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A Live Report from ABB Automation & Power World 2013

ABB

by the Editors of

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FOR MACHINE BUILDERS

CEO HOGAN BULLISH ON ABB OUTLOOK

ABB Leadership Expresses Optimism at Opening of ABB Automation & Power World 2013

by Jim Montague, Executive Editor of *Control, Control Design* and *Industrial Networking*

Commitment, investment and integrity beat uncertainty every time.

To fight all the economic, political and technical turmoil battering people, companies, governments and regions worldwide, ABB Group and ABB North America's leaders stressed their unwavering commitment to serving their customers and increasing organic growth, continuing aggressive investment in R&D and disciplined acquisitions, and maintaining the personal integrity to keep these promises in today's keynote address to the more than 4,800 attendees gathered in Orlando, Fla., for ABB Automation & Power World 2013.

"This is the fifth time I've addressed Automation & Power World, and I come back to the United States now with more optimism than ever before," said ABB Group CEO Joe Hogan. "We're investing more and doing it more aggressively because we're a power and automation company, and we know there are huge synergies to be gained by combining them, and that automation is at the nexus of a lot of these technologies coming together. Many jobs are coming back to the U.S., but they aren't the same as the ones that left. These new jobs will be much more automated. This is an exciting time of rebirth in the U.S."

Earlier in their joint presentation, ABB North America president, CEO and region manager Enrique Santacana laid out some of the daunting challenges and persistent headwinds that the industry is facing. "China is experiencing slower growth, Europe is still in recession with high unemployment and debt burdens, and the Middle East is still highly unstable with events that could skyrocket oil prices and cause economic problems worldwide," says Santacana. "And, even though the potential U.S. government shutdown has been put off until September, we're still in the middle of the sequester crisis, debating the debt ceiling and dealing with poor monetary policies. In addition, we've got regulation overload and persistent high unemployment. And, if the U.S. Federal Reserve takes out the market's liquidity, what's going to happen to the bond markets, interest rates, our economy and all of our businesses?"

On the other hand, Santacana added there are some tailwinds helping to propel ABB towards reaching its goals and fulfilling its mission. "The U.S. housing market is getting stronger, and there is strong investment in many industries

"This is the fifth time I've addressed Automation and Power World, and I come back to the United States now with more optimism than ever before." ABB Group CEO Joe Hogan addressed the nearly 5,000 attendees at this week's event in Orlando, Fla."

such as mining, manufacturing, oil and gas, and the common thread is they're all investing in increasing productivity by employing energy efficiency and automation," explains Santacana. "Of course, the brightest star in the U.S. economy right now is energy, especially shale oil and gas plays, upcoming grid modernization and development of renewable energy sources. Data center technologies and the digital age are also upon us, including exploding numbers of apps and cloud-based computing services, and these are transforming all of our lives."

"We don't know how all of the headwinds and tailwinds are going to play out, so we have to proceed with caution," continues Santacana. "The good news is that all of the tailwinds I talked about are right in ABB's power and automation sweet spot, and that sweet spot is also growing bigger thanks to our organic growth and our recent acquisitions of Thomas & Betts, Baldor, Ventyx, Tropos and APS. In fact, our footprint doubled between 2009 and 2011 because of Baldor, and grew another 50% by 2013 thanks to Thomas & Betts and our organic growth. As a result, we now have 27,000 employees in North America, and we're fully committed to becoming indispensable to our customers and their value chains."

To update ABB's overall profile and recent performance, Hogan reported the company now has more than 145,000 employees, more than 400 facilities in 100 countries, and earned $40 billion in revenues in 2012, with a market capitalization of more than $50 billion. Later, during the ABB Automation & World's media briefing with ABB's executive team, it was announced that ABB North America achieved a record 26% increase in revenues to a total of $6.7 billion for 2012.

"ABB is a truly international company — not just one that's headquartered in one place and exports to others," explains Hogan. "However, to accomplish this, we must go beyond just selling to get involved with the manufacturing, engineering and even the politics of each local country and its markets. We may be a large organization, but we have to think, act and get small enough to work with all these customers.

Hogan added ABB's five primary strategies leading to 2015 include:
- Driving competitiveness and staying relevant in present markets;
- Capitalizing on megatrends by anticipating and participating in key markets;
- Aggressively expanding its core businesses;
- Seeking and conducting disciplined mergers and acquisitions; and
- Exploiting disruptive opportunities that can change existing markets, and even create entirely new markets.

"We've invested aggressively for the past five years because we believe these economies worldwide will recover, and so we'll be able to compete and grow in them," adds Hogan. "For instance, despite the dysfunction of the U.S. political system at the federal level, there is a lot of legislative innovation at the state levels. So, the United States is still a great place to be and its economy will continue to grow as well. This is why we've invested $12 billion in it over the past four or five years, including opening our new Smart Grid Center in Raleigh, N.C., and our new cable plant in Huntersville, N.C."

Hogan reported that one demonstration of ABB's commitment is its spending on R&D has increased 70% since 2009 to about $1.5 billion. In fact, he added ABB's acquisition of Thomas & Betts has also provided benefits on the component side. "With help from Thomas & Betts, we've developed circuit breakers that are 40% to 50% smaller than their competitors," says Hogan. "This is because our engineers better understand the plasma physics involved and can apply that knowledge."

Likewise, ABB also has been pioneering the development and application of high-voltage DC cabling, which only loses about 2% to 3% of its initial power over long distances, and is planning to deploy them to send 1,100 kV of ultra-high-voltage DC (UHVDC) over the 2,500 miles between Three Gorges Dam and Shanghai in China. To aid this effort, he added ABB has also created its new Hybrid HVDC breaker, which will be essential in managing power, isolating faults and performing other jobs crucial to these new grids.

"Previously separating islands of automation are coming together around automation, and power and users are adding an enterprise system on top to anticipate issues, improve productivity and optimize their businesses," says Hogan. "This is also why it is so important for us to move closer to our customers and listen more closely to them, but then also engage with integrity and live up to the promises we make. They have to be sure that we will do what we say we're going to do, and we will." ■

DESPITE UNCERTAINTIES, U.S. ECONOMY POISED FOR STRONGER GROWTH

Federal Debt and Stimulus Withdrawal Are "Twin Elephants" in the Room

by Keith Larson, Group Publisher for *Control, Control Design* and *Industrial Networking*

Three years into the U.S. economy's most anemic post-war recovery, signs finally are pointing to stronger growth over the next few years, according to Timothy Gill, economics director for NEMA, the National Electrical Manufacturers Association. "Even as things improve, we have to be aware of the two elephants in the room," he added.

For Gill, who spoke at this week's ABB Automation & Power World event in Orlando, Fla., those twin elephants are the unprecedented federal debt together with the eventual wind-down of the Federal Reserve's ongoing stimulus programs.

"Following several years of trillion dollar deficits, federal debt-to-GDP ratios are a post-war high," Gill noted. Attempts to rein in the debt via taxes or spending cuts will be a drag on the economy. But if corrective action is not taken, eventually rising interest rates will raise debt servicing costs, crowding other government spending and requiring higher taxes and/or increased borrowing, Gill said. Further, history indicates that the chances for a misstep are high as the Fed inevitably transitions to tighter monetary policy. "It's a tightrope that must be walked. When and how do you begin to reel it in?"

The United States faces other headwinds as well, such as continued deleveraging of consumers and businesses, persistently tight credit and a generalized case of "global jitters." Longer term, an aging American population faces lower workforce participation, which will strain entitlement spending. Federal government borrowing during this recession has accelerated the fiscal "day of reckoning" for entitlement reform, Gill added.

