Rockwell Automation — Enabling the Connected Enterprise

A Live Report from

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by the Editors of

CONTROL and control design

FOR MACHINE BUILDERS
“We believe that we are at an inflection point drawn by the integration of the Internet of Things and the Connected Enterprise,” Nosbusch said.

As the global population accelerates toward 8 billion, millions of people exiting poverty and an expanding middle class will demand more food, housing and transportation—goods that will have to be manufactured and distributed. This will increase demands on not only our manufacturers, but also on infrastructure, water supply and raw materials. Increasing demand for scarce resources will drive inefficiencies out of manufacturing, leading to a need to spend an estimated $1 trillion on resource productivity, Nosbusch said.

Enabling truly connected enterprises will improve global competitiveness as producers capitalize on the business value of real-time data from the large number of Ethernet-connected nodes, or connections, in an industrial ecosystem. The evolution of smart, secure, Internet-enabled architecture that helps transform this data into actionable information will
lead to sustainable competitive differentiation with optimized plants and supply networks.

To bring manufacturing data into the enterprise, where it can be used to generate value, Rockwell Automation is breaking down the barriers and combining manufacturing automation with enterprise systems to create the Connected Enterprise. The Connected Enterprise will bring us safer, more accessible food and other products, and less waste in production processes by integrating the cloud, mobility, big data and analytics, smart things and security.

The cloud offers remote access to devices and information, massive storage and the computing power needed for complex analytics. Mobility is not only about devices, but also providing people with the ability to access information on the go, making security a high priority. Big data and analytics empower collaboration, and “manufacturing generates more big data than any other sector,” Nosbusch said.

Cisco estimates that this technology—the “Internet of Everything”—will be worth $14.4 trillion over the next 10 years, generated by enabling efficiencies in asset utilization, employee productivity, supply chain/logistics, customer experience and innovation, and has the potential to raise global profits 22% by 2022.

“By letting people know what’s really happening in the enterprise, the Connected Enterprise creates real customer value by turning data into information into knowledge and ultimately into wisdom,” Nosbusch said. This requires a common, secure Ethernet infrastructure to integrate control and information.

For example, “King’s Hawaiian makes delicious dinner rolls,” observed Nosbusch. “They also have 11 production lines connected by EtherNet/IP and remotely monitored from California, where they collect quality and production metrics and compare line-to-line efficiencies….King’s Hawaiian now has a Connected Enterprise.”

The Connected Enterprise has obvious value in food and beverage plants, which experience fluctuations and rapid change due to seasonal variations, supply chain volatility, market size variations and product changes. In automotive, drivers of the Connected Enterprise include continuous improvement. Toyota is saving half a million dollars a year by analyzing data from production and quality systems to find and correct errors in real time. “Savings like these are only possible when you get the right information to the right decision-makers at the right time,” Nosbusch added.

Through remote asset monitoring, operations can be debugged and optimized from around the world. And by linking system information, “We can know what was supposed to happen as well as what did happen,” Nosbusch said. “The next layer of investment will be at the plant infrastructure level. The value at stake is enormous.”
The proliferation of Internet-enabled devices and the deployment of standard Ethernet across control systems have the potential for delivering tremendous benefits. What Rockwell Automation calls the Connected Enterprise allows substantive collaboration among people, plant-floor systems and enterprise applications. The connections facilitate collaboration to improve overall productivity and sustainability.

But as the historic disconnect between enterprise and production networks is bridged, manufacturers, producers and utilities need to better understand potential security risks and the best practices needed to develop a more secure environment.

In a morning session at today's Automation Perspectives media event leading up to the Rockwell Automation Automation Fair®, presenters aimed to help media and analysts better understand the importance of protecting industrial control and information systems and key elements in implementing an effective security strategy.

“When we speak to our customers about moving a Connected Enterprise forward, it's not unusual for them to raise two concerns: cost and security,” began John Nesi, Rockwell Automation's vice president of global market development. “So as we discuss this, we have to realize that the vision of the Connected Enterprise includes value creation.”

That value opportunity comes directly from the technology opportunity. “We’re in the middle of an amazing technology transition that has a big impact on business,” said Rob Soderbery, senior vice president and general manager of the Enterprise Networking Group at Cisco. Soderbery oversees the strategy, engineering and marketing direction of the company’s networking technology for the enterprise, and his organization is responsible for the core technologies critical to business customers.

That transition is influenced by three big macro trends, Soderbery said. “It’s the economics of the growth of emerging vs. developed countries; it’s energy consumption and what the demands and sources will be moving forward; and it’s social demographics of hyper growth in emerging markets, and declining workforce and aging population in developed countries.”

Productivity, he added, will be at the heart of solutions dealing with these issues. “The next wave of productivity will come out of the Internet of Things (IoT).” By 2020, we’ll have 50 billion connected things connected to the Internet.

“But the big impact, the stunning opportunity here, is in industry. When you can connect things, processes and data in the cloud, you can create new real-world applications in logistics, in segments that are upstream in the supply chain.”

Cisco says there’s $14.4 trillion in increased value to be realized in the private sector over the next 10 years in this Internet of Everything. “That value will come from benefits in innovation expansion, enhanced customer experiences, asset utilization, employee productivity, and supply chain and logistics improvements,” Soderbery said.
These opportunities are there across all the big verticals. “We tend to find a ‘killer app’ in each segment that is so powerful that it makes other initiatives more feasible and achievable,” Soderbery explained. “BT Hydro in British Columbia is an example of this. They’re concluding a smart meter project that will provide a $100 million savings by pulling the meter readers off the street. And there are other opportunity areas that will increase that number. That’s one application in one utility, in one province in one country. These numbers add up very quickly.”

Soderbery believes that once you’ve built an application like this, you’ve basically built a new infrastructure: You’ve connected the systems you’re capable of monitoring; now you can do predictive maintenance, traceability, mobile control rooms, wireless machines, supply chain and other applications.

Soderbery said some $1.95 trillion of that $14.4 trillion he noted will come in the manufacturing sector.

SECURITY AT THE FORE

There clearly are many challenges to all this, from converging and merging disparate networks, to harvesting distributed intelligence by pushing analytics out to the data sources, to ease of use, but the one that trumps them all, Soderbery said, is security.

Unless you address those concerns, you can’t get started.

So why is IoT security different? One of the reasons is the ‘attack surface.’ “Those are places where an attack can be initiated,” Soderbery explained. “The attack surface of a factory is large and complex. Remediation also is different. What do you do if you’re under attack in the process industry? Shutting down is not a practical or easy response.”

Soderbery presented a few simple building block ideas for IoT security. “Access control is more than a firewall,” he stated. “You have to be aware of the content on the network through tools like deep-packet-inspection engines. A second thing is the context. What’s the device, what data does it produce, is it where it says it is? You can draw some conclusions through the combination of content and context.”

All this contributes to improved threat awareness and an understanding of the threat landscape, Soderbery said. Who are the bad guys, what are they trying to do, what actions have they taken or are they taking now?

Mike Assante is advisor and director for the National Board of Information Security Examiners. He currently is the SANS Institute project lead for industrial control system (ICS) and supervisory control and data acquisition (SCADA) security.

He mentioned that the desire for analytics isn’t just restricted to the manufacturer and its supply chain. “Companies such as the equipment and machine builders themselves want access to the equipment they sold you and want to better understand the operating envelopes of those machines to help optimize those machines and perform more safely,” he said.

Expanding on Soderbery’s security remarks, Assante pointed out that the threats in industry are becoming more targeted and structured. “We aren’t the only ones investing,” Assante reminded the audience. “The cyber underground has been doing it for years, some say to the tune of several billion dollars.”

Assante reported that up to 94% of those targeted attacks aren’t discovered by the victim until they learn about it through a third-party or learn that some of their information was found on someone else’s server. And the mean time before that discovery was a whopping 416 days of what Assante calls ‘free time’ for intruders to travel around through that business system.

“In all these reported cases, the companies were up-to-date with their anti-virus solutions in place and used industry security practices, but still were compromised,” Assante reported. “It tells us that our conventional security approach isn’t working for that type of threat.”

So it’s time to adapt, Assante proposed. “We’re at an inflection point in the effectiveness of traditional defenses.”

He said we have to secure our people first. “Automation engineers have to work with cybersecurity personnel and vice-versa to cross-educate their strengths and needs. We don’t want to turn automation engineers into security professionals. But this can lead to new approaches to better security. We’re setting up guidelines to help do that.”

DESIGNING FOR SECURITY

Frank Kulaszewicz, senior vice president for Architecture & Software, Rockwell Automation, followed by reporting that less than 14% of U.S. manufacturers have tied their machines’ intelligence to the enterprise network. As a result, there will be plenty of opportunities for increasing value. But, as we connect, potentials for threats will rise as well.

Kulaszewicz explained the strategic partnership that Rockwell Automation shares with Cisco, which leverages the expertise of both companies to help enhance security going forward, particularly at the device level.

“We’re changing the way we do development and we’ve created a Design for Security process,” he said. “Before any Rockwell Automation product leaves our doors it has to be compliant with these Design for Security standards.” These include clearly defined specifications and an audit process to identify gaps in performance. They allow us to enhance and improve our products that will help customers evolve their systems to a safer, more secure environment.”
As technology experts discussed emerging technology trends such as the Internet of Things, convergence, Big Data and analytics this week in Houston at the Automation Fair®, presented by Rockwell Automation, attendees also learned of a new source of network technology information: the Industrial IP Advantage community. Housed online at industrial-ip.org, the Industrial IP Advantage offers guides, case studies, technical white papers and online discussions on how Internet Protocol (IP) networking technologies can be used throughout the Connected Enterprise to boost productivity, efficiency and flexibility.

Industrial IP Advantage promotes the idea that manufacturing and industrial companies can build more successful businesses by deploying a secure, holistic, digital-communications fabric based on standard, unmodified use of the Internet Protocol (IP). Using Industrial IP, companies have an opportunity to turn this vision into reality through connectivity that drives better business intelligence, increased profitability and reduced costs.

Industrial IP Advantage was established by Cisco, Panduit and Rockwell Automation — three like-minded organizations that joined together to educate the market on the benefits of Ethernet, Internet Protocol and EtherNet/IP. Industrial IP Advantage was formed in cooperation with ODVA, the organization that manages and commercializes the EtherNet/IP specification and standard.

$3.88 Trillion Over 10 Years

“There’s been a lot of talk around and about this subject and, as a whole, pretty much all of the manufacturing community is coming to see that the Internet of Things, the Internet of Everything, provides huge opportunities as a result of connecting its devices and the value it obtains from the information gathered from those devices,” said Cisco marketing manager Kevin Davenport. “Just within manufacturing, we’ve identified the opportunity value in cost savings and efficiencies from this at $3.88 trillion dollars over the next 10 years. We believe that the best path to access that value across the entire manufacturing design chain from R&D to production, supply chain, and all the way to customer acquisition is by leveraging a standard protocol, namely Internet Protocol, and so we’re promoting the value of Industrial IP.

“The real message with IP Advantage is that this is the standard approach across all of industry, and users and potential users can trust that they have a future path to the levels of security they need.” Panduit’s Dan McGrath on how users can leverage the enormous cyber security investments the broader IT world is making in standard, unmodified IP-based networks.
as the world’s defining network technology.”

Many of these “things” already operate in the production facility. Today, IP-enabled microprocessors—the brains inside digital devices—connect conventional automation equipment such as I/O modules and variable-frequency drives. But the explosive growth of other IP-enabled digital devices—many adopted from other disciplines—is transforming the industrial landscape. Video cameras, RFID readers, digital tablets, security swipe cards: These open-standard, IP-enabled devices help manufacturing and process operations reach new heights of production quality, efficiency, security and safety. To take full advantage of this intelligence, all devices within a plant need to talk with one another, as well as those at the enterprise level, using a unified networking infrastructure that is IP-centric.

“So this Industrial IP initiative takes our companies’ collective core skill sets and market leadership to build a community to give information, training and thought leadership in how to obtain some of the value that we’re promoting,” Davenport added.

So why is Internet Protocol important here? “The key enabler for this Internet of Things movement is Internet Protocol,” said Paul Brooks, business development manager, Rockwell Automation. “It’s the technology that allows the Internet to be scalable, to be routable.”

“And today, EtherNet/IP is the only industrial automation protocol that can claim to be part of that Internet of Things because it uses IP for all of its primary functions, from motion through information gathering and historization,” Brooks added. “That commitment to IP means that EtherNet/IP is highly scalable, and it’s able to take part in a converged network architecture, which is critical for cost-effective deployment. It’s also highly segmentable, meaning it’s easy to add new things to networks that use EtherNet/IP.”

Brooks continued, “Keep in mind that many of the individual innovations that are going to happen within the Internet of Things aren’t going to be able to justify investment in new infrastructure. Many new innovations will be an incremental application added to an existing infrastructure. An IP-centric infrastructure is therefore essential.”

LEVERAGE STANDARD IT SECURITY TECHNOLOGY

“The number of connected devices across a plant floor, connected people via mobile devices, together with devices and systems outside the plant floor create the potential for value creation, but also present a big concern when it comes to hackers, security of intellectual property and downtime,” said Dan McGrath, industrial automation solutions manager, Panduit. The great potential value is threatened if you don’t have a comprehensive ‘defense-in-depth’ layered approach to security, McGrath said. “This is where IP shines. It’s a technology platform where every year there’s a big investment in improving security.”

The Industrial IP Advantage booth at Automation Fair® included an infographic that demonstrated how $1.72 billion was spent in 2012 on delivering IP-based industrial security solutions. “So IP and standard, unmodified industrial Ethernet has the widest availability of the tools to provide that defense in depth,” McGrath added.

This defense-in-depth layering includes physical security measures such as blocked ports and key cards; the network layer of firewalls, intrusion detection and prevention, switches and routers; computer hardening via antivirus software, application whitelisting and removal of unused applications; application security with comprehensive authentication and authorization; and device hardening with change management and restrictive access.

“The real message with IP Advantage is that this is the standard approach across all of industry, and users and potential users can trust that they have a future path to the levels of security they need,” McGrath explained.

This approach also has great potential to bridge the technology and philosophy gaps that traditionally existed between the IT groups and the control system engineers. “The ability for IT to use commons tools and proven strategies from the IT side and bring them to bear on the automation side can’t be underestimated,” McGrath explained.

To learn more, visit www.industrial-ip.org. ■
When it comes to factory and machine automation, Rockwell Automation is a longtime leader in both market and technology. But when it comes to process solutions—the traditional specialty of DCS suppliers—a fresh perspective and groundbreaking new technology have allowed Rockwell Automation to grow much more quickly than its competitors over the past several years, says John Genovesi. This is in no small part because Rockwell Automation can innovate more freely, unburdened by preconceived notions of what a DCS should be and do.

