worker injuries, boosted productivity and cut unscheduled downtime.

According to Eitzman, even with global standards in place, major discrepancies exist for achieving safety on global, country, industry, division and plant levels. "That's because companies define acceptable levels of risk differently," says Eitzman. "To help address this issue, we defined safety maturity by what we call the '3 Cs': culture, compliance and capital, We created the Safety Maturity Index (SMI) as a way to capture, measure and enumerate what we saw in our experience and research. Culture comprises a company's attitudes and accountability. Compliance involves the use of effective processes and procedures, as well as formalizing risk management strategies, even throughout the supply chain. Capital is a company's investment in technology."

The Rockwell Automation research showed that companies could be divided into four groups. SMI 1 includes



"Whether it's a pull cord, scanner, or drive, we already have the code for it." Michelin's Kerry White discussed how the company's global effort to standardize safety processes helps "squeeze out potential errors."

companies that avoid safety entirely; SMI 2 comprises companies that invest in safety on a reactionary basis, say, after a worker is injured; SMI 3s are companies that understand the direct and indirect costs of safety incidents and are willing to lower production to make the operation safer. SMI 4 firms refuse to compromise and demand both safety and productivity. "Out of the research, we created a self-assessment tool that a company can use to come up with its score on each of the 3 Cs. The tool is found at www.rockwellautomation.com/safety/smi. With your score in hand, the next step is to gather a team including engineers, operators, managers and maintenance professionals and brainstorm where to go for each of the 3 Cs. The 3 Cs is a three-legged stool, and all legs need to be sound to support security."

Chris Brogli added that companies that practice safety have goals such as protecting their workers and the environment, as well as their brand image. "When you hear 'oil spill' or 'accelerator pedal,' which companies immediately come to mind? Firms want be safe to help avoid tainting their brands."

Rockwell Automation also has designed a process it calls the Machine Safety Lifecycle, which firms can follow to ensure they have implemented proper safety practices. It is based on the ISO 12100 standard. Steps to follow include assessing risk, determining machines' functional requirements, design and verification, installation and validation and, importantly, maintaining and improving. "Users can then perform designverification calculations using complex mathematical calculations or an easy-to-use Rockwell Automation tool based on the SISTEMA (Safety Integrity Software Tool for the Evaluation of Machine Applications) methodology," said Brogli.

Michelin Tires is putting similar methods to practice. The company been around since 1832, has 111,200 employees

worldwide in 67 plants in 17 countries, and has made tires in the U.S. since 1971. "We approach safety in terms of reliability because in the final analysis, it's all about how reliable that machine is going to be at the safety level," said Kerry White. "We are part of what we call UTEs—united teams of engineering with a fourfold purpose of improving design safety, design quality through standardization, engineering efficiency and engineering professionalism."

This endeavor is a challenge because Michelin has many regions, zones and plants at many different skill levels. Further, there are different requirements in every country, continued White. "To ensure the level of safety in every plant is the same, we use ISO 13849 and IEC 60204, standards that apply to all governmental regulations and meet the requirements of every country."

A few years ago, safety standard EN 954-1 was replaced by ISO 13849, so Michelin now uses the latter. "EN 954-1 was mostly electromechanical and involved relays and contactors. The safety circuit defined by the electrical diagram. The engineer drew it out, wired up the machine, started it and flagged the light curtain. If the machine stopped, we said 'we are good to go.' But you can't use a solid-state device in that safety system," explained White. "ISO 13849, though, includes EN 954-1 tenets and encompasses electrical, programmable, pneumatic, fluid and hydraulic technologies."

"Currently, we look at how reliable will a machine or switch be, what is the ability of a system to detect a fault or the state it is in, as well as common causes of failure," said White. "If we deconstruct the standard (ST-154), it can be seen that every risk has to be mitigated by a safety function. So if you have a machine with 10 risks, you have to have 10 safety functions. Inside each safety function are three components— inputs like light curtains, interlocks, floor mats and scanners; logic in the form of controllers, safety relays or safety PLCs; and outputs, which are the final switching elements such as valves. When you look at the whole system, you must look at multiple safety functions for different levels with the varying input, logic and output devices."

