Harness the Future of Innovation

Highlights of the 2014 Yokogawa Users Conference & Exhibition
September 9-11, 2014, Houston

A Special Report from the Editors of CONTROL
YOKOGAWA EXECS PLEDGE COMMITMENT TO AMERICAS
Industrial Automation Leader Strives to Understand and Serve
by Paul Studebaker

The straight angle at the top of the Yokogawa logo represents cutting-edge technology, and the curved lines below stand for the company’s warm-hearted people. The yellow of the sun symbolizes its contributions to society through measurement, control and information systems, and its courage to innovate.

Celebrating its 100th anniversary next year, Yokogawa has 88 affiliates in 55 countries around the world. Its presence in the United States dates back to the 1950s, and the United States is “a most important market” for Yokogawa, said Satoru Kuros, director, executive vice president, Solution Service Business Headquarters; president and CEO Yokogawa Electric Japan International, Pte, Ltd., in his keynote address to the 2014 User Group meeting for Yokogawa Corp. of America, held this week in Houston. “We not only share your challenges and concerns, we have a vision for a long-term relationship.”

With 4,000 engineers in 38 centers and 2,000 customer service engineers, “We have the ability to provide integrated solutions of any size and complexity, with continuous long-term support. We want to become your lifecycle automation supplier in the spirit of the Japanese word o-mote-na-shi, which means attentive and thoughtful service.”

ADDRESSING HUMAN RELIABILITY NEEDS

Identifying industry’s megatrends as globalization, increasing speed of business and environmental concerns, Kuros is aware that “You need more skilled people, but they’re scarce, aging and retiring.” Your four main concerns are safety and security, availability, efficiency and the “human reliability” that lies at the center of it all.

For safety and security, the company offers safe operations management; health, safety and environmental, and compliance management; management of change; safety system validation (periodic testing and diagnostics); and IT security consulting services.

For availability, Yokogawa’s service portfolio includes secure remote...
operations and maintenance, condition monitoring, asset management, advanced analytics and procedural management for mode switch, start-up and shutdown operations.

For efficiency, tap into Yokogawa’s ability to reduce operational expenses, improve productivity and energy efficiency, minimize greenhouse gas emissions and manage key performance indicators (KPIs) in real time using the company’s opportunity identification services, real-time production management, energy optimization, total quality management and advanced process control capabilities. Kurosu cited examples of routinely saving 2% to 5% of energy in oil and gas facilities.

Finally, reduce human errors, improve collaboration, and retain and transfer knowledge using Yokogawa advanced decision support, operator training simulation, control room consolidation, fault-tolerant and ergonomic control room design, and workflow management capabilities.

Presenting the full spectrum of Yokogawa advanced solutions, Kurosu asked the audience, “Did you not know about all these?” In response to more than one raised hand, he said, “That’s a problem we intend to solve.”

“Yokogawa is a global solutions and services company that understands its customers’ business concerns,” Kurosu concluded. “We commit to the customer to deliver sustainable solutions that provide for sustainable growth.”

SYSTEMS, ANALYSIS GROWING IN AMERICAS

A perspective on the Americas business was provided by Chet Mroz, president and CEO, Yokogawa Corporation of America, who reminded us that the company announced a new global organization this year that separates the Industrial Automation and Solution Service businesses, and gives both direct access to Yokogawa corporate resources and attention.

In the Americas, strong growth in systems and advanced analytical solutions have driven 18% annual growth since 2009, almost doubling total revenues to $425 million in 2013. A long list of projects includes many new offshore and deepwater installations.

The Yokogawa global organization is expanding and adding U.S. facilities for engineering, manufacturing and distribution, including doubling the capacity for integrating analyzers and housings in Cool Spring, Texas; building a new distribution center in Newnan, Georgia, and a laser analyzer lab in Sugar Land, Texas; and founding a Global Subsea Measurement Center in Houston. The latter has provided thought leadership for subsea oil and gas, Mroz said, resulting in the “world’s first degree program in subsea engineering” at the University of Houston, which now offers a MS degree in the specialty.