But Gill's prognosis wasn't all gloom and doom. That stronger growth mentioned at the beginning of this story will kick in as the recovery transitions from one led by manufacturing and exports to one driven by consumers and construction. "Consumers are getting their houses in order. Their balance sheets are halfway back to pre-recession levels, and this sets the stage for stronger spending." Meanwhile, growth in household formation is beginning to return, which should further buoy the construction and housing sector. "People had been living together who didn't really want to," Gill said.

Other reasons to be economically optimistic include the massive resource development efforts underway in North America. "It's changing the global energy picture in ways unthinkable only four years ago," Gill said. Manufacturing is benefiting from these lower energy costs as well as increasingly competitive wages and a rethinking of supply chain relationships. Further, Gill is confident that the U.S. electorate will eventually support entitlement reforms and more a relaxed immigration policy. "And the emerging middle class in developing markets will encourage new free trade agreements, trade infrastructure development and new export opportunities." ∎

"When and how do you begin to reel it in?" While cautiously optimistic, NEMA's Timothy Gill worries about the Federal Reserve fumbling its inevitable transition to tighter fiscal policy.

EVER MORE DATA, BUT STILL CYBER VULNERABLE

Megatrend Session Discusses Cybersecurity Concerns from an Adversarial Perspective, Plus the Impact of Big Data and Advanced Analytics

by Aaron Hand, Managing Editor of *Control Design* and *Industrial Networking*

After hearing Shawn Henry, president of CrowdStrike Services, give dire warnings about the rampant threats to network infrastructures and the data they hold, IBM's Michael Valocchi wondered aloud whether perhaps we should just keep all that big data to ourselves.

Henry and Valocchi both spoke as part of the Wednesday morning keynote session at ABB Automation & Power World this week in Orlando, Fla. Henry, who spoke about cybersecurity dangers, knows what he's talking about. He's a retired executive assistant director at the FBI who oversaw computer crime investigations around the world.

"The DNA of all of your companies resides on the Internet. And it's incredibly valuable," Henry said, noting the value of intellectual property, R&D, corporate strategies and more. "There's an increasing push to move it all to the network. But it's all riding on an inherently insecure infrastructure."

That infrastructure, Henry insisted, is only getting larger and less protected. "Imagine trying to protect a building with 100,000 doors," he said. "There are too many vulnerabilities right now."

It's an incredible challenge for which there is no short-term answer, Henry said. To make a better run on the problem, however, the focus needs to change. "We've been focused on how to reduce our vulnerabilities," Henry pointed out. "We need to focus on who our adversaries are."

Those adversaries take three main shapes: organized criminal groups, largely centered in Eastern Europe, that are focused on monetary gain by attacking major corporations; terrorist organizations, which are an increasing threat, particularly to infrastructure; and foreign intelligence services, groups operating on behalf of governments that steal data for economic gain, military gain or some other advantage.

And while the public might run screaming from the threat that a physical bomb presents, people have a harder time understanding and grasping the very real threat of having an unwelcome visitor in their network. "In many cases, the adversary has been in that network for months or even years, and has gone undetected," Henry said, noting such adversaries as trusted insiders, disgruntled employees or people setting up wireless hotspots, just

"The DNA of all of your companies resides on the Internet." Shawn Henry of CrowdStrike Services challenged ABB Automation & Power World attendees to lead by example in their companies' cybersecurity efforts.

waiting to intercept vital information.

"We often think of the vulnerability of data; you want to maintain some level of confidentiality," Henry said. "But with the depth and breadth of access that adversaries have right now, they can change the data or completely destroy it."

That data, along with advanced analytics, is what Valocchi, global energy and utilities industry leader at IBM Global Business Services, came to talk about. "Big data," he said, has replaced "smart grid" as one of the most overused and misunderstood terms used today. Above all, Valocchi emphasized that big data is not a technology trend, but rather a business trend. "If I can't prove the business value, I'm not going to embark on the journey," he said.

The concept of "big data" refers to the sheer volume of data that's out there — the scale of data (terabytes) and the variety of data. It's coming at us from so many different sources, in near-real time, and now even in unstructured forms, Valocchi said. "It's all over the place. And it's coming at us so quickly like nothing before," he said. "And we also have to worry about the veracity of the data. How certain are we that the data is good?"

Valocchi summed up the issue surrounding big data with four key characteristics: volume, variety, velocity and veracity.

Although Valocchi called it "early days" for big data, a lot of data-based initiatives are beginning to take off around the globe. A survey of executives found that almost half of the organizations polled are at least having discussions about big-data projects. The survey showed that 47% are planning big data activities, and almost a third (28%) are at the pilot and implementation stages.

On top of that, Valocchi said, the big data discussions have moved out of the IT departments and to operational, finance and other departments. "It's no longer an IT-driven discussion."

Valocchi reported on five key findings:

Customer analytics are driving big data initiatives. This is happening not just in banking, but in industry and utilities as well. "This isn't about putting people in buckets; this is about treating each person as an individual," he said.

Big data is dependent on a scalable and extensible information foundation.

Initial big data efforts are focused on gaining insights from existing and new sources of internal data.

Big data requires strong analytics capabilities. "We don't necessarily have those within our company in the scale that we need them," he said. "We can't get analytical people into the industry quick enough. There's an actual lack of talent in the marketplace."

The emerging pattern of big data adoption is focused on delivering measurable business value. Initial projects are based on measurable business value. ■

OPERATOR IS FOCUS OF LATEST SYSTEM 800XA ENHANCEMENTS

'Essential Automation' Portfolio Complements Feature Pack 4 Release

by Mike Bacidore, Editor in Chief for *Plant Services*

"We see demographic change, fewer available operators and shorter attention spans," began Tobias Becker, senior vice president, global business unit manager, control technologies, for ABB in his review of the latest enhancements to company's 800xA automation platform at this week's ABB Automation & Power World event in Orlando, Fla. "You need to create an environment offering the best operator functionality available, the true power of integration, a truly attractive and ergonomic control room environment and one that enables consolidation and collaboration."

Many of the new features and capabilities added to ABB's flagship automation platform in Feature Pack 4 (for version 5.1) are intended to advance these very goals, Becker said, making the system better, faster, safer and more secure. "It's a major step forward in functionality," he said.

Feature Pack 4 makes it easier to create and configure a collaborative environment, continued Jonas Brannvall, global product group manager for the 800xA platform. "The latest release for 800xA 5.1 is easier to engineer and has improved change management, new communica-

tion capabilities, space-saving I/O modules and more flexible architecture," Brannvall said. Embedded video capabilities also are designed to improve collaboration and decision-making, Brannvall said.

Cybersecurity also is improved. "We're putting a lot of effort into securing our customers' control systems," said Brannvall. "With Feature Pack 4, we're introducing a lot of new features." For example, Industrial Defender connectivity and SE46 white-listing functionality have been added to help to mitigate the risk of cyber threats.

Many features included in this update add to System 800xA's focus on increasing operator effectiveness and visualization inside the control room and out. A mobile client configuration guide and a tablet workplace facilitate flexible collaboration between the field and control rooms, while ensuring safe and secure operations. Additional graphic elements have been added to System 800xA's graphics editor, making it easier to create a high-performance environment for improved situational awareness. An embedded video system and CAD drawing viewer help to increase visibility and enhance

"We see fewer available operators and shorter attention spans." ABB's Tobias Becker discussed the company's ongoing quest to make today's process plant operators more effective in their duties.

decision support. And an "Alarm Help" feature has been added to the alarm management portfolio, providing operators easy access to valuable instructions, as well as the ability to enter and review input from other operators.