Instead of training all its engineers on becoming safety experts, "Michelin developed a several-step process. Following it ensures we apply ISO 13849 and meet our goals of safety, quality, efficiency and professionalism," White said.

The first is a risk analysis that defines what performance level to design to. It involves using a tool Michelin developed that walks through the interventions with the machine, then identifies hazards. "The tool tells us the risk level, how we need to protect it and documents every intervention. For example, if a worker is likely to get pinched by a robot, this is documented. In addition, every hazard is mitigated by, say, putting up a guard or implementing an electrical fix.

In another step, the company looks at the input, logic and output components one at a time. "For inputs, every plant has a choice of only three E-stop buttons, simplifying the process," said White. "The next step is to apply the input to a safety logic element—a safety relay, safety controller or other device. That way, the diagram is already done, and we don't have to guess whether the PLC or safety relay was wired up right. The method is the same from plant to plant or zone to zone. We do this for every one of our inputs and have only one safety relay and one safety controller to choose from, again simplifying the process. Output components are done the same way."

Every safety device also has its implementation guide from the manufacturer that we must we follow (for example, directions on how to best install a light curtain), continued White. "The last part is to validate that the performance level required equals the performance level achieved, and again, this is all based on ISO 13849."

"The upshot is that following these instructions ensures safety," said White. "We apply the same kind of thinking to programmable safety by using a modular approach with locked bits of code that contain the HMI graphics and programming, as well as the implementation guides. Whether it's a pull cord, scanner or drive, we already have the code for it. Our approach standardizes our operations, which bolsters safety by helping squeeze out potential errors." ■

### SMART MACHINES ANSWER END USERS' CALL FOR PRODUCTION QUALITY

The Connected Enterprise Is Enabled by Connected, Compliant and Competitive Machines

by Mike Bacidore

he desires of end users for Smart Manufacturing are driving The Connected Enterprise, according to Mike Wagner, director of the packaging segment for the Rockwell Automation global OEM team.

Rockwell Automation, in turn, is helping OEMs to design Smart Machines that are connected, compliant and competitive. "It's how we speak to the OEM," explained Wagner. "Smart Manufacturing represents the convergence of information aggregation and control aggregation. The Smart Machine goes all the way down to the device level."

Wagner cited Tetra Pak, the Swedenbased food packaging and processing company, as a hybrid model of an OEM offering production capability, as well as a traditional capital-equipment model. "They make money on the paper," he explained. "The machines are almost a giveaway. You can end up with a lease program on the equipment. The faster and longer the machine runs the more paper it uses."

On the visualization side, there's also a move away from text-based HMIs to multimedia displays on modern machines. "It's not unusual to see embedded video, graphics and pictures," Wagner said. One of the newer trends is that SMS cards are being installed so operators can receive text messages directly from their Smart Machines. "The texts can schedule preventive maintenance or order spare parts for a job," said Wagner, admitting that such functionality requires a progressive "openness" on the part of the end user. "Safety has always been an issue. Now you've got security in the mix because the OEMs are motivated to have a live connection to that machine."

Market leading OEMs have been thinking about remote connectivity and security for a while, and the technology's now catching up, added Wagner. Rockwell Automation, for example, is bringing multi-level discipline to security. "It's not enough to secure the operator login on the machine," he said. "You need to have security around who's allowed to make changes, how they're made and how they're tracked." The OEM also wants



"Machine builders need to understand the end user's needs, and how they can help boost their customers' return on investment." Mike Wagner of Rockwell Automation talked about connectivity, compliance and competitiveness across the OEM landscape. intellectual property protection, said Wagner. "They need to guarantee quality of their machine."