“We refer to PlantPAx as a modern DCS,” said Genovesi, vice president and general manager of Rockwell Automation’s information software and process business, to the more than 750 attendees from some 36 countries around the world attending this week’s Process Solutions User Group (PSUG) meeting, held in Houston during the lead-up to the company’s Automation Fair® conference and event. “Rather than look backward, we’re looking forward to new business problems and how we can evolve the architecture to address them.”

Genovesi pointed to the company’s vision of plant-wide control and the connected enterprise, a unified architecture for handling not just process control tasks, but all the other control and information management tasks required to optimally manage plant operations both safely and efficiently. “Whether it’s a process application, a balance-of-plant application or a third-party skid, an integrated approach will result in less engineering effort, higher efficiency and reduced maintenance costs.”

Also key to Rockwell Automation’s continued advances in the process arena is its embrace of what some would call “disruptive” new technologies as enablers of improved plant performance, Genovesi said. “We want to help capture the ‘big data’ that’s created by plant-floor devices and turn it into information that people can use to make better decisions, and in turn, deliver it to the mobile devices where they need it. And while we’re making this information available, we know it must be secure.”

While technology and implementation partners continue to be central to the Rockwell Automation strategy, the company also...
has continued to build out its own delivery capabilities, with 6,000 engineers now working on projects for customers around the world. “We want users to have integration choices,” Genovesi explained. “We’re striving for world-class execution and support, enhanced by unparalleled technology and delivery partners.”

THREE STRATEGIC PRIORITIES
The next keynote speaker to address the Houston PSUG meeting was Som Chakraborti, business director, process automation, Rockwell Automation. Chakraborti delved into greater detail on the three strategic priorities for the Rockwell Automation process solutions business moving forward: advancing the platform, leveraging sustainable technologies and expanding the company’s portfolio of solutions.

As examples of the ways in which Rockwell Automation continues to advance its plant-wide control platform, Chakraborti cited the latest 3.0 release of the company’s PlantPAx process automation system. “Many of the system’s advanced new features were directly driven by user input,” Chakraborti said. “QuickStart,” for example, is a standard initial system setup that enhances consistency across large projects, especially when multiple parties are involved. Enhanced visualization toolkits, a new “Sequencer” procedural automation development platform and standards-based alarm management also were added in this latest release. Further, a new “Skid Workstation” product is designed to make it faster and easier to join up third-party skids developed concurrently with a plant-wide control project.

Virtualization, network communications and cyber security are among the frontiers where Rockwell Automation continues to leverage new technology, much of it adapted from the commercial sector to the unique demands of the industrial world, Chakraborti continued. “We believe in making sure your automation asset has the ability to support new capabilities as technology advances.”

New on the virtualization front are templates for easier deployment of Rockwell Automation servers and workstations, as well as sizing and architecture rules. And while the company remains “agnostic” as far its support of networking protocols, it also sees EtherCAT and EtherCAT as an increasingly core network for process automation, Chakraborti said. He pointed to Endress + Hauser’s release of EtherCAT-based mass flow, electromagnetic flow and now analytical instruments as evidence of the continued convergence of process automation networks “from sensors to the highest levels of plant networks” around the protocol. Rockwell Automation also continues to invest in cyber-secure “hardened” networks and associated services that incorporate such measures as access control and tamper detection.

Finally, when it comes to expanding the portfolio, “we believe in partnerships and acquisitions too,” Chakraborti said. He cited the just announced acquisition of vMonitor, a pioneer in digital oilfield implementation and remote operations worldwide. The company delivers monitoring and control solutions for wellhead and upstream applications that combine cutting-edge wireless instrumentation and communication with visualization software to help customers make more informed decisions and improve production. vMonitor’s remote terminal unit (RTU) offering, in particular, plugs a capabilities gap in Rockwell Automation’s current offering for oil and gas companies, Chakraborti said.

Further, he indicated that Rockwell Automation would continue to pursue partnerships, organic developments and acquisitions that increase the company’s value proposition for oil and gas companies and for other industry verticals as well. “Remote monitoring and asset management, subsea technologies, big data and analytics, all are enabling technologies that will help us further boost process performance for our customers.”
SUPPLIER ALLIANCE SECURES BIG DATA FOR USERS

More Connections May Mean More Vulnerabilities, but Awareness, “Security as a Habit” and Helpful Partners Are the Best Defense

by Jim Montague

Industrial networks are rapidly multiplying and diversifying, giving users access to big data sources, better analyses and wiser production and business decisions. However, closer and more numerous network ties can also leave users open to potential intrusions and attacks, according to Rick Esker, senior director of the Industry Solutions Group (ISG) at Cisco.

“Four or five years ago, we didn’t think too much about malevolent actors, but since then, security has become one of the top issues that users at our customer conferences care most about,” said Esker. “In fact, one of the main white papers at this summer’s Black Hat conference was about how to hack the software and controls on a Toyota Prius.” And while this may seem a bit removed from industrial control, Esker said, consider whether a sophisticated, latent worm infecting a fleet of maintenance vehicles might be used to take down the controls at a refinery or other process facility.


Besides the worries raised by Stuxnet and other software-based worms and viruses, Esker added that many process control engineers and their organizations are facing rapidly aging and retiring workforces. Simultaneously, “It seems like most young people want to go to work for Facebook and Google, but few want to work in industrial companies in remote locations,” added Esker.

To resolve these dilemmas, Esker reported that many process applications and companies must seek to build new infrastructures with the added sensors they need to gain big data’s advantages, but include enough security to reduce risks and ensure safe operations. At the same time, these new infrastructures can allow them to preserve and disseminate expert operating practices from their veteran engineers, as well as allow remote monitoring and troubleshooting, which will also be more attractive to the best and brightest new engineers and software developers.

“Security is about maintaining awareness, policies and education, and then building the services to support them,” explained Esker. “Big data initiatives need these same kinds of assistance.”

“With Stuxnet and its 85 families of worms, Pandora is really out of the box.” Cisco’s Rick Esker on the growing priority that industrial companies are placing on cyber security.
Cisco’s Security Information Organization (SIO) has a long history of identifying threats, sandboxing and quarantining them, and even identifying early-warning triggers and anomalous behaviors that could lead to threats on industrial networks. “However, security is no longer just about isolating and protecting against threats. It must be paid attention to as a habit,” he added.

“The targeted addressable market (TAM) for the ‘Internet of Things’ is about $14.4 trillion, and the biggest piece of this is industry. For instance, as video inputs are added to SCADA systems, and as more applications can’t suffer latency above 800 milliseconds, they’ll need network routers that can serve as computing devices as well. The heart of being able to do all of this is network security.”

Fortunately, one of the primary ways to improve awareness of security and make it a habit for users is to establish and nurture exactly the kind of partnership that Cisco and Rockwell Automation have had for more than seven and a half years. “The Converged Plant-wide Ethernet (CPwE) architecture that Rockwell Automation and Cisco developed together is the crown jewel of our alliance,” said Esker. “It’s one of the best examples of how industrial networks have moved from historically proprietary to open systems and is really the heart of all we’ve done together. Now we’re going to extend our joint leadership in industrial networking even further with cloud-based services, virtualized desktops, manufacturing execution systems and more distributed computing.”

Esker explained these new capabilities will be essential for users and their applications, and help them take in and analyze all the added data from the new and better sensors they’ll be employing soon. “The explosion of big data will add richness to what we already know and increase awareness from formats like video. However, we’ll also know more about factors that were previously unknown, and both will help avoid negative outcomes,” he said. “For example, we’ll be able to contextualize video so we can close control loops by recognizing when a video input needs to indicate an alarm situation.”

Esker added that Rockwell Automation and Cisco’s alliance and their recent collaboration with Panduit is going to start producing smaller and even more capable devices, such as core computing components that also have Ethernet, wireless and other industrial networking capabilities. “With Stuxnet and its 85 families of worms, Pandora is really out of the box. It really flipped our world because its vector came from the bottom up,” added Esker. “As a result, Cisco and Rockwell Automation have been working on deep-packet inspection, detecting anomaly behaviors and finding advanced network threats. We have a much more integrated approach, thanks to our enduring relationship, and this lets us successfully address the primary concerns of our users, help them become more aware and practice security as a habit, and protect them against threats in the future.”
This week at the 2013 Automation Fair® in Houston, Rockwell Automation introduced its Safety Maturity Index (SMI), a self-guided assessment tool drawn from studies, extensive private research, collaboration with cultural development experts, input from leading manufacturers and a wealth of its own experience as a provider of safety systems. The Safety Maturity Index tool is touted as a comprehensive measurement of performance in creating and sustaining a safety culture, compliance processes and procedures, and capital investments in safety technologies. It helps companies understand their current level of performance and steps they can take to improve safety and profitability.

“One of the key things that played into the development of this—and we’ve been looking for a couple of years—was to understand what we’ve referred to as the ‘epiphany’ that companies experience,” said Steve Ludwig, safety programs manager, Rockwell Automation. “What is it that causes a company that’s been fairly steady in its injury rate, good or bad, to suddenly decide that they really want to address safety? Some were driven by standards, some by changes in leadership or other factors. But why does a company that found it acceptable to have 75 incidents last year, suddenly decide that 76 this year is not at all acceptable?”

SAFETY MATURITY = OPERATIONAL EXCELLENCE

Ludwig added that Rockwell Automation took careful note of a recent Aberdeen study reporting that the safest companies also were the most productive—they were not mutually exclusive objectives. “The safest companies had 5% to 7% higher OEE [overall equipment effectiveness], 2% to 4% less unscheduled downtime and less than half the injury rate of companies performing at average levels of those indicators,” he reported.

Ludwig said Rockwell Automation then did additional custom research with Aberdeen to get more details about how these companies were operating. “Repeatedly, we found that the best companies had a really good safety culture,” he explained. “They had processes and procedures in place to understand what hazards they had around them, and the methods to facilitate mitigation and compliance, and they used a lot of integrated safety technologies to improve productivity. We saw that the three ‘C’s of culture, compliance and capital were present in these successful companies.”

The research also showed that each of these safety pillars is equally critical and dependent on the other. A company that builds a strong safety culture, for example, can only go so far without complying with standards and investing in safeguarding technologies. Likewise, manufacturers can make significant investments in safety technologies and procedures, but those investments only go so far if management doesn’t embed safety into the cultural DNA of the company.

Out of this work came the Safety Maturity Index assessment tool, which gives manufacturers visibility into their safety programs and the ability to optimize them. It can

“About 15% of the responding companies are in this top category,” Rockwell Automation’s Mark Eitzman on the relatively small number of manufacturing companies achieving a top rating of 4 on the company’s new Safety Maturity Index.
FOUR LEVELS OF MATURITY

A company that scores at the lowest level, SMI 1, makes minimizing investment its key focus or driver. For these manufacturers, production throughput and cost reduction are the top priorities. Safety incidents frequently are hidden. There could be high incident rates, high insurance costs, fines and/or employee complaints to government agencies. Incomplete or improper use of safety technologies exacerbates the problem. Mark Eitzman, safety market development manager at Rockwell Automation, added that the initial Aberdeen study places 25% of the respondent companies in this category.

The second level up is SMI 2. Attaining compliance would be these companies’ key driver. Safety is important, but minimal compliance is the most important part of the safety program. They often use safety technologies such as relays, which separate safety from core or standard machinery operation. This score represents the largest respondent group at 37%.

An SMI 3-level company views cost avoidance as its key driver. Such companies consider safety a high priority, but not necessarily a true value. Most safety incidents are reported properly, but some might be discovered after the fact. Compliance processes are established, but might be applied inconsistently. Safeguarding technologies are a supplement to the standard control system. Safety is the goal, not operational excellence. Eitzman said 23% of the responding companies find themselves here.

Operational excellence is, in fact, the key driver for companies in the top SMI 4-level. “These companies are implementing around 90% of what we deemed as essential to safe manufacturing,” Eitzman said. “That compares to less than 50% for the SMI 1-level companies.”

At the SMI-4 level safety is considered vital to the health of the business and its employees. Safety is an inherent value, and everyone is held accountable and willingly accepts responsibility for themselves and the safety of their coworkers. Compliance processes are clearly defined, and even suppliers must live up to required safety standards. The company conducts thorough risk assessments, follows the Functional Safety Life Cycle, and uses advanced safety technologies to improve worker safety and OEE. “At this stage of the journey,” Eitzman said, “about 15% of the responding companies are in this top category.”

The ratings came as a result of a lot of discussion with customers and through our Safety Automation Forum that shared best practices, Eitzman added. “This helped customers and other companies benchmark themselves against definitions or other companies.”

The best-performing companies don’t overemphasize statistics. Eitzman noted that incident statistics are lagging indicators and recalled Georgia-Pacific Director of Safety Bill Hilton’s remarks at a recent Safety Automation Forum that “A historical lack of accidents does not imply a current presence of safety. It simply means you’ve been faster than the machine.”

Eitzman remarked that today’s processes and machines are going faster and are more sophisticated than ever. Combine that with a workforce that is becoming less-experienced over time, and we’re in a collaborative environment of people and machines, and it’s the dynamics of that interaction where safety has to come in, he said.

“So,” Eitzman added, “the SMI can help point companies in the right direction when they say, ‘I get it. Safety has to be my driver.’”

COLLABORATION IS CRUCIAL

As an additional challenge, the knowledge necessary to improve each of the safety pillars often resides in disparate functional areas. Ludwig pointed to a finding of critical need for the collaboration between engineering and environmental, health and safety (EH&S) functions. “In most companies EH&S is responsible for safety culture and the company-wide compliance policies and procedures,” he noted. “Engineering is responsible for the safety technology in machinery and the engineering procedures and developing standards and doing safety assessments. They often don’t talk, but communicating and collaborating across functional groups is essential for a comprehensive approach to safety.”

Considering the importance of this, “Good collaboration can lead them to advanced remediation technology and techniques, and they’ll both realize they don’t have to compromise their goals and objectives,” Eitzman added. “In companies where the safety culture is high, but maturity is low, they are willing to sacrifice productivity to achieve safety goals. Companies are missing the mark if they have a high safety culture and high compliance, but the capital element is low, and they are using, for example, lock-out/ tag-out energy isolation that, perhaps unnecessarily, stops an entire process or machine. Two out of three can be good in some instances, but this isn’t one of them.”

With the launch of the online SMI assessment tool at Automation Fair®, attendees can answer questions about their culture, compliance and capital, and based on their responses to about 25 multiple-choice questions generate scores in the three Cs, and a cumulative score and to help create their roadmap.