Virtualized clients are now available in addition to all other system nodes, helping to minimize the labor involved with installation, setup and maintenance of operator and engineering client nodes. Among the other productivity-enhancing tools are a new, easy-to-use, diagram editor for process and safety applications that makes it easier to engineer and debug control applications. Libraries for both intelligent electrical devices (IED) and TÜV-certified machine safety were added to help reduce engineering and commissioning time. Further, an application change management option has been added that stores several versions of configuration data and allows for difference reporting. And updates have been made to 800xA's Load-Evaluate-Go (LEG) feature that allows users to evaluate application changes online — using actual process inputs — before they go live and affect outputs to the field.

For customers that don't need the full capabilities of System 800xA, the company also unveiled its Essential Automation portfolio. "Essential Automation is a new term," continued Becker. "We have customers who want to go beyond the DCS. And we have customers who don't want all of that. It's essential in terms of the basic things they want to have."

The Essential Automation portfolio includes established control solutions and products that are easy to install and deliver to improve the efficiency of small- to medium-sized processes in all industries. Essential Automation includes two main offerings: Freelance, the user-friendly, reliable and cost-effective DCS currently running thousands of applications ranging from water to chemical processes worldwide; and Compact Product Suite, a collection of products from ABB's former Compact 800 family of process and safety controllers, human-machine interfaces (HMI), field interfaces or I/Os and process recorders. It includes the AC 800M controller, Compact HMI, Panel 800 and the S900, S800 and S700 series I/O. The Compact Product Suite also includes the AC 700F microprocess controller, ScreenMaster videographic recorder and ControlMaster single- and dual-loop controllers.

These products may be used as stand-alone solutions or to complement an existing or customized system. This flexibility of use makes these control products suitable for system integrators and for OEMs to deploy in managed control environments. ■

BALDOR SOLUTION DRIVES COOLING TOWER PERFORMANCE

In with Efficiency and Reliability; Out with Noise and Troublesome Gearboxes

by Jim Montague, Executive Editor of *Control, Control Design* and *Industrial Networking*

Nearly a decade ago, Baldor Electric Co. set out to simplify and redesign the ubiquitous right-angle gearboxes widely used in industry to transmit power to cooling tower fans. But a funny thing happened on the way to a new gearbox design, according to Roman Wajda: The gearbox was eliminated altogether in favor of an innovative direct motor drive solution that achieved significant gains in energy efficiency and dramatically improved reliability.

"We began evaluating the cooling tower industry in July 2005 regarding a new gearbox solution that would achieve better sealing, lower maintenance and higher reliability," explained Wajda, industry business manager for Baldor, now a member of the ABB Group. "But industry's response to this plan was lukewarm because gearboxes historically had a lot of problems with oil leaks, environmental contaminations, high maintenance and low reliability. They wanted to remove these problematic components." To satisfy this objective, Baldor designed a permanent magnet motor that could provide the necessary torque, yet fit directly into the space formerly occupied by the gearbox. Wajda described the continued success of Baldor's Cooling Tower Intiative (CTI) at a presentation this week at ABB Automation and Power World in Orlando, Fla.

To develop its solution, Baldor and its CTI initiative focused on three main areas: permanent magnet motor technology; finned frame designs that could remove enough heat to allow 25% more power density; and higher-performance insulation methods. Baldor first presented its electrically driven, variable-speed motor solution to OEMs in July 2007 and installed its first beta test as a retrofit to an existing cooling tower at Clemson University in June 2008. Installation test data showed that the new solution boosted overall electrical efficiency by 11%, as well as reducing noise by 5 decibels (dB). "For reference, a reduction of just 3 dB cuts what the human ear can hear by half," said Wajda.

Because of these performance advantages, some 400 cooling towers have been equipped or retrofitted with this solution for companies ranging from NL Pharmaceutical in Denmark to Cargill in Turkey to Intel in California. "CTI's ultimate goal is simplicity and low maintenance, but we're still in the early stages in many ways," said Wajda. "Industry is still often slow to change from the inefficient technologies of the past. But, once we get that first one installed, they're convinced." ∎

"They wanted to remove these problematic components." Baldor's Roman Wajda on the inspiration for the company's gearbox-eliminating, direct-drive, cooling tower solution

MOVING YOUR HISTORIAN TO THE CLOUD — CAREFULLY

Process Manufacturers Already Are Leveraging Cloud Technologies for Process Control-Related Applications

by Jim Montague, Executive Editor of *Control, Control Design* and *Industrial Networking*

It's good to learn about a place before you move there — especially if you're a process historian that's thinking about moving its data to the cloud.

Unfortunately, many potential users still don't know exactly what "the cloud" is, how it works, how they could benefit from using it, and how they can do so securely and safely. To help clear up some of these issues, a four-person panel discussion entitled "Moving Plant Historian Data to the Cloud" was held this week at ABB Automation and Power World in Orlando, Fla.

Moderator Peter Reynolds, senior consultant at ARC Advisory Group, reported that the cloud is generally computing that's performed offsite from its consumer as a service. The cloud is enabled by the fact that Internet is everywhere, that many PCs are now running as virtual devices and operating systems on large-server infrastructures, and that they're accessed by technology-savvy users with consumer-based devices such as smart phones and tablet PCs.

"As a result, the enterprise software business is evolving to a new model, which sells apps that run as subscription services on private or public clouds, can be implemented in weeks or days, can support a diverse user ecosystem, are managed and upgraded by the supplier and provide tools for global cooperation," said Reynolds. "There are still barriers between operations technology [OT], which requires high availability, and IT, which stresses confidentiality, but automation suppliers are still evolving to be more like IT departments and taking on tasks like doing critical updates for users."

For example, panelist Kenneth Jackson, global process control leader and corporate integration and testing center manager at DuPont Engineering, reported that his company has migrated to Microsoft's Office 365 cloud-based service for its corporate email and some collaboration applications. This leads some observers to speculate that manufacturing software is likely to be drawn into the cloud in the future. "Our prime concern is always safety, security and more recently, cybersecurity, and there are still a lot of issues to work out," said Jackson. "So we're just using a private cloud infrastructure in our process control area and for some regional alarm management."

"The enterprise software business is evolving to a new model." Peter Reynolds of the ARC Advisory Group led a panel discussion on the how companies are starting to use cloud technology for applications where doing so makes sense.

Consequently, while real-time execution environments will still be located on-site to perform critical control and safety functions, Reynolds added that plant monitoring, analytics, enterprise and business tasks are all going to cloud-based servers and services, which means cybersecurity is also becoming even more important. "Many users still underestimate the risks to industrial networks and don't take appropriate measures," explained Reynolds. "Suppliers have made some progress in providing security tools to meet the needs of industry, but many gaps exist in site practice. The challenge for manufacturing IT is that many end users continue to think that operations and the supply chain are their only core competencies, and that IT doesn't really do value-added work. Nevertheless, cloud computing is about delivering more solutions faster."

For instance, while the cloud can't be used for critical process control systems, it can be used to aggregate and transfer non-plant-specific information, according to panelist Michael Williams, senior asset manager, Dow Chemical Co., which is also going to Office 365 email on April 1. "We can use the cloud for internal opportunities, such as going beyond some of OSHA's requirements as part of our continuous process improvement efforts," said Williams. "When latency and security aren't criteria, using the cloud can make economic sense. These tools can be employed if users have the discipline and security to apply them appropriately. And we vet and test suppliers, and denial of service is a metric we use. If a supplier can't meet the level we need, then we don't use them."