Smart Machines and connectivity also have changed error reporting on most machines. "OEMs in the past have been required to create error logs, which are glossaries of failure," explained Wagner. "Today, we have diagnostic logic built in. Trends and analytics are available on the fly. Root causes are easier to chase. Now the operator screen is going from green to yellow to red. It'll tell them, for example, that they have a material issue and tell them what to do, without interrupting production in many cases."

As OEMs look to deliver more connected machines to global end users, they also encounter a variety of regulations and standards, some of them unfamiliar. "Compliance is

multi-faceted," said Wagner. "We're all complying with many

standards globally every day. We have safety compliance. We have the Food Modernization Safety Act, which affects the way we report and monitor sanitary conditions. We have electrical compliance from OSHA. And compliance varies by country. If you're operating in the United States, you have UL. For Europe, there's CE. All of our drives have to be tested, not just as a product, but as a system. China has its own standards, and so does Canada."

As users drive to realize The Connected Enterprise, it represents a significant business opportunity for OEMs, who can make themselves more valuable to end users by anticipating their customers' future needs. "Our goal is to enable OEMs to be more productive and competitive in their markets," Wagner said. "Machine builders need to understand the end user's needs, and how they can help boost their customers' return on investment."

### COMPRESSOR CONTROL COMES OUT OF THE BLACK BOX

Refinery Replaced Proprietary Boxes with Open Systems for Surge and Performance Control by Paul Studebaker

Does your bucket list include implementing fully redundant integrated turbomachinery control on a two-stage coker wet gas compressor in a refinery? In six weeks? In Mexico? That's the task described by Paul Fisher, president, Energy Control Technologies (ECT) and Cecilio Gomez, president, Oros Electromechanical (Oros) at the Rockwell Automation Process Solution User Group (PSUG) conference, in Anaheim, California.

ECT deals with axial, centrifugal, screw and reciprocating compressors as well as steam and gas turbines commonly found in floating production, storage and offloading (FPSO), offshore, refining, petrochemical and, especially recently, LNG applications (as a result of increased fracking). ECT specializes in complex applications with networked compressors, load sharing, turbine-driven compressors and plant air systems with mixed compressors. Its products include specialized packages for process, surge and sequence control, HMI, and lubrication and vibration monitoring. Its services range from sales to startups, support and training.

ECT competes with "black-box companies" that provide purpose-built systems for compressor, turbine and surge control. "We keep all the good things and put them in an open environment," said Fisher.

In Mexico, Oros builds and installs the systems and provides communications and training in Spanish. The company has a 23year history integrating compressor, turbine, fire and gas, and emergency shutdown applications, often involving vibration, lubrication and dry-seal systems.

The coker compressor application described in the presentation

required redundant control (including inputs, outputs and power supplies) using open-platform PlantPAx and ControlLogix technology with dedicated compressor control. "That's a little bit of a leftover from the black box," said Fisher. "We did it as dedicated surge control integrated into PlantPAx." The system also had to be SILcertified, have transmitter failure fallback and be "simple to understand," Fisher said.

"The way the customer operates, they take a long time to develop the specifications and approve a system," Fisher said. "Then they expect you to build, install and commission it in six weeks. It's easy for ECT, but hard for Cecilio."

The high-level control to detect and prevent surges required 40-ms execution and known invariant coordinates. The 10,000-hp, motor-driven two-stage compressor has variable-speed drive, two surge control valves in parallel on the low pressure stage and one valve on the highpressure stage. "There's a lot of interaction between control and surge," Fisher said.

ECT's SurgePAC controls surge; its PerformancePAC runs the motor drive. The process involves variable molecular weight wet gas and changing out coker drums so, "It's a challenge to keep pressure from fluctuating," said Gomez. The compressor is the limiting factor in production, and the key is to have the compressor operating envelope as large as possible to maximize production by handling the variations without surge.

The HMI shows exactly where the

compressor is operating on the invariant diagram. "You can see where you are in relation to the danger point at all times," said Fisher. To establish that envelope, the compressors are surge tested, and the reason for 40-ms response becomes apparent. "We bring the compressor into the danger zone to see where the surge point is and immediately open the valves to bring it back. Then we repeat that at different speeds to find the operating envelope of the compressor."