“The responder might typically be the company’s EH&S person, who probably can do an accurate assessment of the culture and compliance steps, but might have to collaborate with engineering to accurately assess the technology (capital),” Eitzman said. “That’s sort of a built-in encouragement toward collaboration.”

The companies using the SMI assessment tool will be able to compare themselves to others by industry, region, company size and other characteristics.

This tool is different, Ludwig and Eitzman said. It will help companies that have good initiatives under way in culture and compliance appreciate that the technology pillar is vital. “Perhaps they didn’t realize they could improve OEE and not have to sacrifice performance or compromise on safety. In fact, the best companies have moved beyond incident rates as their primary driver and measure themselves on OEE, because they know they’re already doing everything they can, short of a better use of technology, to enhance a safety culture.”

Company experts are available to demonstrate and discuss SMI with Automation Fair® attendees in Booth 401 on the exhibit hall floor, or you can visit www.rockwell-automation.com/products-technologies/safety-technology/safety-maturity.page.
For most of us, two birds with one stone would seem quite enough of a stretch. But system integrator Sirio Sistemi Elettronici (SSE) of Prato, Italy, reported it had taken down three in one throw of Rockwell Automation technology when it extended the control and safety capabilities of a crude oil transfer pipeline. The application included 70 kilometers of 38-inch pipe, one onshore master control unit and four remote terminal units (RTUs), including offshore RTUs, and two onshore RTUs. The pipeline also included a variety of remote I/O data acquisition equipment and other components.

“This project was to provide integrated process controls and a supervisory control and data acquisition (SCADA) system and help establish the reliability of the existing pipeline system between two offshore terminals, an offshore maintenance terminal and the customer’s main onshore terminal,” said Bruno Zanotti, SSE’s technical director.

Zanotti and SSE’s commercial director, Cristiano Tatini, presented “Integrated Control & Safety System for Crude Oil Transfer Pipeline” today at Rockwell Automation’s Process Solutions User Group (PSUG) meeting in Houston. Established in 1984, SSE is a Rockwell Automation Recognized System Integrator that typically integrates oil and gas and power generation applications in Italy, Algeria, Kazakhstan, Brazil and Iraq.

“Our system design for this pipeline included a process control system (PCS), emergency shutdown system (ESD) and a fire and gas (F&G) system,” explained Zanotti. “Common requirements for all systems included dual-redundant power supplies, processors and communication and I/O modules, while the ESD and F&G systems needed to be Safety Integrity Level (SIL) 3 and comply with the IEC 61508 standard. Common environmental conditions were 5 °C minimum and 50 °C maximum, while maximum temperature inside the field enclosures was specified to be up to 80 °C.”

Zanotti added that networking for the pipeline would be mostly redundant Ethernet, but it would also use fiber optics for its especially long runs, as well as some wireless where applicable. “Our backbone communication network is based on fault-tolerant, redundant Ethernet TCP/IP and...”
OPC protocol and with redundant communication system interfaces for each node,” he said. “The communication system is based on automatic bumpless switch-over. The external, subsystem interface is also based on fault-tolerant redundant Ethernet TCP/IP and OPC.”

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The pipeline’s software requirements were based on a three-level hierarchy: Level 1 is the high-level master terminal unit that provides 24/7 monitoring and control of all facilities; Level 2 is the mid-level RTUs that provide monitoring and control areas for operators in cooperation with Level 1; and Level 3 is the low-level subsystem that provides monitoring and control of subsystems and communicates with the RTU in each area.

“Our main challenges were that the PCS, ESD and F&G systems had to be programmable automation controller (PAC)-based and had to operate on the same PAC architecture,” said Zanotti. “We also needed to use a common engineering tool for PCS, ESD and F&G controls and for the operating interfaces for monitoring functions. In addition, we had to have a strong operating and environment condition for field device system equipment, such as our remote I/O. Also, we had to assure a single fault tolerance for power supply, processor and communications between the operator workstations, processors and I/O modules.”

These requirements were needed so the pipeline could guarantee:

- The functionality of a DCS system through the use of a PAC-based system with clear economic benefits;
- System scanning time lower than 500 ms;
- Better availability and reliability compared to a traditional DCS system;
- One simple programming language between systems and operator stations through the plant network;
- Easy system expansion.

“We evaluated different technologies available in the market with different system suppliers and found that Rockwell Automation’s proposal was the best, and that it was the most complete solution for all of our customer’s technical requirements,” said Zanotti. “These included having the same supplier for all types of their required PCS, ESD and F&G systems; full integration of all installed components; a common engineering tool, in this case FactoryTalk View, for the operator interfaces; and finally worldwide commercial and technical support that would be available locally.”

In short, the pipeline’s PCS implemented Rockwell Automation’s PlantPAx processors, power supplies, I/O modules and other components, while the ESD and F&G system implemented its AADvance processors, redundant modules and I/O components; remote I/O data acquisition on the PCS is performed on Flex I/O XT modules.

“The master station in the main control room allows full access for monitoring and control to the data of all RTU stations. Upon the master station operator’s request, under a protected password, the control of each facility can be switched to each local RTU operator,” explained Zanotti.

Likewise, the ESD system in the onshore main control room provides shutdown functions for all facilities, and the ESD systems in each RTU station provide shutdown functions of each respective facility. Also, the F&G systems in each RTU station provide fire and gas protection of their respective facilities.

“This was a very cost-effective solution for our customer,” Zanotti concluded. “We reduced costs and time needed for spare parts change-out and servicing, and we implemented a fully integrated plant-wide control, while reducing engineering efforts and ensuring worldwide customer support.”
Processes that are required to implement process safety systems need to identify risk, evaluate a strategy around each hazard and come up with a plan to minimize the risk of each hazard,” said Julien Chouinard, business director, critical control systems, in the control and visualization business of Rockwell Automation. “Then you can talk about products.”

Chouinard debuted the new AADvance Workbench 2.0 this week at the Rockwell Automation Process Solutions Users Group (PSUG) in Houston. “This is an evolved editor with a modern graphical user interface,” he said. “What we have here is a complete design, configuration and maintenance software environment that is designed to provide a space where the customer can manage the evolution of the system. It is a collaborative environment for multiple engineers and multiple controllers that can manage history, traceability and version control.”

Chouinard continued, “This new offering stems from the acquisition of ICS Triplex and represents the continued investment Rockwell Automation is making as a world leader in the industrial process control and process safety markets. The workbench is now an integral part of the PlantPAx process automation system, which is capable of managing the entire range of plant automation applications, including process control, discrete control, power, information and process safety.”

The safety system consists of the scalable AADvance controller platform configured to any mix of SIL 1 to SIL 3 simplex, redundant or triple safety loops. Several units can be used to form a network of distributed safety controllers seamlessly integrated to monitor and control thousands of safety I/O points. A system is configured using the Workbench software to suit any functional safety or critical-control application using a standard range of modules and assemblies. It is particularly well-suited to emergency shutdowns and protection applications for fire-and-gas detection by providing a system solution with integrated and distributed fault tolerance.

The new Workbench software is one of the industry’s first T3-compliant software tools, as per the IEC61508 standard that generates SIL 3 code certified by TÜV Rheinland. This significantly reduces the

“It doesn’t validate the application itself, but it does validate the code as generated.” Rockwell Automation’s Julien Chouinard on the company’s new Workbench software, one of the industry’s first T3-compliant software tools that generates SIL 3 code certified by TÜV Rheinland.
burden of validating the application. “It doesn’t validate the application itself,” Chouinard noted, “but it does validate the code as generated. We can’t save the customer from an application error, but we can certainly see to it that the code that is generated is what the application required.”

AADvance Workbench 2.0 features a modern graphical user interface (GUI), drag-and-drop configuration and built-in simulation. Compliant IEC61131 programming languages for optimum flexibility are also featured. With Workbench 2.0, application designers can import, export or migrate projects, as well as use convenient plug-ins to monitor and manage controller status and communication protocols, along with other time-saving development tools.

“With the modern GUI of Workbench 2.0, users aren’t confined to a single pane anymore. The floating windows improve productivity by giving viewers more navigational flexibility and a more holistic view of their application,” added Chouinard.

Chouinard noted that Rockwell Automation has several ways to implement process safety. “We can use the ControlLogix platform, and many of our customers do, which provides an integrated safety system for up to SIL 2 and, of course, we can provide the stand-alone AADvance system or the triple-modular-redundant Trusted system for up to SIL 3, and now we can use the same Workbench 2.0 software for all.”
CHEMICAL MAKERS TAKING STEPS TO CORRAL BIG DATA
Specialty Chemicals Experts Use Best Practices to Secure Opportunities
by Jim Montague

Newly abundant shale gas and the continued economic recovery are just two of the many positive developments affecting the specialty chemical industry. However, engineers and their companies still need some serious know-how to fully take advantage of these opportunities with the right data, analysis and tools, and by employing them in the right settings and at just the right times.

Gordon Bordelon, principal consultant for chemical industry solutions at Rockwell Automation, outlined several chemical market trends and challenges for attendees of the Specialty Chemicals Industry Forum this week at Automation Fair®, presented by Rockwell Automation in Houston. Among the forces defining the automation landscape for specialty chemicals manufacturers are dwindling veteran workforces, lack of standard data infrastructures or toolsets, aging production assets and limited resources to deal with increasing performance demands.

“Some of the other changes we’re seeing have been the emergence of the ISA S88 batch standards and other common programming constructs; increased computing power and drops in collection costs per point; and new or rediscovered data-driven methodologies,” said Bordelon.

CONCEPT DESIGN IS CRITICAL FIRST STEP

“Fluor is one of the world’s largest publicly traded engineering, procurement, maintenance and project management companies in the energy, chemical, global services, government and other fields, and we usually have about 1,000 projects going on at any one time with about 600 clients in 79 countries,” said John McQuary, Fluor’s vice president of workflow optimization, as he took the Specialty Chemicals Industry Forum podium.

“I’m mainly responsible for work process optimization and redefining our operating model,” McQuary continued, “which we’ve distilled into 24 primary requirements that all projects must meet. What we’re seeing is larger and more complex projects at the billion-dollar level, which also have more aggressive schedules and involve more complex supply chains. As a result, there’s not enough engineering expertise to complete them in any one place, so many of our offices are partnering with each other more.”

‘Big data is increasing in volume, variety and velocity,’ Janice Abel, of the ARC Advisory Group, on the growing need for enterprise manufacturing intelligence (EMI) applications.
often, and we’re also working more closely with our competitors to get these projects done.”

McQuarry reported that Fluor’s engineers usually begin with a concept design and then develop a detailed design before construction. “However, it’s the concept design that can have the most affect on total project costs—usually up to 80% of our committed costs,” explained McQuarry. “This is why involving process automation at the concept design stage is such a great, low-hanging-fruit opportunity for aiding both total installed costs and lifecycle costs. Likewise, using created data assets early on in projects can help when specifying deliverables and formats. The essentials of process automation are critical to understanding all aspects of specialty chemical and other process applications, but automation planning needs analysis, goals and smart tools, too. For example, we’re also using 3D models after construction to color-code equipment and help create reports on operating assets.”

“There’s a lot of hype around big data, but there’s also no denying that it can provide better views into operations by identifying patterns and helping to predict future performance,” McQuarry said. “We’re also working on using embedded knowledge and synching it with augmented reality tools to give us a better perspective on what’s going on in the real world to improve long-term plant performance.”

INTELLIGENCE IN OPERATION

Using the perspective of many companies and applications, Janice Abel, principal consultant in ARC Advisory Group’s regulated industry division, reported that enterprise manufacturing intelligence (EMI) is high on companies’ list of priorities as investment returns to specialty chemical and other process sectors.

A manufacturing execution system (MES) typically takes operating data and uses it to aid workflow and plan and further optimize performance, Abel explained. “One of the newest functions of EMI is to aggregate KPIs [key performance indicators] and other data, visualize them, conduct data analysis, create dashboards and distribute them to users for better decision-making,” said Abel.

“For instance, Rockwell Software FactoryTalk VantagePoint helps integrate and contextualize many sources of specialty chemical and other process data to make it useful to operators, engineers and managers. Big data is increasing in volume, variety and velocity, making EMI applications increasingly important.”

Unfortunately, one in three business leaders make decisions based on information they don’t have or don’t know, Abel continued. “Further, one in two say they don’t have the information they need, and 60% of CEOs report they need to do a better job of capturing data to make better decisions faster,” Abel said. “All data can fuel intelligence, and it’s growing because there are so many sources—from many more connected field devices to websites to social media.

ARC Advisory Group cautions that none of the data is useful unless something is done with it to deliver value to the organization. Actionable intelligence is the new mantra. “As one plant manager told us, ‘We’re drowning in data, but starving for intelligence.’ So, what he needs is at least one good KPI that can be put in context and then be able to interpret intelligently.”

For example, one chemical plant reported that every 1% improvement in overall equipment effectiveness (OEE) results in about $1 million per year increased profit, while another chemical plant integrated its plant data with other technical sources across its enterprise, got information to the right users and paid for its new system in less than six months.

“One herbicide producer needed a way to retrieve data and report it easily; its track-and-trace procedures were outdated,” said Abel. “So it built a new facility and implemented Rockwell Software FactoryTalk VantagePoint and its historian, metrics and batch recipe software. This resulted in faster and better decision-making; automated real-time data capture; increased data security; improved regulatory compliance; put KPIs on real-time dashboards to enable real-time decisions; and reduced labor costs, errors and non-value-added activities. It also created an integrated, scalable system that enables quality and on-demand supply and increased the overall production by 166%.”

Likewise, a petrochemical firm with 5,000 employees and multiple plants processing oil sands found it had a bottleneck in data reporting, lots of added programming changes for its IT department, excessive Excel reports and customization, disparate data sources and manual data entry. To give it better data visualization and intelligence, the company also implemented Rockwell Software FactoryTalk VantagePoint at two facilities, accelerating report delivery and intelligence, all the while minimizing risk with an off-the-shelf solution, which also supports different types of reports and manual entry.

This reporting revamp took six months, and the new solution supports different report types faster, including regulatory compliance data. “This user now gets KPI indicators for facility operations on scorecards and can now distribute useful information via smart phones and deliver full reports via email,” adds Abel. “Reports that used to take six or eight hours now take two or three minutes.

“The roadmap to EMI begins with vision and a culture change, including support and funding from the top,” Abel said. “EMI is a high-reward, low-risk technology, but it takes the collaboration of the whole organization.”

FIVE SS COME BEFORE SIX SIGMA

Meanwhile, Jeremy DeBenedictus, operations and engineering vice president at plastics-to-energy startup Vxddx Energy Corp. and a Six Sigma black belt formerly at GE, reported on how lean operating principles can be applied to eliminate variation from chemical manufacturing processes. This method involves using the methodology of define, measure, analyze, improve and control (DMAIC).