Consequently, some automation suppliers such as ABB are working with public cloud providers like Microsoft Azure to offer cloud-based automation supplier services, including a "hybrid cloud historian model" that maintains its enterprise historian in the cloud and also makes a local copy of its historian data, according to Reynolds. This and other tools are expected to be available via cloud-based services. They will help enable knowledge workers who are always connected to analytical tools by their smart phones and other mobile devices. "There are many other devices that can be layered on the cloud, and these enable better analytics and drill-downs to useful data," added Reynolds.

Marc Leroux, collaborative production management monitor for ABB's Automation Technologies division, reported that it already has a solution for collecting process data, transferring it to the cloud-based service ABB maintains with Microsoft Azure, and then storing, analyzing and visualizing results for better decision-making. "ABB is in a unique position because we already have historian, data analysis, management execution system (MES), advanced process control (APC), operator effectiveness, overall equipment effectiveness (OEE), energy management and device asset management capabilities. However, we recently acquired Ventyx, which had data warehousing, equipment reliability, asset health, maintenance management and other functions. And all of them can benefit from using cloud-based storage and applications, and do it securely and safely," explained Leroux. ■

FIND WAYS TO CURB DATA CENTER POWER USAGE

With Increasingly Critical Data Centers Consuming a Huge Amount of the World's Power, There Are New Ideas About Capturing Efficiencies

by Aaron Hand, Managing Editor of *Control Design* and *Industrial Networking*

Most people don't typically consider 2 to be a very high number. Even putting it in the context of a percentage, it's still not high. Now consider that it's the percentage of global power consumed by data centers. Still not high? Then try this: That power used is a carbon equivalent greater than the entire airline industry.

"When you think of it that way, it's a huge number," said Dave Sterlace, market development manager for the data center business at Thomas & Betts, the newest addition to the ABB family. Sterlace spewed a range of interesting numbers Tuesday afternoon at ABB Automation & Power World in Orlando, Fla., bringing into perspective just how massive power use is by the world's data centers — and ideas about how that power can be reined in.

By some estimates, power usage by data centers will double within five years. And data centers already using 15 to 30 times the power per square foot of an office building; some estimates put that at more like 50 to 100 times.

The largest data center in the world is a 100-MW facility near Chicago that belongs to Digital Realty, which hosts websites for other companies. In all of the

Chicago metro area, only the O'Hare International Airport has a bigger power load. In the second half of 2012, Digital Realty added new capacity in metro New York City —an additional 30 MW. "They're big power users, they're going in extremely fast and they have an always-on mentality," Sterlace said.

That always-on mentality is essential for data centers. So while 2.5 is almost as small as 2, it's a huge problem when it's the average number of unplanned outages per year at U.S. data centers. "It's always got to be on," Sterlace says. "So 2.5 outages a year is a big problem."

Those outages equate to big numbers in lost revenue. The average cost of downtime is $350,000/hour. If that downtime happened to fall on Cyber Monday for Amazon, there's no telling how high the cost of "irrecoverable revenue" could be. The total loss in downtime in the United States alone is estimated at $426 billion. "And that's probably a low number," Sterlace says. "That's why people care so much about keeping those data centers up."

All this said, there are trends in computing power at data centers that could have power usage — though still overwhelming

"When you think of it that way, it's a huge number." Thomas & Betts' Dave Sterlace on the power usage of data centers, which generate a larger carbon footprint than the entire global airline industry.

— heading in the right direction. There has been a tremendous increase in computing efficiency, Sterlace notes. Server virtualization can equate to up to 80% fewer servers; blade servers increase the power density of racks; and the use of ARM and RISC processors can reduce power consumption by 90%.

Other trends also seem promising, Sterlace said. For example, higher voltages can make power distribution more efficient. You can increase power density using existing wiring; getting twice as much power through the same conductor equals savings in copper wiring.

There is much to be gained by the current movement toward the cloud as well. While current designs are based on hardware redundancy, the cloud is based on applications redundancy, leading to a less costly infrastructure. With the cloud, the use of data centers will be more likely able to "follow the moon" to save on standard energy costs — meaning that server usage could be switched to China, for example, while the Western part of the world is at higher usage levels. Scalable deployment is also key.

Sterlace also spoke of DC distribution, a topic that has already received considerable attention during the week's conference. But could it be the wave of the future? It just might be for leading-edge customers. "For the right person, it could be a really good solution," Sterlace says, explaining how DC can require less transformation and the transformation losses that go along with it.

Still, there are some hurdles that will need to be overcome for DC distribution to be viable on a larger scale. The National Electrical Code (NEC) doesn't yet recognize DC-only wiring, so you're not able to take full advantage of the higher power capacity of DC wiring. Grounding and arc flash standards are still in development, and there is still design work to be done.

"Some of the trends are very good ideas, but you have to determine for yourself which are relevant to your facility," Sterlace said. "Sifting through all the information is the hardest part." ∎

PLATFORM APPROACH SPEEDS INSTRUMENT INNOVATION

Users Gain a Common Interface, ABB Gains a Platform for Bringing New Measurement Solutions Quickly to Market

by Jim Montague, Executive Editor of *Control, Control Design* and *Industrial Networking*

The 4,500 employees in ABB's Measurement Products division are divided into four main product groups — Field Instruments and Devices, Flow Measurement, Analytical Measurement and Force Measurement — and these are supported by a dedicated service group. Collectively, they serve customers mainly in the oil and gas, refining and chemicals, and power and water industries.

Greg Livelli, product group manager for ABB's flow measurement products, described the division's new and upcoming solutions in his presentation, "Building the Future: What's New in Instrumentation and Why it Matters," at this week's ABB Automation and Power World 2013 in Orlando, Fla.

Livelli reported this blossoming of new measurement solutions is the result of a four-year effort to resolve and standardize many of ABB's former instrumentation and measurement products. The division developed its "platforms and base" technology, which is a common electronics, hardware and software platform for the top sections of its transmitters, flowmeters and other products, and then did the same for the bottom base sections of these devices. The division released its new pressure and temperature products last year, is launching its new flow products this year, and will introduce its complex analytical products next year.

"We have a huge breadth of measurement solutions, but a lot of people don't realize it," said Livelli. "This allows us to be very consultative when helping customers solve problems because we can draw from and apply such a wide variety of solutions. Now our common platform and base technology will make meeting these challenges even easier." The portfolio includes two-wire base, four-wire base, field-base and advanced-base products. Also referred to as the bottom works section, the base includes analytical, flow, pressure, temperature or force measurement sensors. Meanwhile, the top works area consists of human-machine interfaces (HMIs), software, electronics, mechanics, diagnostics and integration components.

"Several years ago, the average age of our products in the field was nine years, but now it's only five years old," said Livelli. "So now we also have better reliability, better digital technologies, better diagnostics and enhanced metering, as well as wireless and new energy-harvesting capabilities."

"Our common platform and base technology will make meeting these challenges even easier." ABB's Greg Livelli discussed how the company's modular approach to instrumentation solutions provides a launch pad for further innovation.

Some of the many new solutions introduced by ABB Measurement Products include:

- The DHH803 handheld configurator is a microprocessor-based, battery-powered handheld communicator. Its easy-to-navigate parameter scrolling capability eliminates the need to memorize menus for online device configuration.
- CoriolisMaster has a unique tube and modular design for high-performance measurement requirements; offers unrivaled accuracy in direct mass flow measurement; and is available in 1-inch to 6-inch sizes with flexible connections to enable optimal adaptation to all processes.
- The EMF is an electromagnetic flowmeter for oil and gas applications. It has a wide range of liners and electrodes to meet the needs of a broad variety of demanding applications. Its high-pressure design is also suitable for power generation and minerals and mining applications.