Fisher and Gomez measure the success of a system by whether or not it is kept in automatic. One important element is excellent surge control; another is reliability. "If the operator doesn't know what's going on, he immediately switches to manual," Fisher said. "Once it goes to manual, it's very difficult to get it back on automatic."

"Standard Rockwell Automation redundancy doesn't meet the needed performance specs, and we have to maintain the 40-ms speed," Fisher said. The solution involves a second I/O chassis, proprietary field termination assemblies and redundant transmitters. These are ECT global-standard solutions, "so any developer and any service technician can handle them," said Fisher.

Redundancy allows the system to stay in automatic through a failure, and the faceplates make it easy to drill down and identify the cause. If card A detects a failure, it shifts control to card B and indicates a fault. "You can easily see if the failure is in a



"It's a challenge to keep pressure from fluctuating." Cecilio Gomez, Oros Electromechanical, together with Paul Fisher, Energy Control Technologies, discussed how important it is to keep compressor surge control systems in automatic to maximize productivity.

card or in the field," Fisher said.

Now the refinery's two-stage coker wet gas compressor sports state-ofthe-art parallel multi-section surge and performance control using an open ControlLogix platform with PlantPAx with speed of response equal or better than a black box. It meets SIL, API and customer specifications. And it stays in automatic.

### PARTNERNETWORK DELIVERING FOR ROCKWELL AUTOMATION CUSTOMERS

Users Credit Program with Simpler, More Innovative and Collaborative Solutions by Keith Larson

rom CEO Keith Nosbusch on down, Anne Vondrak and the rest of the folks at Rockwell Automation realize they can't go it alone, and that the company's customers can end up suffering when they try. So they have a long history of working closely with complementary suppliers and service providers to better satisfy the needs of mutual customers. "Our collaborative approach is based on an understanding that no single supplier can do it all and a belief in the importance of working with best-in-class companies to bring innovation, global reach and local responsiveness," Nosbusch says. "We see it as the best way to address customer needs."

Working together with hundreds of companies worldwide, but in the end providing a simplified customer experience doesn't just happen, says Vondrak, manager of the Rockwell Automation PartnerNetwork, the program through which these relationships are managed to provide "a better solution and more satisfactory experience for our mutual customers." Extensive customer surveys also indicate that the companies brought together under the PartnerNetwork umbrella deliver more innovative and collaborative solutions that contribute to business success, Vondrak says. "We go to market together with our partners," Vondrak adds. "In The Connected Enterprise, for example, EtherNet/IP flows through our systems and through the products of our partners."

Created in 2008 to unify its existing partner programs, the Rockwell Automation PartnerNetwork framework offers global manufacturers access to a collaborative network of companies mutually focused on developing, implementing and supporting bestin-breed solutions to achieve plantwide optimization, improve machine performance, and meet sustainability objectives. The PartnerNetwork embraces a variety of relationships ranging from Encompass program referenced products that are engineered and pre-tested to work out of the box with Rockwell Automation systems to strategic Enterprise Partners such as Microsoft, Cisco and Endress+Hauser. Sales and solutions providers, including system



"In The Connected Enterprise, EtherNet/IP flows through our systems and through the products of our partners." Anne Vondrak of Rockwell Automation on the importance of the company's PartnerNetwork relationships.

integrators, distributors and OEMs, also are part of the Rockwell Automation PartnerNetwork ecosystem.

For Spectrum Controls, a provider of complementary I/O cards for Rockwell Automation systems, the PartnerNetwork facilitates close collaboration among Rockwell Automation and its PartnerNetwork companies. "Sometimes our sales teams will go in together," notes Bruce Wanta, Spectrum Controls president. "Other times we're leveraging Rockwell Automation global technical support for a mutual client in China," Wanta says. "We pay Rockwell Automation to provide that support, but for the customer it's seamless."