However, before attempting to apply Six Sigma principles, DeBenedictus recommends practicing the five Ss, which are sort, stabilize, shine, standardize and sustain, in order to provide structure. Next, he suggests gaining overview and insight by adopting Kaizen principles, such as visual KPIs and a continuous improvement culture. Finally, he advises using lean practices, such as the stabilizing process and eliminating waste. “You don’t want to do Six Sigma until you’ve done the five Ss,” DeBenedictus says. “You don’t need sophisticated models to start. You can even begin with paper and pen or a whiteboard to identify key input variables and key outputs.”
TIDES OF COST AND WAVES OF ECO CONCERN
Shipbuilders and Operators Face Many of the Same Pressures as Their Onshore Counterparts
by Joe Feeley

Shifting energy equations. Increasing environmental regulation. Accelerating demand for larger, multi-use ships. When it comes to designing high-performance, cost-effective diesel electric vessels, today’s shipbuilders face daunting challenges. For each new challenge they face, they must find a solution that can withstand the rigors of a marine environment.

This week at the Marine Industry Forum at Automation Fair®, presented by Rockwell Automation in Houston, marine industry professionals offered insight into industry trends and best practices that help drive efficiency, flexibility and productivity across a ship, address current environmental demands, and discover how to lower total cost of ownership, whether it’s a private fleet or Navy transport vessels.

“The pressure to innovate is ever-present and it’s growing,” noted forum host Mike Tangora, business development manager, Rockwell Automation. “There are demands for constant change from all around the marine industry. The U.S. energy revolution in progress is changing traditional shipping route constraints, ports that until recently were receiving energy supplies are now exporting energy. The entire U.S. shipping distribution network is being redone in the midst of a renaissance of private American shipbuilding.”

Tangora noted that oil exploration is heading into ever-deeper waters and will require larger- capacity oil and exploration and production vessels, while at the same time the cost pressure on traditional government programs is growing.

Forum speakers also made it clear that cost and performance pressures don’t stop outside the gates of the U.S. military. Similar performance pressures are found there as well. “The Navy’s platforms are getting older,” began Johnny Walker, Capt. U.S. Navy (Ret.), and president, Thor Solutions. “They need to get to the full service life that taxpayers paid for.” Thor Solutions is a technical consulting group with a range of acquisition, program management and engineering services centered on surface ship and combatant craft maintenance, training, logistics, warfare assessment, machinery controls, environmental and safety sectors within the defense and Homeland Security domains.

In early 2005, the Navy faced declining control system reliability and obsolescence in its twelve LSD-41/49 class ships, but was unable to fund replacement. “These are the ships that carry armored landing vehicles to the beach, the first ones in,” Walker explained. “The heavy stuff is on the horizon waiting. If you don’t have that ship that puts in the first set of armor, nothing happens. This can be a single point of failure for an operation.”

The Navy embarked on the implementation of a distributed PLC-based advanced engineering control system (AECS) for these ships, based largely on ControlLogix architecture from Rockwell Automation. Now nearing completion of its few remaining installations,
LSD AECS includes new subsystem controls for propulsion, electrical power management, steering and an onboard trainer (OBT). The result, Walker reported, is an energy-efficient, low-cost solution providing lowest total cost of ownership, and more dependable performance.

“Somebody asked me, what led to the decision to upgrade and refit the control systems on the ship,” Walker continued. “It was the risk of a legacy system and the consequences of failure,” he said, citing personal experience with a controls malfunction during an already dangerous refueling at sea operation.

The expected service life of these ships was at 40 years. “It started out at 30, then went to 35, and the next year they wanted us to make it 40, and today it’s at 45 years,” Walker recalled. “It’s designed service life is 30.” He pointed to the new installation that included Allen-Bradley Logix PACs, PanelView HMI and PowerFlex drives from Rockwell Automation, and new AC motors as the critical elements in ensuring the performance of functions such as crane operation that were single points of failure elements.

**ENVIRONMENTAL PRESSURES LOOM**

Along with cost pressures, new regulations governing seafaring pollution limits on the marine industry mandate reductions in sulfur-containing fuels and NOx pollutants. The marine industry, in similar fashion to other land-based industries has been developing NOx reduction technologies such as fuel injection and combustion enhancement, exhaust gas recirculation (EGR) and selective catalytic reduction (SCR). But these technologies face unique limitations, given the typical quality of marine diesel fuels and the extreme operating conditions they face.

“Up until 2000, marine exhaust emissions were completely unregulated,” reported Philip Wasinger, vice president, new equipment, MAN Diesel & Turbo North America. One of the alternative fuel choices is a dual-fuel engine technology that uses liquefied natural gas (LNG). “Natural gas is the only fuel available today in great quantities and excellent prices, but it can only work for ship applications in a liquefied state, stored at -200 °F,” Wasinger explained. “That means it has to be contained in a cryogenic vessel with a vaporization system for delivery to the engines. While ships that transport LNG already have some of this required infrastructure design, it could be a problem on smaller ships.”

However, Wasinger noted, the environmental benefit is significant. “Compared to diesels, an LNG-powered engine would produce 20% less CO2, 85% less NOx and eliminate more than 99% of the SOx and particulate matter found in shipping-grade diesel fuels.” Hardware requirements are not insignificant with this approach, Wasinger added. “The fuel delivery system could cost more than the propulsion system, so these are areas of cost we’re looking to reduce.” He pointed to Tote Shipping’s first non-transport, LNG-powered merchant ship, of which several are on order, as the first wave of possible things to come.

Regardless of what emissions levels a merchant ship might achieve, the monitoring and reporting requirements will be far more likely to catch offenders than in the past. Ship owners and operators will soon be required to meet the emissions reduction and monitoring requirements of the International Marine Organization (IMO) and new rules of MARPOL 73/78 Annex VI global regulations.

“People don’t appreciate how many ships are crossing the oceans,” said Joseph Miller, global technical consultant—environmental at Rockwell Automation. “It’s estimated that from 20,000 to as many as 90,000 ships are crossing at any one time.”

Miller discussed the use of the company’s SeaPEMS, a software-based continuous emission monitoring system (CEMS) for cost-effective monitoring and compliance reporting. “A lot of new technologies to control emissions are being installed on ships,” he said. “The problem is knowing that it’s all working properly and being maintained at sea.”

The SeaPEMS system doesn’t just measure the smoke. It’s monitoring “the processes that make the smoke,” Miller said, explaining that the system monitors variables such as injection rates of the urea going into the SCR, how fast the crankshaft is turning, bearing temperatures—many things that wouldn’t be looked at by an environment monitor. The system should hold up better as well, Miller continued, since it has no moving parts, no spare parts requirements and no calibration gases.

It’s tamper-proof as well. “The model is locked down,” Miller said. “If someone tries to tamper, we get an email. Also, for these systems, the requirement is that it must be up and running 95% of the time an engine is running and be accurate to +/- 20%. We tend to be around +/- 7%, and that improves to around 3% after a year or so of operation. It also reports if it’s been taken offline and the operator will have to explain why.”

Miller says the system has been proven in more than 2,000 installations on land and off-shore platform applications.

**POWER SOURCE SELECTION**

Using electro-mechanical actuation (EMA) technology coupled with modern, variable-frequency drives can help lower energy demands, increase operational effectiveness and reduce overall logistics costs, reported Clyde Thomas, systems business program manager at Exlar, which supplies electromechanical linear and rotary actuation products to a wide range of industries and applications. “By accommodating industry trends such as energy efficiency, simplified connectivity and higher machine intelligence, EMAs can be an effective technology to address the challenges faced in supplying, using and supporting today’s modern marine and naval platforms,” he said.

Thomas pointed out that there are still a lot of companies that haven’t really started. “Some 40% of industrial actuation applications haven’t taken energy-efficiency into account, and more than 50% don’t deploy any level of smart motor control,” he noted.

Thomas presented the pros and cons of using an electromechanical solution as compared to using hydraulics or pneumatics. He pointed to a study produced by UNB-Kassel in 2012, which compared the energy efficiency of the three choices. “It was a pretty basic setup of a mechanical weightlifting of a 1,000-Newton force through a 150-mm stroke at a 1.7-second cycle rate for a number of hours. Based on the test results, with the electric option as the baseline of 1 kWh, the pneumatic system consumed 10.3 times more energy; the hydraulic system consumed 44.4 times more energy. The conversion of energy to work for the electric option was 90%, compared to 77% for pneumatics and 57% for hydraulics.”
PLANTS FIND POWERFUL WAYS TO BOOST ENERGY EFFICIENCY
UT Austin, Tyson Foods and FuelCell Energy Tell How Technology Helps Them Cut Energy Consumption
by Paul Studebaker

The University of Texas at Austin generates 100% of its electric power, steam and cooling for more than 150 buildings comprising 20 million square feet. Electricity, chilled water, steam, condensate recovery, water and sewer lines all run underground in truly redundant loop configurations through a network of tunnels throughout the campus. The university’s 135 MW of combined heat and power operates with 88% fuel efficiency at 99.9998% reliability.

But it hasn’t always been this way. “17 years ago, we were operating at 62% efficiency,” said Juan Ontiveros, P.E., executive director of utilities and energy management for the university, speaking at the Power and Energy Management Industry Forum this week at the Automation Fair® in Houston, presented by Rockwell Automation. The Austin campus and its power systems had grown organically since 1929. “Our controls were all pneumatic, and we were at capacity. We had to upgrade, but we couldn’t shut down.”

To add to the challenge, his department’s budget left little room for investments. Money for improvements would have to be saved from operating costs by improving operational efficiencies and allowing staff to reduce by attrition. So they implemented digital controls in stages, starting with the boilers and power turbines. “We improved the maintenance process, standardized our systems and got a new Title V permit,” Ontiveros said. The information provided by the new controls showed that the average efficiency was 62%, but some of the equipment was running at 80%. “Why don’t all of them run at 80%?” he asked. “That became our first efficiency target.”

The quest for efficiency gradually lead to new equipment, including a steam load controller, a load-shedding system for the electrical generator, and a modern tie-in controller to the grid. But major improvements came as the department was able to digitize the balance of plant (BOP) for remote monitoring and control. “BOP is very important when something goes wrong, so you can see it right away,” Ontiveros said.

The department transitioned to Allen-Bradley PLCs for all BOP applications because of local support and their reliability in high-temperature and high-vibration environments. Standardizing made it easier

“In combined heat and power applications, fuel efficiency is about 90%.” FuelCell Energy’s Ben Toby on the high efficiency and improving affordability of high-temperature fuel cells for power generation applications.
to implement incremental improvements as funds become available. The latest major accomplishment was implementing a 100-MVA substation and an all-new power plant electrical system "without shutting down," Ontiveros said. "We did it all live."

The digital system supports optimization of the chilled water system, real-time power dispatch and, with new burner management systems, 100:1 turndown on the turbines and boilers. "We do all the tricks in terms of efficiency," Ontiveros said.

The systems' controls must have redundancy, independent process checks (to verify status of critical processes), the ability to gather and process data reliably even during work, and security. "We must be able to manage them in-house," Ontiveros said. "And they must have OPC."

Since its peak about 17 years ago, fuel usage has dropped to 1976 levels despite more than doubling of the square footage. Energy savings like that don't happen by accident. "You have to take some risks," Ontiveros said. "It's easier to do nothing, but then you get nothing." Asked if he was able to invest some of that fuel savings in efficiency improvements, Ontiveros said, "The money we save on energy is outside our budget." All he gets for that is an annual, "Thank you very much." That's apparently enough.

**TYSON TARGETS ENERGY USE**

Tyson Foods is just getting started on a systematic approach to energy management. For the company that produces "one in five of every pound of protein in the United States," said Danny Hamilton, director, energy engineering, Tyson Foods, "Energy has started to become a definitive factor in the success of our operations."

The company has set the goal of 20% reduction in energy—$84 million annually—over 10 years. Based on historical energy audits, it expects 10% to come from low-cost operational efficiencies and 10% from capital-based improvements.

To find those opportunities, Tyson started at a single plant with a pilot implementation of a Rockwell Automation Industrial GreenPrint energy monitoring system and energy services. "We can't afford to monitor every possibility," Hamilton said, so Tyson selected the five major systems that, according to audits, consume 80% of the plant's energy: compressed air, cooking, refrigeration, steam and tempered water. Projects were limited to those that would pay back in less than two years.

All the information from the five systems was integrated with GreenPrint to feed its dashboards, and standards were established for each system based on production rates and historical information. Dashboard displays are coded green/yellow/red so anyone can see immediately how well they're doing, and can drill down as needed for real-time process information. "Very quickly, we are able to tell how we are operating against our standards."

Variance reports give details on cost, production and energy intensity, so "Unit operations managers know how much it's costing them to not perform," Hamilton said. "How much I consume is important, but I want to know how much I should be consuming."

The pilot identified major pain points in the compressed air and steam systems with paybacks of less than 12 months that reduced utility costs $300,000 per year. The system is going live at a second plant in December of this year, and Tyson is developing an enterprise-wide rollout.

Hamilton said energy managers need to clearly define their process and objectives, and to implement a continuous improvement process with continuous monitoring, real-time dashboards, feedback and opportunity tracking. He also said they should plan on some capital investment to get started: "We budgeted 20% of the annual energy spend to get this implementation."

**FUEL CELLS BECOMING MORE COMPETITIVE**

Another potential way to save energy while providing electricity and process or district heat is to install a commercial-scale fuel cell power plant, said Ben Toby, vice president, FuelCell Energy, Inc. High-temperature fuel cells have been used in commercial applications since 2003, and his company has installed more than 120 MW in commercial and industrial facilities around the world. "High-temperature cells run on natural or biogas at 1600 ⁰F, which allows reforming of methane and high efficiencies with lower CO2 emissions. In combined heat and power applications, fuel efficiency is about 90%.

The power plants aren't for everyone. They cost $7 to $12 million, so they generally must be financed by power purchase agreements (PPAs). Installed costs run 14 to 15 cents per kilowatt-hour with natural gas prices at $6 to $8/mmbtu, which makes them generally only attractive in states with high electricity costs and significant subsidies for using fuel cells.

Toby expects prices to fall to about 10 cents per kilowatt-hour as production volumes rise but even now, his company is finding takers among hospitals and companies such as Gill’s Onions, which uses biogas from onion waste to feed fuel cells that provide a significant portion of the company’s electrical power requirement. The fuel cells also can serve as back-up generators to sustain operations in the event of a grid outage.