This flowmeter's self-check feature allows users to check if it's still using its factory calibrations without removing it from duty. It will be released in October 2013.

- VT5 Vortex and Swirl flowmeters provide accurate flow measurement with short upstream and downstream piping requirements; offer high performance and reliability in liquids, gases and steam flows; and use digital signal processing (DSP) and advanced filtering techniques to eliminate effects of hydraulic noise and pipeline vibration. They will be released in June 2013.
- The Cumulus thermal mass flowmeter provides a mass flow output without pressure or temperature compensation; is suitable for industrial and test rig applications that demand quick and precise gas measurement; and has high accuracy, short response time and wide rangeability. It will be released in December 2013. ■

LEAN MANUFACTURING'S UNEXPECTED WINDFALL

A Lower Carbon Footprint Often Comes Along for the Ride

by Paul Studebaker, Chief Editor of Sustainable Plant.

"I usually talk about how lean manufacturing makes companies more profitable and gives them a competitive advantage," began Charles Cohon, CEO of Prime Devices Corp., in his presentation at ABB Automation & Power World this week in Orlando, Fla. "But today, let's talk about carbon footprint — the amount of electricity you use, the fossil fuel you burn, raw material utilization, water usage, sewer emissions — things like that."

Imagine your job is to lower carbon footprint. If you have many employees each driving to the plant, you might institute a carpooling program. A very successful carpooling program might reduce vehicles in half — a 50% reduction in commuting emissions. You might look at the building envelope and HVAC system, and make improvements that reduce natural gas consumption 20%. You could look at your lighting, ovens and fork lifts, and buy more efficient equipment, make operational improvements, or switch fuels to reduce their associated carbon footprints.

Now consider the effect of lean manufacturing. Striving to eliminate waste by reducing work-in-process (WIP) and streamlining production can improve sustainability and provide an unexpected windfall in the form of a lower carbon footprint.

This is not a new concept: "Consider the waste of over-production, for example," Cohon said, quoting Taiichi Ohno, father of the Toyota Production System: "It is not an exaggeration to say that in a low-growth period such waste is a crime against society more than a business loss."

Cohon asserted that lean manufacturing can not only cut the carbon footprint of a plant or company, but also of an entire industry.

For example, when FNGP Seal & Gasket Co. transitioned from batch and queue processing to a lean, single-piece production flow, it reduced large inventories of incoming materials, WIP at each process step and finished product. Less warehousing and storage allowed the redesigned production area to shrink from 2,300 to 1,200 ft.², about 50%, while monthly production rose from 1,200 to 1,800 units. By reducing material handling and buying more efficient equipment, the workforce of 21 support and production people was reduced to three, a reduction of 84%.

Alone, those personnel and space requirements could reduce HVAC and lighting emissions by half and reduce the number of commuter miles by 84% — more on a per-unit-production basis and far more than typical conventional carbon reduction projects.

Lift truck emissions are eliminated, and quality requirements enforced by lean manufacturing result in less rework and scrap, further reducing the product's carbon footprint.

"But look," Cohon said. "We also see that we might easily and efficiently absorb our non-lean competitor's production and close his wasteful, dirty plant." If FNGP Seal & Gasket's competitor was like the old FNGP, the competitor's production could be performed at FNGP by two employees in 800 ft.², cutting the industry's carbon footprint by 19 more people, 1,500 ft.², and the accompanying energy, equipment and supply footprint. "It's simplistic, but someone is going to do it best," Cohon said. "If it's not you, then maybe your competitor.

"That dirty plant's emissions are now zero," Cohon said. "The last person turned off the lights." ∎

"Such waste is a crime against society more than a business loss." Prime Devices' Charles Cohon attributed the first linkage between lean production and sustainability to Taiichi Ohno, father of the Toyota Production System.

DTE ENERGY TACKLES UNRULY ALARMS

Rationalization Process Restores Meaning--One Alarm at a Time

by Jim Montague, Executive Editor of *Control, Control Design* and *Industrial Networking*

In the course of an ongoing control system upgrade at its Greenwood Energy Center (GWEC) in Avoca, Mi., DTE Energy engineers also undertook to rationalize and reorganize a decades-old, dysfunctional approach to process alarms. "Previously, many of our DCS alarms were not rationalized," explained Kip Dobel, senior engineer in GWEC's Engineering Support Organization. "They were just characterized as high or high worse, and so we had a lot of noise and chattering alarms that were only fixed occasionally. In fact, operators determined unit status by the volume of alarms and not the actual alarms. Pages of alarms would scroll by on a unit trip, making it very easy for an important alarm to get lost in all the noise."

The company has been working to upgrade its distributed control system (DCS) from a 1990s-era Westinghouse WDPF system and lightbox displays to ABB's Process Portal A (PPA) 800xA DCS, but first decided it was essential to rationalize and reorganize the unit's approach to alarms. Dobel and colleague John Dage, DTE's principal engineer, presented "Alarm Rationalization Process at Greenwood Energy Center" this week at ABB Automation and Power World in Orlando, Fla. Located about 60 miles north of Detroit, GWEC is an 800-MW oil and gas plant, which serves as a "peaker" to deliver power to the grid when demand is especially high. This means the facility ramps its electrical production up and down more than other plants.

To focus on important alarms and eliminate the chatter, Dobel reported that GWEC began efforts to migrate to PPA 800xA in 2010 and also installed Matrikon's Process Guard software to help with post-event trip analysis. PPA 800xA included customer libraries, seven operator consoles, three engineering work packages (EWPs), domain and 800xA controllers, and AlarmInsight operator assistance software for 800xA, which grew out of collaboration by ABB and Matrikon. GWEC also runs OSIsoft's PI historian software to further document high-priority alarms and check on operating devices.

"We had about 6,000 analog I/O points, and so this meant dealing with about 10,000 decisions just to rationalize alarms and alerts from our analog signals," explained Dobel. "We wanted to give our operators an alarm system that would provide timely, accurate information to assist in operating the powerhouse in a controlled manner; employ Matrikon's Alarm Manager management of change (MOC) software to handle the rationalization; set up and execute an alarm rationalization scheme following EEMUA 191's principles; and provide the rationalization data to the operators' consoles."

Dage added that, "Previously, we were putting Band-Aids on the bleeders in our alarm system, but we weren't completing the documentation needed. This was the first time we did full documentation."

GWEC also hired a senior software engineer from Matrikon to help get its three-month, $250,000 alarm rationalization project started; hired some retired operators from outside the plant to help; and even set up a dedicated Alarm Rationalization Room with whiteboard and projector to present component data, trace alarm profiles, and facilitate discussing and hashing out the most logical and efficient ways to reorganize and reassign them. ∎

"Operators determined unit status by the volume of alarms and not the actual alarms." DTE Energy's Kip Dobel on the "before" state that precipitated an ambitious alarm rationalization project at the company's Greenwood Energy Center.

MAKE THE MOST OF YOUR GENERATION GAPS

From Traditionalists to Millennials: Making Sense of Today's Multi-Generational Workforce

by Jim Montague, Executive Editor of *Control, Control Design* and *Industrial Networking*

In the old days, there was just one Generation Gap. Now there appear to be at least three in the United States, with another one already on the way. Each generation is characterized by its own styles of work and motivation, and understanding their particular needs and operating modes is essential to optimal organizational performance, according to Kim Lear, generational consultant for BridgeWorks LLC. Lear presented "Rocking the Workplace: Managing and Leading Four Generations" in the closing keynote session this morning at ABB Automation and Power World 2013.