"The PartnerNetwork business model adds tremendous value to our mutual customers," adds Wanta. When an automation company wants to deliver a sole-source solution, it may fill in portfolio gaps with products that are less than best-in-class, Wanta explains. "You can't be good at everything. The PartnerNetwork model is a key competitive advantage that we have together."

### HOW TO IMPLEMENT THE CONNECTED ENTERPRISE The Convergence of Control and Information Requires Smarter Technology

by Leslie Gordon

he Integrated Architecture booth at Automation Fair this week in Anaheim, California, showcased products that support the Rockwell Automation vision of The Connected Enterprise. According to John Pritchard, global development manager, Integrated Architecture, The Connected Enterprise integrates operational technology (OT) and information technology (IT) across the business to boost the productivity and profitability of both discrete and process plants, all while mitigating risk.

Rockwell Automation defines the necessary "smart" technology in several ways, said Pritchard. "For example, many of our devices now use standard EtherNet/IP networking technology, all the way from the machine control on up to the enterprise level. Smartness also comes from our Logix control engine, which is used in all of our controllers, regardless of discipline or scale. Although deployed in different hardware form factors depending on the application, the engine is multidisciplinary, providing safety, process and motion capabilities via international standard programming languages including function blocks, structured tags and ladder logic, among others. Because the controllers all use the same engine, there is only one design environment, which makes for an efficient approach—engineers don't have to settle on one language for an entire project, for instance," explained Pritchard.

Smartness also comes from devices that support manufacturing productivity by gathering and displaying data and contextualizing it to give personnel the information they need to understand what is going on and make good decisions, continued Pritchard. "We call this concept 'reducing the cost of curiosity.' In other words, instead of having to go to a manager, make a request and two weeks later get a KPI report, you can now just create a mashup report immediately on a mobile device."

Smartness aside, security also tops the industrial hot topic list, and Rockwell Automation provides a smorgasbord of devices to address this issue, said Pritchard. "First, though, it is important to understand there is no silver bullet in regards to automation security; the area is complex and evolving," he said. "Our advice is to deploy a 'defense in depth' approach, meaning you approach security across several different levels in your organization. These could include physical security, software or device-based technologies.

"Security can be as simple and straightforward as keeping your network assets in a physical, locked box," he said. "For example, Panduit products on display in this booth have a feature called lock-in-block-out, which keeps the cable in the port it is meant to be in and makes it hard to pull out. Our managed switch features Cisco technology that switches off the ports not being used, as well as creating unique IP assignments so only the right cable can be plugged in, or it won't be able to pick up an address."

Taking networking security up a notch is an industrial firewall with VPN capability. "Typically, firewalls are placed between an enterprise and the outside world. Our firewall is dropped directly into the control panel, letting companies protect zones of critical machinery." The VPN capability lets users tunnel through otherwise insecure networks and create a secure connection to remotely monitor a machine.

And software is obviously critical to support security in The Connected Enterprise. "Consider for example, our FactoryTalk Security software and FactoryTalk AssetCentre program," said Pritchard. "The first assigns the proper personnel rights, such as being able to access certain control functions or change codes, while the latter is all about change management control. It keeps track of who has made changes, logs in the latest version of the code, and if somebody has made a change, what it was and why they made it. The fringe benefit is when you must pull out an asset or a machine and bring in a new one, you don't have to run around trying to figure out the level of configurations and what programs were running. Just use theFactoryTalk AssetCentre server and redeploy everything back to the way it was."

Also important is Studio 5000 Logix Designer v24 software, which is used to do all the programming of

Rockwell Automation Logix controllers. "The program has new features that support automation productivity and, thus, helps support one of the goals of The Connected Enterprise," said Pritchard. "For example, it includes new ways to show the application code. Depending on your job function, you might view the world slightly differently. Control engineers tend to think in terms of controlling the process or scheduling tasks, so you want to do your code in that way. On the other hand, maintenance personnel tend to think of things in terms of tank #1. machine #2 and filler #3. The new feature lets users view the same code in different ways, and these can be switched dynamically."