The Power & Energy Management Forum also included a presentation on regulatory issues facing power- and energy-intensive industries by Diane Fischer, air quality control services leader, Black & Veatch, reported in yesterday's newsletter.
Manufacturers today want innovative machines that easily integrate into their plantwide infrastructure. As a result, equipment and machine OEMs are responding with smart machines that seamlessly connect the factory floor with the enterprise.

By using a single control and information platform, these machines can demonstrate an unsurpassed level of intelligence along with the ability to consume and generate information automatically, adapt to new situations and give industrial OEMs the remote access and insight they need to both satisfy these customer demands and analyze the operational data that lets them build better, more responsive machines.

These issues set the stage for today’s Global Machine and Equipment Builders Industry Forum at the Automation Fair® in Houston, presented by Rockwell Automation. “‘Smart machines’ is an umbrella term for the important trends in the industry that include safety, leveraging information, integration, diagnostics and basically taking advantage of the information that’s on machines and is becoming more available,” began Chris Zei, vice president, global industry group, Rockwell Automation. “And there are three issues that we at Rockwell Automation think about in this regard that help us figure out the right value proposition for each customer.”

The first issue, Zei said, is plant-wide optimization. Rockwell Automation is committed to helping end users use their assets in the optimum manner and helping reduce the total cost of ownership of those assets.

“The second thing is machine builder performance: our commitment to do what’s right for the builders, making sure we’re providing the products that help them build a better machine,” Zei said. “Not only that, we want to be a good partner to them so we can help them deliver on their promises of better machine TCO to their end customers.”

The third item is sustainable production. “We have footprints all around the world,” Zei explained. “So not only do we want to do the right things in terms of being a sustainable company, but we also want to help the many companies that come to us for help in being or becoming a more sustainable company through automation and things like improved energy monitoring.”

“Safety and sustainability are big on our list,” agreed session participant Ted Hutto of Panhandle Meter, a company that specializes in custody-transfer meters for crude oil. “Among other things, we’ve helped improve working safety. Around liquid hydrocarbons, you’ll find H2S, a poisonous gas. We have an H2S monitoring system to watch for that so dispatchers and others can alert workers and others entering the area.”

Zei then dove into the trends that affect machine builder performance, some of which have been around for a while. The first is the sheer dollar volume that end customers spend on equipment. “About 75% of the purchases in the consumer products space are for equipment needed by customers, we’re able to stop it inside.” TetraPak’s Ana Paula Herrstrom of TetraPak on the need to quickly gather and aggregate product quality information from its packaging machines.
and machinery on the factory floor,” Zei said. “In automotive, it’s more like 50%, and in some of the heavy industries such as water, wastewater, mining, it’s closer to 30%. But in all cases, it’s a significant number.”

**STICK TO WHAT YOU KNOW**

Another force is the increasing rate at which end customers outsource activity to the OEMs in order to focus more on their core competencies. “The CEO of a food company told me that his company had to get back to what it does well—making cookies—and it shouldn’t be specifying what goes on or into the machines. It should just be specifying what they want that machine to do,” Zei explained. “Those end customers want machine builders who can be good partners with them.”

One of the things that nearly every end customer wants from its equipment is a combination of throughput and flexibility. “Those two are really counter to each other,” Zei remarked. “If you want maximum throughput, you design and optimize a machine to produce one SKU as fast as it can. But what’s typical is the need to produce many SKUs, and that means a machine designed to handle the most-difficult SKU, and that tends to determine throughput. The reality is that everyone wants both.”

Another big need is for machines to generate information that will provide these good outcomes for productivity, sustainability and flexibility needs.

Valter Marcolini of Tissue Machinery Co. (TMC) in Italy, also a participant during this session, said leveraging information is an important element of TMC’s business. “Diagnostics and preventive maintenance are very important to achieve OEE,” he said. “We’re proud to have developed systems that can do both through specialized software, so we can see what is going to happen and analyze the data compared to the compiled data.”

Gathering process information to enhance product traceability is a key factor for Ana Paula Herrstrom of TetraPak. She said that, “The information we need is to ensure that if product quality didn’t reach the levels demanded by customers, we’re able to stop it inside [the company].”

Equipment builder M.W. Waldrop uses data in both directions. “Almost every piece of equipment we build has data-gathering capabilities from the plant floor to the engineering desk, but we’re gathering information for our own use to improve our designs,” said Chris Waldrop. “How long did it take to get up and running after an upset; did the infeed not flow as well as it should have for a particular product?” Waldrop says his company also uses the data to present efficiencies back to its customers, including recipe performance and even operator or group performance.

And the emerging way to access and analyze that information is an Ethernet-enabled network, which Zei said provides the best case of access. “So a lot of the IT tools we’re used to on the business side are moving to the production areas,” Zei said.

But with access comes the need to secure that information. “Just as has been shown with safety—that you can’t just put a wrapper around it, you have to build it in as part of your architecture—the same applies for network security,” Zei remarked. “That means building security in a layered model with best practices that include defense-in-depth that accounts for both inside and outside threats; an openness that includes strict, but appropriate access control, but which has the flexibility to deal with specific end customer needs, while maintaining an overall consistency of approach that users will understand.”

Machine OEMs are involved with line integration either directly as the responsible party or as part of an overall scheme. “In the CPG [consumer packaged goods] space, we found that in many cases, the highest or second-highest cost of a project was line integration,” Zei noted. “And we heard that in some cases, the integration cost exceeded the total cost of the machines being installed.”

Having determined that there has to be a better way, Zei said Rockwell Automation developed the Rapid System, which provides standard templates in a drag-and-drop environment to visualize the connected environment and can see delays, stops and other encumbrances in the operation.

**MORE THAN JUST THE MACHINE**

Mike Irwin, vice president of global logistics and material planning, operations and engineering services for Rockwell Automation, followed with a discussion of how OEMs fit in the scheme of Rockwell Automation’s “Design for the Supply Chain” initiative. “My job is to make supply chain a competitive advantage for Rockwell Automation,” he began.

The key premise of the Design for the Supply Chain program is to have a “preferred availability” of products that get to machine and equipment builders quickly and dependably, regardless of global location. Irwin said Rockwell Automation reviewed its 377,000 parts and found there are 35,000 that represent the vast, vast majority of the purchases—parts that the company will deliver in one to three days with 97% on-time reliability. The list is segmented to account for regional differences as well.

On top of that, there are product-selection tools. “Our Proposal Works tool can suggest alternative bill of material (BOM) parts choices that are in the preferred availability family,” Irwin explained. “There’s a configuration tool that will lead you to a preferred product alternative to consider for your design.” Irwin said that they did about 500 BOM analyses in North America last year via Design for the Supply Chain. “The results increased the use of preferred availability parts from around 80% to about 93% and created BOMs with parts delivery times that were reduced by 50%,” he reported. “So now you have market-leading parts-delivery times to help you build your machine faster, a much reduced inventory—because you know we have them—and a resultant improved cash flow.”

Time to market is a competitive advantage from Panhandle Meter’s perspective. “SCADA usually brings the oil-field data back to management, but that can involve a lot of time and expense,” Hutto stated. “Our product is one box, and, if we have everything we need, we can be at a location in the morning and be delivering data that evening.”

Parts availability and other factors are essential to TetraPak’s responsibility to its customer. “We have to be partners and very close with our customers and with our suppliers as well,” said Herrstrom. “We have to be fast to fix any problems so our customers don’t lose uptime.”
Bringing the Cloud Down to Earth

Rockwell Automation Uses the Cloud and Virtualization to Turn Big Data into Profitable Decisions
by Jim Montague

As long as the intelligent and useful decisions get made, it doesn’t matter over what physical or intangible avenue their supporting data travels, but they still need some kind of pathway. Fortunately, Rockwell Automation has long cultivated open networking, so it can now offer all the wired and wireless hooks—across in-plant networks and over the cloud—its customers need to realize the Connected Enterprise.

“We bet the farm a long time ago on our Integrated Architecture, which is based on open, standard Ethernet, web and mobile connectivity.” Rockwell Automation’s Keith McPherson on why the company is well prepared to help its customers benefit from public and private cloud technology.

“As long as the intelligent and useful decisions get made, it doesn’t matter over what physical or intangible avenue their supporting data travels, but they still need some kind of pathway. Fortunately, Rockwell Automation has long cultivated open networking, so it can now offer all the wired and wireless hooks—across in-plant networks and over the cloud—its customers need to realize the Connected Enterprise.

“To us, big data means all the information running on plant floors, so our mission is to help our customers find the best ways to make sense of it all,” says Keith McPherson, market development director, Rockwell Software. “So we help users connect to their information, organize it, put it into the right context, set up dashboards and distribute it to the right individuals who can make better and more profitable decisions.”

McPherson and John Lohmann, market development director for services and solutions at Rockwell Software, conducted the “Cloud, Virtualization and Other Enabling Technologies” tour at the Information Software exhibit this week at the Automation Fair® event in Houston presented by Rockwell Automation. The booth demonstrates how Rockwell Automation’s Connected Enterprise initiative enables collaboration across all levels of its customers’ organizations by connecting manufacturers with their supply chains and giving better insight into their needs. However, it also shows how employees can connect to each another for easy collaboration and problem solving, and how they can tie their businesses together from the plant floor to the IT and enterprise levels. It’s these higher levels of collaboration that can help drive productivity improvements, innovation and ultimately optimize business processes.

“We bet the farm a long time ago on our Integrated Architecture, which is based on open, standard Ethernet, web and mobile connectivity,” explained McPherson. “That’s what’s making it easier for us to implement the virtual computing and cloud-based services so many users are asking for now.”

Lohmann added that, “Besides dealing with the strain of aging workforces, many users are still working with assets that must perform in harsh and difficult environments, so our ability to leverage open

“We bet the farm a long time ago on our Integrated Architecture, which is based on open, standard Ethernet, web and mobile connectivity.” Rockwell Automation’s Keith McPherson on why the company is well prepared to help its customers benefit from public and private cloud technology.
networks and the cloud can help users with all their logistics issues and people challenges.”

For instance, McPherson reported that M.G. Bryan Equipment Co. in Grand Prairie, Texas, is implementing Rockwell Automation’s cloud-based solutions and Microsoft’s Azure platform on its fracking trucks. The platform provides generic Internet connections for tablet PCs and smartphones, so Bryan’s users can secure production data from the trucks and their drill sites. For example, this enables the trucks to alert operators when their air filters need to be changed, which can be as often as every eight hours.

“Basically, sensors and other field-based devices provide data via real-time production models to our FactoryTalk VantagePoint software, which builds reports and displays,” said McPherson. “But now, M.G. Bryan’s users can use iPads and Gmail to log in to their trucks, check actual data dashboards with real-time parameters and even initiate immediate orders for service or supplies.”

In fact, Rockwell Software just announced this week its FactoryTalk VantagePoint Mobile App, which is based on FactoryTalk VantagePoint’s enterprise manufacturing intelligence (EMI) software, Version 5.0. Featuring Windows 8-style on-screen tiles, this new app can provide any KPIs that users need right at their fingertips, McPherson said. The app will be released this December, while versions for Apple’s iOS and Google’s Android operating systems are scheduled to ship in early 2014.

“Users can set any alerts or notifications they want, and then the software will display high-level gauges; allow users to immediately drill down into more detailed VantagePoint reports; and allow them to distribute specific information to colleagues via email, Facebook, Twitter and Microsoft OneNote,” added McPherson.

To help support all these apps, big data and cloud-based projects with some heavy-duty virtualization hardware, Rockwell Automation also released this week its new Industrial Data Center, which is a pre-engineered, scalable infrastructure that lets users run multiple operating systems and applications on virtualized servers. Available for lease or sale, this center’s main components include rack-mounted blade servers from VMWare, networking from Cisco, an enclosure and temperature controls by Panduit, and the ability to run a variety of FactoryTalk, PlantPAx and other software packages on a user’s private cloud.

“Industrial Data Center moves having your own cloud from a capital expense to an operating expense, which can make it a lot more approachable for many users,” says McPherson. “It also follows the basic Microsoft model, so users can have one, four or 16 cores, which makes it easy to scale up as needed. The cloud has two main value propositions: improving asset performance management and enabling remote monitoring to virtually support engineering functions.”

For example, Lohmann reported that Hilcorp’s submersible, medium-voltage pumps had only been running for a short time on a user’s oil platform in Alaska earlier this summer, when they started generating alerts that were uploaded via Rockwell Automation’s cloud-based service to Hilcorp’s office in Cleveland. “The customer reported that these alerts from the cloud enabled their operators and saved about six hours of unplanned downtime,” added Lohmann.

“The advantages of cloud and virtual computing will continue to converge in the future. We’re already using them and their flexibility to learn and work closer with customers, so we can better tailor these tools to meet the individual needs of their applications.”
In complex, far-flung oil and gas applications, the power of simplicity can’t be overestimated.

For instance, French oil and gas producer Perenco recently undertook the largest surface redevelopment project of its onshore and offshore production operations in Gabon on the central west coast of Africa, which required it to build new infrastructures, and reorganize and coordinate numerous platforms, control facilities and industrial networks.

“Perenco began production operations in Gabon in 1992 with the acquisition from Total and Marathon of developed, offshore fields near Port-Gentil,” says Laurent Mollard, Perenco’s senior automation and control systems engineer. “Twenty years later, our yearly average production reached 62,500 barrels of oil equivalent per day (BOEPD) in 2012. This growth was sustained by continuous development of mature fields, an aggressive acquisition strategy and successful exploration, but we really needed to streamline all these production operations and overhaul our infrastructure.”


Headquartered in Paris, Perenco is an independent oil and gas company with onshore and offshore operations in 16 countries in northern Europe, Africa, South America and Southeast Asia. The company presently produces approximately 375,000 BOEPD with net production of 210,000 BOEPD. It’s also participating in some of the world’s largest exploration projects in Brazil, Peru, northern Iraq, Australia and the North Sea.

In Gabon, Perenco runs 27 oil production sites, including 12 offshore and 15 onshore. Each offshore site can include three to six platforms. The production sites cover an area that’s about 400 kilometers long, running north to south off Gabon’s coast, and they’re networked via a combination of fiber-optic cabling, radios and satellite communications.

The company also operates one natural gas pipeline, which covers two production fields, one gas treatment plant and

“They’ll be easy to remotely support, and they’ll help our site maintenance and project engineers optimize operations and improve production turnover in any of these locations.” Perenco’s Laurent Mollard on the remote access capabilities of the company’s new PlantPAx automation infrastructure.
we installed rack-based I/O for our main plants and FLEX I/O and SIL 2 safety controllers and power distribution controllers. Next, we launched several server applications. We implemented ControlLogix process control for main production facilities, and combined them in a multi-server room. "We used a global standard approach with PlantPAx redundant configuration, which has been assisting Perenco since it started working in Gabon and his colleagues turned to longtime partner Rockwell Automation in its main office and remotely."