The Traditionalists, or "Greatest Generation," were born before 1946 and number about 75 million. The 80 million Baby Boomers were born between 1946 and 1964. Roughly speaking, Generation X arrived during 1965-79 and totals about 60 million. The newly redefined Millennials arrived from 1980 to 1995, and also total about 80 million. And despite the large numbers in each demographic generation, many have significant problems communicating with, relating to and working with the other three generations. In particular, the recent wave of Millennials has been especially difficult for many organizations to understand and manage.

"My generation may look as alien to you as you may have looked to the others," said Lear. "So to recruit and manage people in these four generations, it's important to first realize that this isn't about right or wrong or about who's better or worse. What's really crucial is to understand each other so we can leverage the strengths of each group and enable everyone and the whole organization to do better work."

Because individual and generations are shaped by major events, emerging technologies and society-wide events during their formative childhood years, Lear reported that what happened to each is vital to understanding and working with them:

The Millennials grew up in a period of accelerating technological change, particularly the Internet. However, they also were exposed to the violence of the Sept. 11 attacks, the Columbine High School shooting, the Oklahoma City federal building bombing and other tragedies, and the resulting wave of guidance counselors taught them to speak up and collaborate much more than their forebears. Lear added that Millennial children typically have closer ongoing relationships with their Boomer parents, and many still receive financial support from those parents.

"Say 'Jump' to a Traditionalist, and they'll say 'How high?' But a Millennial will say 'Why?'" Kim Lear of BridgeWorks on generational differences in work style.

Generation X experienced the information explosion that accompanied the creation of CNN, MTV and other media entities, but they also saw many institutions fall apart and were children when the U.S. divorce rate tripled. Consequently, many grew up as latchkey kids, who often had to fend for themselves in single-parent households. This upbringing made many GenXers very independent, adaptable and able to handle change, but also made them very skeptical.

The Baby Boomers struggled with all the national turmoil of the 1960s and beyond, and Lear says they learned not to sit back and to get out and fight the good fight. "They secured many rights that we should be grateful for today, but they also had to deal with the fact that there weren't enough schools, desks and books to handle their numbers and then face events like the oil embargo of the 1970s," said Lear. "And because there weren't enough jobs when they graduated, they also had to become very competitive in the workplace. Now many wonder why what motivates them doesn't seem to motivate the younger generations."

The Traditionalists (of which half of the men are World War II or Korean War veterans) are builders that put aside individual needs for the greater good, according to Lear. Consequently, many of their traditions and the traditional command-and-control structure in most workplaces come from them.

"This top-down structure was a streamlined way to get things done, but having all the strategic information at the top can eventually slow down change and make innovation hard to do," explained Lear. "So when you say 'Jump' to a Traditionalist, the classic response is 'How high?' But a Millennial will say 'Why?' They often also ask too many questions too soon for other generations and need more fluid organizational structures. With Millennials, you may do a lot of explaining, but this can have advantages. For example, Google requires its workers to spend 80% of their work time doing what they're told and 20% doing what they want, and this is how Google Fiber was invented. This fluidity enables a lot of innovation because good ideas can bypass regular organizational structures with powerful results." Google Fiber is an experimental, broadband Internet network infrastructure.

Lear added that those born close to the end of one generation or at the very beginning of another are sometimes called "Cuspers," and they're especially valuable because they can often translate among the others.

"The members of each generation need to be able to tell the others what they need and want, and this is why so many mentor programs are growing and getting stronger now," added Lear. "This is helpful because one thing the Millennials need to learn is the value of face-to-face, person-to-person relationships. Conversely, many companies are now doing reverse mentorships so their older people can learn from their younger colleagues."

Lear explained that another defining characteristic of the Millennials is that they want to be sure that their work has real meaning. "Meaning is the new money," she said. "Where other generations just put their heads down when they start working and wait for meaning to come later, a lot of 22-year-olds want to know right now that what they're doing has a real impact on their company, community and the world." So some companies are connecting the dots, showing their Millennials the meaning in their work. For example, LinkedIn put together a panel of people that got their dream jobs via LinkedIn, asking them to explain how much LinkedIn meant to them and how it changed their lives. "As a result, the motivation of LinkedIn's staff went through the roof when they saw how their jobs had helped others."

In fact, Lear added that one of the biggest workplace stresses now is independent GenXers trying to manage hyper-collaborative Millennials. "Both sides need to work on this, but GenX often need to train to be more collaborative leaders so they can continue to work independently, but the Millennials they manage can still feel supported," she said. "For instance, when a new assignment or project starts, some organizations are having launch parties to help everyone understand all the deadlines and priorities involves. Meanwhile, Millennials need to train to be more effective, independent contributors and thought leaders by stepping away from the security blanket of their groups. Also, Millennials can help manage their Gen X managers by giving them the space they need, but still asking them to check in and support them as needed."

Lear concluded that the next upcoming generation—often the kids of the GenXers—may be called Generation Edge or iNatives. And where Baby Boomers were very careful to shelter the Millennials self-esteem, Lear added that Gen X parent may be teaching their offspring about the value of learning from useful failure, which may be why there's been a resurgence in more competitive sports for many youngsters. ∎

HIGH-TECH FUTURE BECKONS FOR OPERATORS

Emerging Technology Promises to Enhance Performance

by Mark Rosenzweig, Editor in Chief of *Chemical Processing*

Operators in the process and energy industries stand to benefit from technology now advancing in the consumer market—everything from augmented reality to autonomous quadcopters. So say Jonas Brännvall, global product group manager, extended automation, for ABB, and Elina Vartiainen, scientist in ABB's corporate research group.

Their presentation "Future Operator" this week at the ABB Automation & Power World event in Orlando, Fla., proposed how these technologies, as well as 3D visualization and wearable computer-control devices, could positively impact operators, and also cited the potential value of social media at sites.

"3D visualization technology already is a mature technology using gaming engines," noted Brännvall. For example, he cited a 3D visualization of a Swedish pulp mill ABB developed for use in the mill's control room. Touching a particular area on the 3D rendition brings up real-time data on the relevant key performance indicators for that area. The information is easier for whole group to view and, thus, should enhance communication and discussion during shift handovers, noted Brännvall and Vartiainen.

Augmented reality enables providing more information about a real object (as opposed to just a depiction of it) when someone looks at the object on a screen. "Augmented reality has been around a few years, and it is widely available for all of us through mobile apps," said Brännvall. For instance, ABB offers a free augmented reality app—Augmented xA—in the iTunes store that shows how the technology could work in an industrial environment.

"Eye-tracking and gesture technology could be very attractive in the future. Imagine that you work in an oil rig, which can be a dirty environment where you use safety equipment. Then it might not be easy to use keyboards and a mouse to interact with the system if you are, for example, wearing gloves," noted Brännvall. At sites such as offshore platforms, Vartiainen speculated that remotely located experts could use gestures to have robots on-site perform necessary work.

Camera-equipped quadcopters, small helicopters that can navigate on their own without remote control, could show what's happening in a hazardous part of a site without having to put operators at risk, or view otherwise hard-to-reach areas. Another attractive potential application is to use quadcopters with 3D cameras for real-time 3D modeling of a plant site.