Rockwell Automation also has done a lot of work around modular programming techniques to support best practices in The Connected Enterprise, said Pritchard. "When an engineer comes up with a nice block of code that does something like initialize a machine, you want to capture the code so you can do it the same way each time and save unnecessary effort. Another feature is what we call 'compare' mode. Imagine you have worked on a project and then someone else works on it later. You come in the next morning, say, and want to know what changes the individual made. When two people have made the same change, you can decide which will be the best one. The feature is a nice way to rack and stack through the program and see what the changes were, and then merge the bits of code so you get back to one project file. This collaboration gets projects done faster and faster."



John Pritchard of Rockwell Automation treated Automation Fair visitors to a tour of enabling technologies for The Connected Enterprise.

### SIMPLER SAFETY = SUCCESSFUL SAFETY

Safety That's Easier to Understand Is More Likely to Be Successfully Applied.

by Jim Montague

R ockwell Automation is simplifying its safety solutions, components, safety design software and documentation so users can adopt them and achieve their safety benefits more easily.

If safety is easier to understand and apply, then it's more likely it will get used and successfully applied to protect people, assets and productivity. This was the plain truth and effective logic behind the product launches and upgrades presented in the Safety Solutions exhibit at Automation Fair 2014 this week at the Anaheim Convention Center in California.

The exhibit focused on four main product releases and supporting developments—all designed to assist and simplify the safety design and adoption efforts of machine builders, integrators and end users. For example, last year's release of Armor GuardLogix was followed by this week's launch of:

- Armor Safety I/O and standard onmachine safety components
- PowerFlex 527 AC drives and Kinetix 5500 servo drives, which can now perform CIP standard-based safety functions over Ethernet, saving space and precluding the use of electromechanical relays

- Allen-Bradley 450L light curtains, which allow users to buy one stick, use an insertable tab to assign it to serve as a transmitter or receiver, and achieve dramatic savings on inventory
- Guardmaster 440C-CR30 software configurable safety relays, now in their eighth release; Ethernet capable, simpler to wire to standard I/O devices and can be programmed using Connected Components Workbench software
- Expanded design tools, such as Safety Automation Builder software, which is now available in 16 languages, as well as a new series of safety function documents, which give users free, stepby-step instructions on implementing a variety of safety hardware and software.

"The theme of our exhibit is simplifying safety and especially enabling on-machine safety, but this also means downsizing the footprint of safety components, which also makes safety easier to do," said Steven Ludwig, program manager of safety solutions at Rockwell Automation. "It's important to understand that it isn't the safety devices that make a machine, production line or process application safe it's how the system is designed that makes its safe, and then how it fits into an overall



"It's important to understand that it isn't the safety devices that make a machine, production line or process application safe—it's how the system is designed that makes its safe." Steve Ludwig of Rockwell Automation on the company's recent efforts to make its safety systems simpler to use and apply. safety lifecycle. For instance, our Safety Automation Builder software can provide a graphical drawing of a user's system, show operator access points, present appropriate products and solutions, and perform calculations to make sure they align with SISTEMA recommendations.

SISTEMA refers to "Safety Integrity Software Tool for the Evaluation of Machine Applications," a methodology for helping builders learn and perform ISO 13849-1s calculations. It was developed and is offered by the German Social Accident Insurance organization's Institute for Occupational Safety and Health and enables developers and testers of safety-related machine controls to evaluate safety in the context of ISO 13849-1. However, it can be difficult for many builders and other users to employ. Ludwig reports that Safety Automation Builder gives users a head start on aligning their solutions with SISTEMA and its recommendations.

Similarly, Ludwig reported that the seventh release of CR-30 safety relay this past March contains improved software and an easier configuration process. "This software matches up documents, is password-protected and walks users through a checklist, which makes configuration easier and more accurate," explained Ludwig. "Release 7 also has an automatic reporting feature that gives users printed documents and a memory module that stores configurations and allows them to be used in multiple devices."