"To optimize operating expenditures in our crude oil production areas, we required scalable automation solutions that could handle both process control and safety control on our production facilities, which produce hundreds to thousands of barrels of oil per day," explained Mollard. "We needed to reduce operator presence on small production plants by fully instrumenting offshore platforms and onshore sites; interconnecting all the automation systems; and remotely operating several production facilities from one main control room. We also needed to rationalize our maintenance efforts by reducing local electrical production units and centralizing electricity production; managing our power plant operations, load shedding and electrical network monitoring; and remotely accessing diagnostic information to prevent unsuccessful trips."

Besides coordinating and streamlining existing operations, Perenco also needed new infrastructure to development its nearby Olende and M’Polunie fields; construct two 14-megawatt power plants with high-voltage electrical distribution; install a distribution network linking Libreville and Port-Gentil to gas reserves; and implement a dual-product, 2-million-barrel offshore terminal.

"Our project objectives were to centralize operations in two main control rooms to minimize local presence and reduce logistics costs, such as helicopters and boats," said Mollard. "We also sought to electrically monitor all of our production facilities by installing the two main power plants to reduce local electricity generation and maintenance costs. We also wanted to further optimize production by acquiring production data for analysis, which helps optimize our financial investments."

Because Perenco's redevelopment project meant it was often dealing with developed fields and managing existing equipment, many of its new projects didn't involve building complete platforms or plants, but instead required it to add new components to older facilities. "It could be difficult to remember where all the existing equipment was, so it helped that we could make all our fire and gas (F&G) connections directly to our PLCs too," reported Mollard. "We can also manage our power generation with a PLC for power management. All these interconnections let us monitor everything from one central control area."

Mollard added that Perenco has also been standardizing its safety instrumented systems (SISs), emergency shutdown systems (ESDs) and F&G systems on the same PLCs from Rockwell Automation and monitoring them together on PlantPAx. In addition, it's also standardizing its HMIs and SCADA programs, which will allow staff to work on uniform displays and simplify training for them.

"The real value of this simplification and standardization is that common platforms can reduce the cost of spare parts. However, we're also getting uniform well analytics and production dashboards that are allowing us to follow operations trends in Gabon from our offices in Paris, and then react and make better decisions in real time," added Mollard. "These standard solutions from Rockwell Automation are going to be deployed further in Gabon and also in Congo, Democratic Republic of Congo, Tunisia, Peru and Cameroon. They'll be easy to remotely support, and they'll help our site maintenance and project engineers optimize operations and improve production turnover in any of these locations."
Global energy supplies and demands are undergoing an unprecedented transformation as yesterday’s fears of energy scarcity are replaced with a new era of energy abundance due to innovative practices in the oil and natural gas industry. Instrumentation and control engineers are matching those process innovations with their own refinements of methods for engineering, installing and commissioning systems.

And Rockwell Automation is keeping pace with acquisitions, products and services to support this area of exploding growth, company representatives relayed to assembled media and analysts at today’s Automation Perspective event in the lead up to Automation Fair® this week in Houston.

“It’s very much a hydrocarbon world, and it will be for a long time to come,” said David Pruner, senior vice president and head of North American gas and power account management, Wood Mackenzie Ltd. “In 2019, coal will surpass oil as the world’s primary source of energy.”

By 2030, China and India’s energy consumption will more than double compared to 2013. “It’s all about electricity output, and in China and India, that’s basically all coal because it’s the cheapest and most plentiful source,” Pruner said. The rest of the world is primarily choosing natural gas to produce electricity. In addition to power production, China and India have rapidly increasing demand for coal in industry, primarily iron and steelmaking, and cement production.

In the United States, the energy revolution is due to hydraulic fracturing for natural gas. Starting with the Marcellus and Utica shale formations and progressing through a dozen others, shale gas deposits in the U.S. are mapped, characterized, costed, and queued up to be put into production as demand and prices rise.

Outputs from Marcellus and Utica wells are on track to double between 2012 and 2016, largely due to improving hydraulic fracturing techniques that are producing from formerly tapped-out fields. U.S. energy from coal is declining, and from gas it’s increasing, due to the low cost of gas and the relatively high cost of bringing coal-fired plants into compliance with mercury and air toxics emissions limits.

“It’s very much a hydrocarbon world, and it will be for a long time to come.” Wood Mackenzie’s David Pruner on the world’s continued reliance on fossil fuels, including the resurgence of coal as global number one source of energy.
“It’s a paradigm shift in U.S. production,” Pruner said. Abundant natural gas supplies are driving an industrial renaissance in chemical plants and natural gas-based industries such as plastics and certain pharmaceuticals.

The United States is on track to become a significant global supplier of liquefied natural gas (LNG). On the world market, U.S. LNG suppliers have a cost advantage because U.S. gas is produced on brownfield sites where exploration and characterization are already done. Wood Mackenzie projects that natural gas prices will stay around $4/MMBtu through about 2016, then rise slowly to $6-$8 by 2025.

Pruner expects the United States to achieve energy independence by 2028 “on a net basis,” he said. “We’ll continue to import oil.”

ONE ENERGY COMPANY’S RESPONSE

Controls engineers are scrambling to keep pace with energy production projects, which “involve a high level of activities simultaneously in multiple locations around the globe, with ever shorter project life-cycles,” said Sandy Vasser, facilities electrical and instrumentation manager, ExxonMobil Development Company. “Successful project execution for automation systems is extremely difficult, but can be achieved.”

Vasser’s strategy is simple: identify all of a project’s I&C-related activities early, plan a flawless execution, contract with the very best resources, and assign each piece to the best resource for that piece. Then select the best and proven technology, guided by an I&C “toolkit of go-bys, guides and tools.” Identify and manage all dependencies and interfaces. Finally, identify cost efficiencies and take advantage of them, remove barriers, and learn and improve from the results.

He cites three major remaining problems: projects are requiring more I/O, changes cause delays, and changes after field acceptance test (FAT) lead to significant rework as well as delays. So ExxonMobil has challenged its suppliers to help them eliminate and automate steps; simplify and streamline the steps that remain; eliminate components, dependencies and interfaces; accommodate change; and simplify and automate documentation.

“We used to improve by perfecting and supplementing conventional methods, but if all we do is improve the way we’ve always done it, all we’ll get are incremental improvements,” Vasser said. “We need to rethink the way we go about things.”

For example, the conventional control, marshalling and I/O cabinets are each highly engineered for a specific project. The project must wait for these to be engineered and constructed. Instead, he uses standard I/O cabinets -- junction boxes-- in the field, ordered based on the approximate I/O count with room to spare. “These can be installed before the controls are engineered,” Vasser said. Controls are also ordered in a standard configuration. Marshalling cabinets are eliminated by using networks.

During construction, field devices can be connected to the nearest junction box, “It doesn’t matter which one,” Vasser said.

Meanwhile, the control software can be tested via simulation and visualization – “FAT without hardware,” Vasser said. In the future, he expects that on installation, the control system will auto-detect the field devices, then configure, enable and document them and the I/O.

“We have to challenge the existing traditional practices and technologies, and look for opportunities to make leaps in improvements,” Vasser concluded. “We want to take automation off the critical path.”

ROCKWELL AUTOMATION EXPANDING OIL & GAS CAPABILITY

Rockwell Automation has steadily increased its footprint in oil and gas through acquisition and product development, said Blake Moret, senior vice president, control products and solutions, Rockwell Automation, “from downstream up, product by product and customer by customer.”

The company integrates control, logic and safety for specific applications by selecting the best products, then knitting them together. “Our most recent acquisition, vMonitor, helps us to achieve the digital oilfield through remote monitoring, secure wireless and packaged implementations.”

Remote services are not new. “We’ve had it for years,” said Moret, but now it’s on a smaller, less costly footprint. “It’s about connectivity back to the expert, so customers can overcome the skills gap,” as well as keep on-site personnel away from dangerous equipment.

The same control system performing automation also can feed information to an energy management system, in context of process and production data. This is helping one Tyson Foods plant save 10% on energy -- a 1-year payback -- and it’s being rolled out in its other facilities.
A Better Machine for the Connected Enterprise

Integrated Architecture Enhancements Facilitate Easier Connectivity with Implicit Security

by Walt Boyes

At this week’s Automation Fair®, presented by Rockwell Automation in Houston, the Integrated Architecture booth was stuffed full of new products, from food-grade servo motors, drives and converters to the upgraded Allen-Bradley Dynamix 1444 Series system for condition monitoring, now with EtherNet/IP, and more.

Seven existing Allen-Bradley ControlLogix isolated analog input/output (I/O) modules have been re-architected into three new designs with increased channel count, higher precision, faster response time and new interface capabilities. A newly enhanced FLEX I/O analog module, for example, is now HART 7.0-compliant, with an independent HART modem on each channel.

The Armor GuardLogix controller extends the Allen-Bradley ControlLogix platform to the on-machine space as a SIL 3 safety controller in an IP67 form factor. The Allen-Bradley GuardLogix controller has dual redundant Ethernet ports, allowing replacement of devices without stopping production. The GuardLogix controller is available with the new Allen-Bradley 1732E ArmorBlock dual-port Ethernet Quick Connect module, which can power up and establish a network connection within 500 milliseconds.

Security was also highlighted in the booth with security appliances, managed Ethernet switches and wireless hotspots. “Plant level security has become an integral part of the Integrated Architecture,” said Rockwell Automation’s John Pritchard, global market development manager for Integrated Architecture. “We used to say, just put it behind a firewall. But now we realize that, as they say, ‘It’s more likely Alice than malice’ will cause a security incident. So we’ve put together a cell and zone security architecture with the help of Cisco and our Allen-Bradley Stratix product lines.”

Highlighted in the Integrated Architecture booth was a LACT skid made by Trigg Technologies. LACT, according to Pritchard, stands for “Leased Automatic Custody Transfer” and is a cloud-integrated replacement for paper invoices for oil well owners. “Previously, the driver would pull up, pump the oil into his truck and write a paper invoice which would be left in the mailbox on the site. About once a month, somebody would come by and collect all the invoices,” Pritchard said.

“It’s more likely Alice than malice.” Rockwell Automation’s John Pritchard on the incorporation of cyber security in multiple layers of the company's Integrated Architecture in order to defend against both the intentional and inadvertent introduction of cyber threats.
“We are using intelligence enabled by cloud technology to transform an industry,” said Ronnie Riggs, co-owner of Trigg Technologies. Incorporating a Coriolis mass flowmeter and a sediment and water detector, the LACT skid provides improved accuracy in billing, diagnostics monitoring, a condition-based monitoring interface and “a high-water content alarm that, after three tries, turns off the well pump.”

Using a tailored version of Rockwell Software VantagePoint visualization software, and with the data resident in the cloud, users can see measured variables, diagnostics and product quality on the VantagePoint dashboard.

B. J. Walker, Rockwell Automation solution architect for Integrated Architecture, said, “This is an example of how the Connected Enterprise can turn data into information, contextualized information into knowledge, and even knowledge into institutional wisdom.”

Riggs said, “The Trigg LACT enabled by the cloud drastically cuts measurement error, human error and billing delays.” Walker agreed. “It’s reduced the average billing cycle from 30 to 60 days to 7-10 days, and using the Coriolis mass flowmeter gives users higher-accuracy flow information and density information that quantifies water in oil.”

Pritchard noted, “Trigg has had some lessons in human factors as well. They found out after analyzing the time some drivers spent on site that it matters where they put the LACT skid. Sometimes drivers had to back up to it, where in other locations, they could simply pull alongside.”

“We feel like we’ve found the ‘easy button’ for custody transfer,” Riggs said.
Oil and Gas booth Sets Visitors on process control pathways

by Jim Montague

The oil and gas pavilion's control room is a model of the war rooms, command centers or centralized control rooms that can be found in process control facilities worldwide.” Rockwell Automation’s Nigel Hitchings on the impressive array of process automation and information management capabilities on display for oil and gas producers this week in Houston at the Automation Fair®.
colors and prioritized data that characterize today’s latest human-centered design principles.

“The pavilion’s control room is a model of the war rooms, command centers or centralized control rooms that can be found in process control facilities worldwide,” said added Bob Ell, regional director of Rockwell Automation’s Oil and Gas division in Canada. “We’re also demonstrating how operations and remote monitoring data can interact with the enterprise and financial levels to help reduce costs for the overall business. These include vMonitor, which can take data from RTUs and controllers at well site or other field locations, and then distribute it via web-based SCADA or a cloud-based data center.”

Besides its central control room, the Oil & Gas pavilion included four other main sections:

- The “Capabilities” area consisted of three interactive, vertical touch screens with supply-chain maps that let users navigate different industry segments, such as offshore and onshore exploration and production, oil and gas processing, pipelines and transportation, downstream refining and LNG production.
- “Subsea Control Solutions” showcased Rockwell Automation’s AADvance controller, which has multiple redundancy functions and no single point of failure capabilities, so it can serve in ultra-deep, subsea settings in up to 12,000 feet of water, including short-term drilling applications running for two or three months, or long-term production applications running for 15 to 20 years.
- “Solutions and Successes” included a 6 x 20-foot, interactive, touchscreen wall, which visitors could use to call up case studies, sweep around documents, and zoom in on interesting solutions from Rockwell Automation and about 90 of its Encompass Partner, OEM, Solution Provider and other PartnerNetwork Program members with expertise in oil and gas applications and services. All of these examples are located at http://oilandgas.rockwellautomation.com.
- The “Wayfinder” section was a dedicated desk where visitors could get quick referrals to other relevant show floor locations.

“Some customers still thought we couldn’t do DCS,” Hitchings added. “But when they saw the Oil & Gas exhibit, they said, ‘Oh, you guys really can!’ And they’re also acknowledging that PlantPAx does DCS and more.”
For energy companies presenting at today’s Oil & Gas Industry Forum at the Automation Fair®, presented by Rockwell Automation this week in Houston, saving time is of the essence. Forum attendees learned how Petrobras is halving delivery time for its floating production, storage, and offloading (FPSO) ships; how SINCI is helping speed decision-making on offshore rigs; and how ConocoPhillips is compressing small projects schedules using front-end engineering and design (FEED) methodologies normally reserved only for large-scale efforts.

Petrobras, the Brazilian energy company, is planning on spending USD$106.9 billion on development from now until 2017 and much of that will be spent on the Santos Pre-Salt region, offshore. As part of this effort, it will be constructing 12 new FPSOs, of which eight are “replicant” ships—barge-like units that are identical and standardized. The remainder of the FPSOs will be located at the “transfer of rights” fields.