Social media also can play a role in improving communication and collaboration, say Brännvall and Vartiainen. "Social 800xA is a concept where we looked at how to take the best pieces from social media and apply them to the field of control systems… [The] idea is that all the plant workers can update their status in Social 800Xa and view each other's status messages regarding what they are currently working on. In addition to this, the process devices also post their status—so, for example, they have an alarm that shows up in their status message stream," explained Brännvall. ∎

"We looked at how to take the best pieces from social media and apply them to the field of control systems." ABB's Jonas Brännvall on the company's Social xA concept.

PLCs HELP OPTIMIZE ALTERNATIVE ENERGY PROCESSES

Even in the Harshest Environments, ABB Extends the Power Available From Wind and Sun

by Aaron Hand, Managing Editor of *Control Design* and *Industrial Networking*

As industry tries to do more with less—better product quality, less waste, lower labor costs—the same extends to power generation. Energy providers are trying to increase the amount of power available at the places where it's needed, with fewer people manning the switches.

It's in this capacity that programmable logic controllers (PLCs) are finding increased usage, optimizing the processes that help wind turbines, solar farms and more to produce the most energy with the least amount of resources, explained Terry Watson, account manager for PLC HMI Motion at ABB. Speaking at a session Tuesday morning at ABB Automation & Power World this week in Orlando, Fla., Watson explained how the company's PLCs and other automation components are being used, and how those processes are being optimized.

ABB, for example, is an active supplier in large wind turbines—not the kind you might see at homes or universities, but the 500-ft tall variety that typically requires the most processing. "There's a lot that goes into it that are not part of the smaller packages," Watson said, noting the electrical drive-train package, generators and converters, for example.

The turbines are optimized to provide the most torque and are continually adjusted to remain at a constant speed, Watson noted. With remote I/O monitoring, PLCs provide pitch control and direction control that are updated multiple times a second. "They control turning of the sails for optimal speed and torque," he said. "And it's happening constantly according to the wind speed measurements."

An ABB PLC is typically installed in the nacelle, a touch panel is installed in the tower base, and the two parts communicate by an Ethernet network. While large wind turbines represent a relatively small market for ABB, the scalability and modularity of the solar field make it "a much wider field than you can chase," Watson said.

Where PLCs find particular use is within technologies such as thermo solar systems with a central concentration tower, parabolic collectors and photovoltaic panels that follow the sun—all areas requiring control of either one or two axes.

Fixed PV units on a house, for example, have no need for PLCs. ABB is focused instead on solar farms whose PV panels will tilt to follow the sun as it rises and falls as the day progresses; this is a one-axis tilt. "A two-axis system will give you sun-up/sun-down, but will also tilt according to the season so your rays are perpendicular to the PV panel," Watson said.

There's actually a bit more that goes into it, Watson added, listing the tasks of a PLC in sun-tracking applications:

- Uses algorithms that rely on a real-time clock to control position;
- Calculates the position of the sun independent of weather;
- Calculates safe positioning for specific events;
- Processes control signals for frequency converters, switchgear, motors, etc.;
- Processes data from various sensors (wind speed, etc.);
- Has an HMI for manual positioning;
- Processes the voltage signal coming from the PV cell;
- Reboots after power loss.

Watson also introduced a new series of extreme-condition PLCs from ABB, the AC500-XC. Features include an extended operating temperature of -30 °C to 70 °C; extended immunity to vibration, hazardous gases and salt mist; and operating altitude up to 4,000 m above sea level. ∎

ABB's Terry Watson discussed the use of extreme-duty PLCs to control solar and wind turbine applications.

ENERGY MANAGEMENT: SMALL STEPS CAN PAY BIG

Like Coins in the Couch Cushions, Savings Are There to Be Had

by Aaron Hand, Managing Editor of *Control Design* and *Industrial Networking*

There's a growing interest in electrical energy management, and it's no wonder as costs continue their meandering upward path. Even as new resources are found, the cost to get to them and to get them to us remains high. Unpredictability, whether induced by weather, mandated reliability upgrades across the grid, time-of-use tariffs or other unanticipated conditions, appears to be the only certainty.

"If you get caught in one of those spikes, that's not good," said Shawn Rash, president of American Energy Solutions, who advocates a "reasonable" approach to energy management. "And a lot of times we don't know exactly what the end game is or where we're starting."

Instead, organizations need to do due diligence to know not only where they're heading, but also where they're coming from, Rash explained in a presentation at this week's ABB Automation & Power World event in Orlando, Fla. "Energy management is not just a single event," he emphasized. "It's ongoing."

As a service provider, American Energy Solutions focuses its efforts on reducing energy costs, reducing energy consumption, managing price volatility and providing sustainability solutions. Speaking of a typical customer relationship, Rash described first looking at an organization's energy rate, whether regulated or deregulated, then managing and reporting that on an ongoing basis. A rate optimization checklist would include an analytical review of compiled data, including cost and consumption, a detailed review of current and other available tariffs, a detailed review of existing purchase contracts and other elements.

In one example, a company was able to save considerable money with a very low investment simply by auditing its bill management and reducing late fees. In another example , this one of a pet food company, a historical study of energy bills was able to uncover huge differences in the average cost of energy at the company's various locations, ultimately learning that some locations were needlessly leaving ovens on all the time, whether they were in use or not. Other efforts have included an infrastructure advisory for new construction, getting the utility company to move things around for better efficiency, negotiating a $650,000 reduction in utilities for a food processor, and finding a seven-year refund and ongoing tax exemption for a grocery store.

American Energy Solutions was able to save ABB's plant in South Boston, Va., $104,700 annually, amounting to a 20% reduction in energy costs. After that initial success, the same ABB plant decided to evaluate its lighting. With a switch to LED lighting, ABB saved more than $45,000 just from the Energy Policy Act (EPAct), and another $21,000 through a retirement-of-current-fixtures tax benefit.

In addition to the tax and energy savings, the ABB plant saved more than 5.6 million pounds of CO_2 emissions. Although it was a greater initial investment, switching to LED lights rather than an interim fluorescent move saved more than a million pounds more of CO_2 emissions.

Rash contends that choosing the right partner can help you find the energy savings. "You can start picking off five or six projects that you can do," he said. "And then the next year, there will be an even better payback as energy prices go up and material costs go down." ∎

"If you get caught in one of those spikes, that's not good." Shawn Rash of American Energy Solutions contends that just a little bit of attention to energy management can yield outsized returns.

WIRELESS IP NETWORKS DON'T HAVE TO BE VULNERABLE

As IP Networks Grow Beyond the Enterprise and Into the Field, That Should Not Mean They're More Susceptible to Cyber Attack

by Aaron Hand, Managing Editor of *Control Design* and *Industrial Networking*

For some 20 years at least, organizations have been challenged to protect their enterprise networks from attack. Proprietary protocols once offered some level of protection, but their convergence into common IP platforms brought new network vulnerabilities to the fore. Now, as industrial field networks grow, and communications and shared information proliferate, industrial sites are finding themselves subject to the same kinds of vulnerabilities as the enterprise networks.

That is particularly true as industrial networks shift to IP systems, just as the enterprise systems did. With all the doomsday hubbub about cybersecurity prevalent today, many might be inclined to want to stick with proprietary networks or perhaps attempt to cut the flow of information off altogether. But the fact is that the use of IP systems in industrial networks is in itself just too valuable to disregard.

Speaking on the final day of ABB Automation & Power World this week in Orlando, Fla., Roman Arutyunov, vice president of global product management and R&D for ABB Tropos Wireless, not only strongly advocated the use of IP systems in large field networks, but explained that there are reliable ways to continue to protect your network from attack.