### WATER WASTEWATER FORUM: AUTOMATION POISED TO ADDRESS SCARCITY ISSUES

Direct and Indirect Use of Treated Wastewater Requires Real-Time Quality Assurance by Leslie Gordon

G lobally, water treatment facilities face daunting problems such as water scarcity and aging infrastructure. Among the most intractable is the unequal distribution of fresh water around the globe, said Jim Hagstrom, executive vice president of San Francisco-based Carollo Engineers, in his context-setting presentation to attendees of the Water Wastewater Industry Forum held today at Automation Fair in Anaheim, California.

"In fact, only 10 countries have access to about 60% of the world's total fresh water supply. Other countries that are less fortunate are demanding water. This supply and demand creates a tension that drives the marketplace," Hagstrom said.

To pull together a model of the U.S. market in particular, the firm performs macro-level analyses using secondary research. "Sources we use include Global Water Intelligence, the U.S. EPA, Goldman Sachs and the U.S. Conference of Mayors, with the majority of data coming from the EPA," continued Hagstrom. "We also talk to company personnel in the field to get a microlevel feel for the market. This information goes into our company database."

According to Hagstrom, from about 2000 to 2007, the U.S. water industry was quite busy, and growing at a rate of about 10% a year. During the recession of 2008, industry activity tanked. "The good news is our analyses show the U.S. water/wastewater industry will achieve relatively stable growth around 2018 or 2019 and will reach about \$30 billion per year in terms of expenditure."

Key drivers for water/wastewater industry investment include scarcity, such as that brought on by the ongoing drought in the southwestern United States. Even as people continue to migrate southwest, water levels in the Colorado River Basin are dropping by as much as 12 feet per year. Population migration to Florida also is straining the capacity of water/wastewater systems in that part of the country, Hagstrom said.

Other industry growth drivers include more stringent regulations; water conservation and reuse programs; aging infrastructure that needs to be replaced; and alternative financing, such as the use of public-private partnerships to help finance water-treatment projects. Constraints to industry growth include lack of capital; rising costs to build plants; and the reluctance of conservative water facilities to take risks (for example, to modernize control systems) unless there is a guarantee of a large reward.

Of equal importance are incidents that need a quick response. Utilities will reallocate funds to address immediate issues, said Hagstrom. For example, wastewater containing nitrates was once discharged into rivers, but the EPA has banned this practice, requiring investment in treatment facilities.

Automation technology holds the potential to alleviate many of these problems, according to Hagstrom. "From a control system viewpoint, the use of a SCADA system can give facilities tremendous capabilities. The data can help them do a better job of being more efficient in distributing water. And intelligent technologies can help inform plants about how much water is being lost due to leakage. We might use the data to predict where breakages will happen."

Another scarcity solution is the indirect and direct reuse of treated wastewater. "Orange County in California has been taking wastewater, converting it to drinking water quality and then putting it back in the ground since the 1970s," says Hagstrom. "San Diego doesn't have a big groundwater pool, so it is looking at direct potable reuse, which involves placing potable water in storage basins to feed water treatment plants. We are seeing this happen all across the Southwest."

What is needed is a mechanism for real-time feedback to give confidence to the community that we are producing a safe water supply, explained Hagstrom. "Texas wants to do in two years what it took Orange County 20 or 30 years to accomplish in the area of indirect potable reuse," said Hagstrom. "To move quickly, Texas utilities must gather real-time water quality performance. In the past, it was okay to take a water sample to the lab, come back the next day and say, 'We met the limits.' But this practice is no longer acceptable. Facilities need to know right away that the water is safe."



"Facilities need to know right away that the water is safe." Jim Hagstrom of Carollo Engineers sees a growing need for real-time analysis and feedback in the U.S. water and wastewater treatment industry.

### **SAVE THE DATE!** Automation Fair 2015 is headed to Chicago



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