Petrobras uses the MAC [main automation contractor] and EPC [engineering procurement contractor] techniques to optimize the different aspects of control systems on these FPSOs,” said Paulo Cezar Vogel Cintra, equipment engineer-electrical at Petrobras. “Petrobras uses a single automation solution, and we standardize on equipment, modules, solutions and suppliers. In this case the supplier is Rockwell Automation.” Cintra said. “We procure several packaged systems by Rockwell Automation for things like compressors, as well as the hull electrical and topsides instrumentation.”

“We insist on a sizeable amount of local content in these systems, and we intend to use Integrated Architecture in new projects so we can gain the benefits of fewer interface issues and faster start-up times,” Cintra said. “So far we’ve had excellent results with Rockwell Automation.”

“We expect to lower costs and reduce construction time from 134 days in 2006 to fewer than 70 days today. Easier qualification of the new systems will make us more competitive, and new technologies like CO2 separation and re-injection will save carbon emissions,” he said.

SPEEDIER DECISION-MAKING

Next, Hiram Sánchez Pantoja, IT project manager for SINCI, a Rockwell Automation information and solution provider, discussed
a FactoryTalk VantagePoint visualization project for three offshore platforms. “The platforms had OSI PI and Process Book historians and visualization, and sometimes the data collection was done manually, with about a two-week delay,” Sánchez said.

The project was intended “to reduce decision time, with updated information and make the information easy to access using a web-based secure solution,” Sánchez said.

The customer wanted a robust architecture with distributed collection of data in a network that was fault-tolerant. It also wanted a maintainable and scalable system. The data is sent over a subsea network to the customer’s onshore offices.

“We used FactoryTalk Historian Machine Edition for the high-speed data collection because we didn’t have to use an additional PLC, and we sent the data straight to OSI PI servers. We used the FactoryTalk Historian’s data buffering capabilities to prevent data loss. In order to maintain high availability, we built a virtualized environment with three virtual servers, including the PI server, a test and development server, and the production server,” Sánchez said.

“We built a dashboard using FactoryTalk VantagePoint. We can provide summary well performance reports in real time, with visual operating conditions and visual alarming conditions, but read-only access for security,” Sánchez went on. “Each transmitter has a ‘quick trend’ capability, showing real-time, 12-hour and 24-hour data trends. There is also a historical trending dashboard drill down, which enables comparison of several variables, and information analysis tools that provide summarized reports, shift and daily production records, and historical data.”

“We gave our customer faster response decision-making by having critical production data at their fingertips, 3D graphics closer to the operators and information available at different levels of the company based on role and security,” Sánchez said. “There was a time reduction in generating reports, and it is now easier to create new reports. Improved operations lead to informed decisions, using real supervisory control,” he said.

“Now we are going to use this scalable architecture and replicate it for other plants.”

SAVING TIME AND MONEY TOO

Finally, Randy Kirkendal, business development manager for U.S. oil and gas from Rockwell Automation, presented for Earl Anderson, senior facilities engineer for ConocoPhillips. Anderson had been scheduled to present a discussion on the benefits of FEED (front-end engineering design) in ConocoPhillips’ Sour Gas Injection Project.

“This was the first time ConocoPhillips had used the FEED process on a small capital expenditure project. It was just under $50 million, but that is a small capex project in the oil patch,” Kirkendal said. “ConocoPhillips implemented FEED because the project is vital to production in an environmentally friendly and cost-efficient manner in the Howard Glasscock Field, because enrichment and injection of the H2S-enriched stream is a safety-critical process, and there is impetus toward a more formal and mature project execution methodology in the upstream business at ConocoPhillips.”

“The benefits of FEED included optimizing site selection and identifying pipeline specifications; providing refinery process design basis and preliminary P&IDs; providing the design-phase HAZOP (hazard and operability study) and LOPA (layer of protection analysis) analyses; developing detailed project cost estimates at the +/- 20% scale; and developing the overall project schedule. FEED provided direction to the project when design decisions have the greatest influence on project cost and delivery,” Kirkendal said.

FEED saved between 30% and 35% on the cost of the project, with a 35% to 50% schedule improvement, and allowed for the development of a detailed and comprehensive project plan. What would ConocoPhillips have done differently? Kirkendal said that ConocoPhillips’ Earl Anderson had quipped, “We’d do FEED on all our other projects, not just the major ones.”
Connectivity Helps Automakers Pick Up the Pace
Productivity Rising, Costs Dropping Due to Higher Visibility and Innovative Automation
by Paul Studebaker

With rapid economic growth in many developing countries and recovery of Western economies, automakers everywhere are pressured to build more vehicles using less materials, energy and resources. Average model lifespan between refreshes is down to 2.2 years, and a given model is being built in an average of six to eight plants around the world, leading to an environment of constant retooling and recommissioning.

“Manufacturing velocity is pressuring automakers and their suppliers to design, deploy and optimize more rapidly and efficiently than ever before,” said Todd Montpas, market development manager, automotive & tire, Rockwell Automation, as he kicked off the Automotive & Tire Industry Forum today at the Automation Fair® in Houston, presented by Rockwell Automation. Plants are expected to remain in production for 20 to 40 years, but must constantly adapt and improve their production and information systems, and are putting “a big focus on employee productivity,” Montpas said.

Bringing the Connected Enterprise to the automotive industry is paving the path for information “from design to dealer,” Montpas said, allowing automakers to bring real-time feedback from their products back to the plants. For example, a quality problem in the field can be quickly communicated and production corrected, “So you’re not shipping a month or two months of vehicles with that problem,” he said.

AN MES FOR EVERY NEED
Tier 1 suppliers’ manufacturing execution system (MES) requirements have a lot in common, but they are also many and varied, according to Vaidee Sampathkumar, director, automotive and discrete business, MESTECH Services, an IT solution provider focusing on the automotive and life science industries. From inventory control to quality, skills and tool management, satisfying those requirements starts with a template of the specific plant’s functional requirements. Order management, materials and production tracking, quality management, finished products buffer and labor management are among the many options plants find worthwhile to include in their MES systems.

“We can see where a box is and its status anytime, anywhere in the plant.” PEMSA’s Jose Luis Diaz Ceballos on a new production management system for painting pickup truck boxes that has dropped processing time by two-thirds and improved overall efficiency by 70%.
Building a system starts by defining the production route, then adding part-mapping and detailed work instructions. “At each station, the operator gets a set of instructions of work to be done,” Sampathkumar said. Controlled by bar coding as parts move from station to station, their work documentation moves with them from one screen to the next. “Operators get real-time monitoring and feedback, such as fastener torque; the screen displays when fastener torque has reached the correct level,” Sampathkumar said.

The MES is integrated with the ERP system so the enterprise can be apprised of plant-floor results and can download the latest instructions to the MES. “Work instructions, error-proofing and quality management are easily configured and modified for new products,” Sampathkumar said. If you want, you can include complete SPC functionality and operations intelligence, such as genealogy reports. “These are critical for products such as electric car batteries,” he added.

Dashboards may include collaboration tools such as commenting, so managers can ask why a particular metric is not up to snuff. “People can write in all sorts of excuses and reasons for the problem, and if it should recur, they can review them to see what happened last time,” Sampathkumar said.

One of the most powerful features of a good MES is knowledge management, including the details of how to do the work on the plant floor. “Operations don’t have to be as highly trained or experienced if they’re guided properly,” Sampathkumar said.

**PAINT BOOTH PERMUTATIONS**

The PEMSA plant in Saltillo, Mexico, which supplies Chrysler with painted Ram pickup truck boxes, was challenged in 2013 to go from painting two versions of boxes in seven colors to more than 1,200 part numbers representing multiple versions of boxes in some 22 colors. The new level of complexity promised to overwhelm its already-taxed management and control systems, which used manual inventory and scheduling and rigid PLC controls with no visibility.

The plant installed a recipe-based production control system based on Rockwell Software FactoryTalk VantagePoint, with hooks to automated inventories and the SAP ERP system. “Now we can see when a box is received, when to paint it and when to deliver it,” said Jose Luis Diaz Ceballos, maintenance manager at the PEMSA facility. “We can see where a box is and its status anytime, anywhere in the plant.”

The system is designed to be administered, configured and modified by on-site personnel. “Sorry,” Ceballos said, “Now we don’t need our system integrators.”

Time required to process a typical box has dropped from 24 to 9 hours. Direct communication with the customer, automated processing and collection of information have improved production efficiency 70%, and problems like robot crashes and unpainted boxes, each occasion of which used to shut down the line for 30 to 60 minutes, have vanished.

“That’s why I can be here,” said Ceballos. “My job is in maintenance.”

**MORE FLEXIBLE ASSEMBLY CELLS**

Similar needs for versatility and efficiency have led to development of the flexible assembly cell, according to Amir Shahnazary, engineering director, Comau, whose company specializes in automated production equipment for high-technology applications, including automotive and aerospace. Comau has been around for 40 years and is no small company, employing more than 13,000 and booking $2 billion in 2012.

“The flexible assembly cell is inspired by business needs to align capacity with demand on the fly, reduce fixed and variable costs, and improve speed to market,” Shahnazary said. The traditional assembly line is linear. Parts are added as the assembly progresses through a succession of stations or tools. By doing an assembly line’s work in one automated cell, the same work can be done in about half the footprint with about 60% fewer line components. Capacity can be adjusted by adding or removing cells. “It’s parallel rather than serial processing,” he said.

The same cell can make multiple kinds of assemblies by changing the tools and programming, which offers significant advantages over hard-tooled assembly lines in design-to-production time and cash flow. A conventional line requires 24 months from PO to production, and product design and capacity must be frozen early in the cycle. The equivalent time for a flexible cell is 19 months. Plus, designs can be changed much later, resulting in design freeze deadlines about 10 months later for a given target production start-up date.

Cash flow requirements also come much later and are initially much smaller for a cell system, where capacity can be added easily by simply duplicating the cell tooling. Eliminating many components and reducing floor space requirements also means “the total cost comes down a great deal,” Shahnazary said.
KLEENEX RUNS BETTER WITH PLANTPAX
The Need to Replace an Obsolete DCS Led Kimberly-Clark to Try a Unified Platform
by Walt Boyes

“We had a real problem,” said Kimberly-Clark engineering and technical leader Bob Kilas. “Our DCS systems were at the far edge of their lifecycle, with many obsolete parts that were expensive and hard to find. We knew we couldn’t continue with them, but we believed that migrating to the latest platform upgrade would be costly and not necessarily give us better performance.”

The company had Rockwell Automation systems on other applications throughout its plants. “We decided to see if we could use PlantPAx on our tissue machines instead of the DCS systems. That way, we could leverage the spare parts, internal technical knowledge and technical support that we were already getting from Rockwell Automation,” Kilas continued.

The tissue machine includes a stock chest where water is mixed with cellulose pulp to make the slurry; the web area where the stock slurry is spread on the 18-foot-wide web belt; a dryer where the stock becomes tissue; and the “creping” end, where the stock is scraped off and sent to the packaging plant in huge rolls.

“The machine is typically three stories high, 180 feet long and 18 feet wide. The unit we upgraded is over 50 years old,” Kilas said. “This is a continuous process. We never shut it down. If the tissue on the web breaks, we just start a new roll.”

The legacy DCS architecture used proprietary controllers for the analog I/O and a proprietary network interface to older Rockwell Automation PLCs that ran the motors and on/off valves in the wet and dry ends of the machine. The DCS also used a proprietary structured text language programming system, where the PLCs used ladder logic.

““We wanted to leverage the spare parts, internal technical knowledge and technical support that we were already getting from Rockwell Automation.” Kimberly-Clark’s Bob Kilas on the company’s decision to migrate its aging DCS to a unified architecture based on the PlantPAx system.

The legacy DCS had 80 PID loops, 180 analog inputs, 60 analog outputs and numerous HMI tag groups. It had 65 HMI process graphic screens and 30 programs written in the proprietary structured text code.

“We had to hire back a retiree who had institutional knowledge of the graphic screens to capture the programming knowledge behind these HMIs,” Kilas said.

This project was done in parallel with other projects and wasn’t part of the machine-down critical path. “We needed to do it while the machine was running,” Kilas said. Kimberly-Clark used a common HMI application and replaced the legacy controller, PLC gateway and HMIs, and eliminated obsolete PLCs. “We migrated the ladder logic,” Kilas said. “We needed to minimize conversion risk, engineering effort and down time so we did not rewrite the legacy structured text language code, just ported it to ladder.”

Describing the lessons learned from this migration project, Kilas said, “We should have re-written the legacy structured text language code, and after the project, we did do that. We needed to define and do alarm rationalization. We need to provide system status and Ethernet switch health HMI screens. We absolutely have to ensure operator and maintainer training to cope with variations in operator knowledge and experience and use off-line simulation for automation sequences for training.”

The project took 26 weeks from start to the finish. Kilas said, “We improved operator and maintainer efficiency, reset our lifecycle clock from 25 years to new and going forward, we now have a single architecture and engineering system for the plant.”
WATER UTILITIES CAN MAKE RED TAPE PAY
What FEMA Funding, Concrete Volutes, and Purchasing Contracts Have in Common
by Paul Studebaker

“"It’s critical during formulation to distinguish between temporary and permanent repairs, and call them out correctly in the application narrative, to be sure FEMA doesn’t see anything as duplicate work.”

FEMA will also look for and deny expenses that might be ascribed to normal operating costs. For this reason, Hoyle suggests that you rent rather than buy, regardless of cost-effectiveness, so the expense is clearly temporary. For example, instead of purchasing emergency power, rent a generator.

Mitigation strategies can include alternative projects, where the public interest is better served by an alternative rather than restoration to original design, capacity and function. “FEMA likes to do this,” Hoyle said, “but involve them as soon as possible because they must approve the alternative prior to construction.”

Another form of mitigation is the improved project where, for example, a pumping station is reconstructed with higher capacity. “The difference in cost versus replacement is up to you,” Hoyle said.

Section 406 offers you the opportunity to write in up to a 15% project cost increase, with pre-approval. Hoyle said, “This is free money you should definitely take advantage of.” John Hoyle of Thompson Consulting Services discussed how to get the most from FEMA disaster recovery funding.

“"This is free money you should definitely take advantage of.” John Hoyle of Thompson Consulting Services discussed how to get the most from FEMA disaster recovery funding.
pumps on a relatively weak power grid. Drives give control as well as solving the problem of starting the large approach flow and “candy cane” outlet geometries. Further, variable-speed simulation allowed designers to get near zero cavitation despite tight ap-

375,000 gpm in the same footprint using three concrete-volute pumps. Ada showed 1315 years of total operation with one outage. Crane heights for pullouts.