Tropos Networks, acquired by ABB last June, has focused its business on outdoor industrial markets, making wireless mesh routers, communications equipment and network management software for use in utilities, distribution area networking, mining, oil and gas, control of trains and railways, etc.

"We've seen the growing importance of cybersecurity across all of our markets," Arutyunov said, noting that the desire of industrial customers to optimize their operations by continuously connecting the fields to the back-end office is facilitating two-way communication exchange. "This connection of two elements that were previously very separated or connected with proprietary mechanisms, which gave operators a false sense of security, has given us the growing importance of cybersecurity."

IP architectures are needed if you're going to connect systems in the field, Arutyunov said, pointing to, for example, ease of operations and the ability to run multiple applications over networks. "IP is critical to accomplishing those goals," he said. "But it also increases the risk of cyber attacks.

"I advocate an enterprise-style architecture extended all the way to the edge." Roman Arutyunov of ABB Tropos Wireless stresses the importance of endpoint security in protecting wireless IP networks deployed in industrial environments.

There is a wide array of attacks that can be conducted remotely and on a mass scale over IP networks."

But the good news is that there are ways to prevent those attacks, Arutyunov said. "I advocate an enterprise-style architecture extended all the way to the edge."

He pointed to a typical oil and gas network architecture as an example, including a data center connected to multiple tiers, all the way down to the field elements, which are miles, sometimes hundreds of miles, from the data center. Beyond the data center, the network could include the core IP network at tier 1; the field area network (FAN) at tier 2, including radios on wellheads that are connected back to gateways and then on back to the data center; and tier 3, which could have multiple applications connected throughout territory, such as SCADA endpoints, VoIP phones, safety and security systems, wellhead metering and logging, and laptops, tablets and smart phones.

"This is great power. It facilitates operations, facilitates availability, facilitates capital utilization for the industrial operator and safety," Arutyunov said. "But with this comes exposure."

There are several key elements needed for field network security, including network access control; network resource and remote endpoint protection, which is often ignored; user and device identification and authentication; secure end-to-end data transmission; traffic segmentation and prioritization across applications; secure network management; audit and accountability (another point that's been largely ignored by industrial operators); and availability and performance, which refers to built-in mechanisms to help the network heal itself in the case of attack.

Secure end-to-end data transmission is critical, Arutyunov insisted. "There are three layers of architecture, which means that there are multiple types of equipment in between, all communicating with each other, sometimes over public lines," he said. Most vendors protect the traffic over their own equipment, but the system often becomes vulnerable at junction points. VPN should take encryption all the way from the edge to the data center, he said.

To help with secure network management Tropos Control is a software package that can visualize, monitor and manage the network from just a few clicks. Besides monitoring the network, identifying and tracking security events such as authentication attempts and denial-of-service (DoS) attacks, the software makes it easy to roll out new security policies and change them in minutes across the entire network.

Some problems that networks often face is a lack of access control mechanisms, a lack of firewalls for endpoint and network protection at the edge, and a lack of user and device identification and authentication mechanisms, Arutyunov said. "They move IP to the edge and utilize the same radios, exposing themselves to attacks all the way to the edge," he said, noting that attackers can often get all the way back from the field devices to the data centers.

"This is a lot of stuff that we need to worry about," Arutyunov conceded. "The good news is that there are models in place that we can follow."

The way Tropos addresses the challenge is with end-to-end secure IPsec VPN tunnels; 802.1x for authentication and access control; traffic segmentation using VLANs; and firewalls throughout the network for endpoint security (in every single router, protecting the end elements as well as the data center).

"We have customers who've implemented this model—in fact, quite a few," Arutyunov said. "And security doesn't necessarily mean that it's more expensive, especially when those mechanisms are standards-based." ■

THERE'S ROOM FOR SAFETY IN LEAN MANUFACTURING

Risk Assessment Is the First Step Toward a Safer, More Productive Machine

by Aaron Hand, Managing Editor of *Control Design* and *Industrial Networking*

When it comes to lean manufacturing, there's a seemingly never-ending stream of phrases to identify the various methodologies—5S, kanbans, value-stream mapping, spaghetti diagrams, kaizen, kaikaku…the list goes on and on. "But we don't see safety in there anywhere," said John McHale, engineering manager for ABB Jokab Safety. "A lot of times, it's an afterthought."

McHale presented a session on lean cultural machine safety Monday afternoon at the start of ABB Automation & Power World this week in Orlando, Fla. In it, he explained that lean safety is about being more efficient, better and more cost-effective. And the results can be immediate.

There's been quite a bit of focus on lean manufacturing, eliminating waste in all its forms, whether that's as scrap/re-work, transportation, associated motion, wait times, inventory, over-production, over-process or underutilization of people. But there are common misconceptions that keep manufacturers from integrating safety into lean manufacturing, McHale says. "People think there's no place for safety in lean," he said. "Safety will just impede things; all of my processes will slow down."

Other misconceptions are that the cost will be too high to upgrade every machine in a plant; safety systems will just get bypassed anyway because they stop people from doing their jobs; or a particular process is just too important. "People say, 'There's no way I can shut this machine down. This machine makes the most amount of money of any machine. If I shut it down, my profits and bottom line will be affected,'" McHale said. "I've seen it countless times."

But McHale debunks these misconceptions, noting that, done properly, lean safety will have just the opposite effects. He points to a case in which a Canadian corrugated box manufacturer integrated safety into its process and not only met the necessary standards and regulations, but reduced machine setup time significantly. The changes saved about 30 seconds per setup for the manufacturer's printing press. Running two shifts a day, with an average of six setups per shift, the company gained more than 35 hours of production per year.

"Implementing safety doesn't necessarily result in lost production," McHale noted. "Did safety impede production here? It actually helped it."

"Implementing safety doesn't necessarily result in lost production." ABB's John McHale discussed how safety and lean manufacturing principles can reinforce one another.

But it needs to be done properly, with a well-formed team and effective communication. The team, ideally, should have four to eight people, with some combination of operators, supervisors, EH&S personnel, maintenance personnel, process, system or design engineers, the machine builder/OEM and safety consultants. "From my perspective, the best person to have on that team is the second-shift operator," McHale said. "He or she knows the intricacies of the machine because they deal with it day in and day out. They also are the people who have to deal with that machine with the least amount of operational support."

The team, once assembled, needs to perform a risk assessment. "It's the only way to truly evaluate your machinery," McHale said. Done properly, the risk assessment should be able to identify any issues that could arise with the machinery. And it promotes effective communication by dealing with and involving all stakeholders, McHale added.

There is a wide range of standards that manufacturers can follow—from ISO 13849-1 to EN 954-1—and it can get pretty confusing. "We find 90% of the time when we walk into a facility, they have not performed or even heard of a risk assessment," McHale said. "It's our job to go in and help to educate them."

McHale recommended using a methodology with the least amount of criteria to worry about. "The more criteria we have, the more opportunity we have to get into a gray area, where maybe we didn't classify this risk or hazard appropriately, and then maybe we don't put the appropriate safeguarding on," he said. "The more criteria, the more confusion you can introduce into that process."

For many companies, introducing the concepts of lean safety and risk assessments requires a cultural shift—a shift away from spending the least amount of money possible by avoiding the latest technologies, away from not meeting or exceeding industry standards, and away from current ideas about training.

"Training often ends in the classroom; there's little on-the-job follow-up," McHale said. "With a new machine, there's quite a bit of training that could be required. And it has to be consistent."

Implementing lean safety, as with other lean manufacturing programs, has to start with management," McHale insisted. "It starts with effective communication, a good team and diligent implementation," he said. "If we don't take those steps, we'll never achieve our goals." ∎