Shafts, and low vibration. Their short inserts allow lower building and lute, which also leads to low speeds and negligible erosion, short and rigid due to the large size, corrosion resistance and rigidity of the concrete vo-

lute pumps. These pumps are very reliable so low maintenance and high energy efficiency weighed heavily in the decision to use concrete-volute pumps. These pumps are very reliable due to the large size, corrosion resistance and rigidity of the concrete vo-

lute, which also leads to low speeds and negligible erosion, short and rigid shafts, and low vibration. Their short inserts allow lower building and crane heights for pullouts.

A study of concrete volute pumps in the Netherlands, Finland and Canada showed 1315 years of total operation with one outage. In the Dallas project, the Pavaho station was upgraded from 76,000 to 375,000 gpm in the same footprint using three concrete-volute pumps. Simulation allowed designers to get near zero cavitation despite tight approach flow and “candy cane” outlet geometries. Further, variable-speed drives give control as well as solving the problem of starting the large pumps on a relatively weak power grid.

The pumps were tested and accepted in 2012, three days before a storm that would have flooded the area. “This time, residents stayed dry,” te Poele said.

Michael Kellogg, systems analyst, City of College Station, Texas, home of Texas A&M University, presented on innovative ways to contract control systems. The city-owned water and wastewater treatment facilities are serving a population growing steadily past 100,000 at 200 people per month, which has lead to a solid stream of expansion projects.

“Our challenge was to break through TITWADI syndrome,” Kellogg said. “Doing things the same way because ‘this is the way we’ve always done it’—buying the same kinds of systems from the same, familiar vendors.”

But the bid process is labor-intensive and time-consuming: one must write RFPs, do reviews, advertise and get bids, and sit through vendor presentations. “Then you must take the lowest bid,” Kellogg said, “or justify a best-value rationale for not doing so,” another investment of time and effort.

So Kellogg examined alternative processes, including purchasing under a state contract at pre-negotiated discounts on approved products from approvedvendors. “We buy our computers that way, why not our controllers?”

Rockwell Automation was already approved for federal contracts under GSA 70, and municipalities are eligible. These offer discounts off list prices and discounted field engineering costs. Panels can be built and shipped to a third party, and delivery costs are included. College Station purchased completed marshalling cabinets for a well field and shipped them to Houston, where a vendor put them in a modular building.

Snags included getting the city’s purchasing people on board. “They were unaware and struggled with the wording of the cooperative agreement,” said Kellogg. “We had to get Rockwell Automation involved to help them understand.”

The purchase orders must come from the government, not a system integrator, Kellogg added, and not all products are on the contract. Since products must be shipped directly from the supplier, “your local distributor may feel left out,” Kellogg said. “Copy them on the order so they can get credit.”

Unfortunately, GSA 70 expired in September, 2013, and a replacement contract is one or two years away, but its lessons stand. “Take the time to research contracts,” said Kellogg. “You may have a state contract, or your distributor or institution may have one.” Contracts can save time and money on obtaining equipment, software and services, and the standardization can streamline operations.
FOOD PROCESSORS TACKLE MANUFACTURING RISK
Faster Retrofits and Speedy Engineering Reduce Downtime and Time-to-Market

by Walt Boyes

“This is the first time in 200 years that emerging market countries will contribute more economic growth than the developed ones,” began Rockwell Automation’s Kris Dornan as he kicked off the Food and Beverage Industry Forum at this week’s Automation Fair® in Houston. Food companies in particular face opportunities and daunting challenges as more and more of the world’s still growing population emerge from poverty and swell the ranks of the middle class.

“Grain consumption has now exceeded production. The cost of fuel is variable and continues to rise,” Dornan said. “Meanwhile, food manufacturers are challenged to improve asset utilization, drive speed and innovation, even as they manage risk.”

Peter Williams, automation and process control manager for Fonterra Brands New Zealand Ltd., understands quite well the risks presented by aging systems. “We had a 10-year-old yogurt form filler with obsolete controls for which parts were impossible to get,” Williams said. “We’re in New Zealand. That’s even worse.”

The plant turned to Rockwell Automation to quickly retrofit the machine without compromising performance or flexibility, thus extending plant life and avoiding a $5 million capital expense. “We could replace the filler or replace the control system for much less,” Williams said. “We chose to minimize the risk and replace the controls.”

And when King’s Hawaiian Bakery decided that the rising cost of fuel and transportation necessitated the building of an entirely new greenfield plant in Oakwood, Ga., the company bought specialized machines from eleven different OEMs. Each of those OEMs typically provides a system pre-configured and pre-wired with its own favorite control system. King’s Hawaiian’s director of engineering, Mike Williams, found the risk that one or more of the systems would be incompatible with others unacceptably high. “With more than 11 machines required for our production process, we couldn’t just turn each OEM loose without clear specifications and an overall integrated design architecture,” he said.

Bachelor Controls, a Rockwell Automation Solution Provider, was asked to provide overall project management services, because King’s Hawaiian had already used Bachelor for projects in its main plant in...
Torrance, Calif. Williams believed that this would mitigate his project’s risk of failure. “Not only did we have to make sure that 11 OEMs would work together, but we also had to get the project done in 10 months. Plus, King’s Hawaiian wanted remote monitoring to be an integral part of the project,” said Kelli Uphaus, software engineer at Bachelor Controls.

We started by writing detailed specifications for the systems that the OEMs were to provide, and then, after the OEMs’ machines were all successfully started up, we designed and built the integration necessary to run the bakery to Mike Williams’ satisfaction,” Uphaus said. When Italian palletizer company OCME needed to improve quality as well as reduce costs to remain competitive, it managed its risk and speeded up innovation by partnering with Rockwell Automation, according to Giacomo Gouery, chief operating officer of OCME America.

“EtherNet/IP is a global network we can use for effective control of the entire system, even remotely. Plus, it is easily programmed and tested with the RSLogix 5000 software,” Gouery said. “The network allows all the PLCs to communicate with each other to synchronize the machines and to communicate product data for full traceability,” Gouery said. “All the PLCs are connected to the customer network in order to supply all the production data needed to print out the labels that are applied to the pallets.”

Dan Malyszko, director of operations (Denver) for Malisko Engineering, related his experience providing a yogurt production control system from scratch for Noosa Finest Yoghurt in Bellvue, Colo. “The existing yogurt production plant was an all-manual, labor-intensive operation that had reached its designed capacity,” Malyszko said. “We had to automate a new facility with five-times greater capacity.” The new system had to monitor the process, collect data, allow for easy future expansion—and be online in only six months. Further, Malyszko said, the Malisko team started in May 2012 with a process diagram that was a simple hand sketch. “Here, automate this,” they were told.

By leveraging the power of PlantPAx, Malisko was able to produce a preliminary I/O and loop count. “Noosa needed reassurance up-front that the system would function reliably and efficiently. We were able to use the PlantPAx System Estimator within the Integrated Architecture Builder provided a baseline BOM [bill of material] and system performance summary to ensure a properly configured system.”

In the end, construction was completed on time in October 2012, Malyszko said, and PlantPAx engineering tools allowed it to produce the system within the time frame Noosa needed. “The first batch of Noosa yogurt made on the new system was in spec, delicious and saleable!” Malyszko said. “With the new system, Noosa was able to grow 260% in 2012 and add 4,000 retailers nationwide.”
“Biopharm companies need reductions in capital expenditures, and they need more rapid transitions between product development and commercialization,” says Barry Holtz. “They need facilities that start up quickly, are flexible, reusable and expendable with recoverable assets. This is a huge shift from the way things used to be.”

Holtz should know. He’s CEO of G-Con Manufacturing and chief science and technology officer of Caliber Biotherapeutics. And in his presentation at Rockwell Automation’s Process Solutions Users Group (PSUG) meeting this week in Houston, he shared his company’s experience in addressing the changing needs of biopharmaceutical companies in general—and his in particular—with the flexibility of Rockwell Automation’s PlantPAx process automation system.

Caliber Biotherapeutics participated in a DARPA challenge to design a plant-based biotherapeutics facility that would be hardened, self-sufficient and contained. DARPA said it had to be done in two years. “We, being self-confident Texans,” said Holtz, “told them we could do it in a year. Dumbest thing we could have said, but we did it. We started digging holes on April 9, 2009, and were online and making product by March 22, 2010. We grew 2.2 million plants hydroponically and made 300 kg of monoclonal antibody material.”

Holtz explained that the way the company did it was “PODification.” We built portable autonomous clean rooms at G-Con and installed them at Caliber. Each of them is an autonomous manufacturing environment that is CFR Part-11 compliant and cGMP5-certified. Each of the PODs has identical controls, with PlantPAx for the basic process control system. ControlLogix and FactoryTalk are used for building automation and FactoryTalk Pharma Suite at the MES layer. The ControlLogix PLCs provide air handling and onboard fire suppression, as well as control for the grow lights for the millions of nicotiana plants that provide the protein product. Everything is redundant, from the air handlers to the process controls. The historians are built-in and redundant. Even the air bearings that allow a single worker to “walk” a 20,000-pound building into place are redundant. “We built green PODs controlled by PlantPAx to grow our plants in, and we even built our own grow lights.”

“Dumbest thing we could have said, but we did it.” G-Con’s Barry Holtz on the company’s promise—and successful delivery—of a working biopharmaceutical manufacturing facility in only a year.
“We are actually doing Process Analyzer Technology (PAT),” Holtz said, “and we are providing real time data and real time data usage, just like the FDA wants. We have a modern interface for continuous process verification and for continuous process control. We do energy control as part of the containment and classification. We have an easier-to-use human-to-human interface and human-to-machine interface. We could not have done this without Rockwell Automation’s products and our integrator’s skill set using the Rockwell Automation PlantPAx system. I am a big cheerleader for Rockwell Automation.”

“We wanted a tool kit for rapid development of smart systems. Rockwell Automation provided that, and we were empowered. We wanted remote monitoring capability, along with remote change-of-algorithm capability, and we got that. We sell our PODs globally, so we needed a service model that was global and that could provide assistance 24/7/365 on a global basis, and we got that too. We wanted a control system that was capable of being iteratively improved, and that we could scale as much as we needed to. We got that from Rockwell Automation also.”

“What we have been able to do with PODs, thanks to Rockwell Automation, is to make a significant difference in time to market,” Holtz said. “Time to market in the pharma industries can mean millions of dollars. We have built-in quality by design and have worked out the tools to let companies manage their scale-ups faster, better and with less cost than any other way.”
INDUSTRY CHALLENGED BY AIR QUALITY REGS
Boiler MACT and Impending Greenhouse Gas Regulations Keep Industry Hopping
by Paul Studebaker

The Energy & Power Management Industry Forum this week at Automation Fair® presented by Rockwell Automation began with an overview of how environmental regulations are affecting industrial energy management strategies presented by Diane Fischer, air quality control services area leader, Black & Veatch. Fischer’s expertise is air quality control, advising industry on compliance. “There are any number of regulations we could discuss,” she said, “but since our time is limited, we’ll focus on new boiler maximum achievable control technology (MACT) and pending greenhouse gas (GHG) emissions regulations.”

Fischer readily acknowledged that regulations are not a pleasant topic in industrial circles. “If you like sausage and respect the law, don’t watch either of them being made. This is especially true of regulations,” she said. Court cases lead to indecision, which makes it hard for industry to plan and develop strategies.

NEW RULES FOR INDUSTRIAL BOILERS
For example, boiler maximum available control technology (MACT) regulations were promulgated in January 2013 to regulate hazardous pollutants from industrial boilers. Originally issued in 2004, then vacated in 2007, the regulations were reissued in 2010, then reconsidered, then finalized for publication in January of this year. “They’re the poster child of difficulties for issuers and industry,” Fischer said.

Boiler MACT compliance begins with understanding that the commercial/industrial solid waste incinerator (CISWI) section separates regulation of fuel-fired boilers from waste-fired boilers. To find the part of the regulations that applies to you, first determine if you’re burning fuel. If so, determine the kind of source your boiler represents: an “area source” or a “major source.” Then you can find the right standards for emissions of hazardous air pollutants (HAPs) in five categories, with the appropriate levels of proxy contaminants used to limit them. The HAPs and their proxies are acid gases: HCl, mercury; Hg, HAP metals; particulates, organic HAPs; CO, and finally dioxins and furans, which are controlled by work practice requirements.

Additional rules and requirements are intended to make sure boilers are maintained and operated to maximize efficiency and
include energy assessments, work practice standards and tune-up requirements.

GREENHOUSE GASES UP NEXT

“The history and nature of the MACT rules provide a good background for estimating the timing and effects of GHG regulations, coming up soon as part of Obama’s climate change policy to regulate GHG emissions from power plants,” Fischer said. Most industrial facilities are not directly affected, but need to understand the new regulations because they “will change the energy landscape in the United States.”

Current draft standards for new units, issued in September, are a re-proposal of rules written in April, 2012. They call for a 50% to 60% reduction in emissions. “Natural gas combined cycle units will meet these easily,” Fischer said. “Simple units will not.”

June 2014 will bring new rules for existing power-generation units. According to Section 111(d) of the Clean Air Act, states will develop their own regulations based on EPA guidelines. Draft EPA guidelines are expected to be given to the states in June 2014 for comments and finalized to the states in June 2015. States are to issue final regulations in June 2016. “Expect both supply- and demand-side regulations,” Fischer said. Getting a grip on GHGs will rely as much or more on how electricity is consumed as on how it is generated.”

The new regulations are likely to follow a similar path as MACT. “I can’t say what these regulations will look like, but I can guarantee they’ll be challenged in court,” Fischer said. Litigation is likely to focus on whether Section 111(d) is an appropriate way to regulate GHGs, the authority of the EPA versus the states and details of the requirements.

The overriding message is the challenge of managing uncertainty. “There may be changes due to the 2014 elections—what will Congress look like?” Fischer asked. “We may have a new law instead of regulation. It’s not likely, but it’s a possibility.” Economic forces are also likely to come into play. “Gas prices have been low; the economy has an effect. All these will affect the path of these regulations.”

Uncertainty is challenging for “strategic folks in industry,” Fischer said. She recommends doing scenario planning, identifying key economic factors for your business and preparing to make adjustments. “Don’t box yourself into a specific future. Leave room for changes.”

The Power & Energy Management forum also included presentations on how energy management at the University of Texas at Austin has reduced consumption to 1977 levels despite a doubling in square footage; how Tyson Foods piloted and is rolling out a company-wide energy management strategy; and the commercialization of fuel cells in multi-megawatt-scale industrial applications. These will be detailed in Friday’s edition of this newsletter.
SAVE THE DATE!

AUTOMATION FAIR® COMES TO ANAHEIM, CALIF., NOVEMBER 19-20, 2014