SUBSEA MEASUREMENT ADVANCES

The subsea initiative is propelled by events including the Mexican government overhaul of its plans for developing its holdings in the Gulf of Mexico, and new exploration and drilling in the Atlantic seaboard and in Newfoundland. The initiative supports and is supported by activities of the MCS-DCS Interface Standardization (MDIS) group, which is developing the ISO 13628-6 standard for topside and subsea integration; SWiG, the subsea wireless working group; and the API group working on high-pressure, high-temperature (HPHT) subsea requirements for off-shore, deepwater operations at pressures over 15,000 psi and temperatures higher than 400 degrees.

Yokogawa’s Intellectual Property and Innovation Committee, created to strategically manage the company’s intellectual property portfolio and promote activities that foster innovation, has filed 28 patent applications since 2009 and has been granted six patents. These activities are intended to make Yokogawa Corporation of America “the most trusted automation solutions partner for operational excellence and a sustainable future,” Mroz said.
AUTOMATION SUPPLIERS MUST SEE THROUGH THE EYES OF END USERS
As Industrial Facilities Take on More Complex Tasks and Lose In-House Expertise, They Ought to Be Able to Rely on Suppliers to Show the Way and Help Them Achieve Their Goals
by Jim Montague

The best process automaton suppliers know exactly what their users need because they listen to them intently and follow through aggressively on what they require. This is always the case at Yokogawa Corp. of America, which works so closely with its customers and end users that they practically live inside each other’s heads—similar to all longtime and devoted family members.

For instance, process engineer and CEO Simon Lam described precisely what users need from their suppliers when he delivered the lead-off keynote address, “Current Industry Challenges and Expectations for an Automation Partner,” on the opening day of the 2014 Yokogawa Users Group Conference and Exhibition on Sept. 9 in Houston, Texas. This year’s event has 500 registrants from 160 companies and 10 countries outside North America, which represents a 40% increase in attendance over the prior event in 2012.

Starting out as a process engineer, Lam has worked for 40 years in various process applications and organizations, and was CEO of CSPCL, a petrochemical joint venture between China National Offshore Oil Co. (CNOOC) and Shell, until he retired in 2007. In 2008, he rejoined Shell as venture director of Shell Eastern Petrochemical Complex (SEPC), Shell’s largest petrochemical manufacturing investment in Singapore, and retired a second time in May 2010. Most recently, he became interim CEO of Indonesia-based Jurong Aromatics in 2012, helped restructure the $2.4-billion oil and petrochemical manufacturer, and presently serves as an advisor to its board chairman.

“I began as a process engineer at Shell in the early 1970s, and gradually moved to the business side,” said Lam. “Of course, there’s been a lot of changes in industrial automation (IA) over the years. The control rooms in those early days were all analog panels, and so the operators would tear through the charts to put together reports for the managers. In the past 10 years or more, digital panels and systems and more powerful computers

“Industrial automation is a business tool, not just a control tool, which can help process businesses meet their industrial challenges,” said process engineer Simon Lam, Shell retired, in his keynote presentation at the Yokogawa 2014 Users Conference. “Is our industrial automation vendor dealing with cost factors only, or do we have a strategic, value-added partner for growth?”
have come in. They’re able to handle much larger data pools at much higher speeds, and they let us manage increasingly complex operations and plants.”

Lam added that process control used to be reliable, but was local and scattered. “At five refinery complexes in Indonesia, there would be five managers and five sets of engineers, so they couldn’t really be managed together,” explains Lam. “Now we have one total plant control solution; we’re able to more closely supervise the performance of critical operations and equipment; and we’re integrated with manufacturing execution system (MES) portfolios of our equipment and other plant assets. So we’re not just doing simple IA and control anymore; we’re managing relevant information better and serving operators, technical support staff, managers and other personnel at the different data levels that they need. And it’s happening fast and integrated enough that we can manage production as total business unit.

“IA is a business tool, not just a control tool, which can help process businesses meet their industrial challenges.”

DEEP INTEGRATION REQUIRES DEEPER COOPERATION

However, this accelerated, deeply integrated IA world brings up some new needs for end users, according to Lam. “The challenges now are these: How do we maintain cost leadership through lowering expenses? How do we achieve safe production with increased scrutiny from the public? How do we get the maximum benefit out of our feedstock? How do we handle the dilution of our technical experiences and resources due to reduced technical know-how and people, and then manage change with improved human reliability? We’ve got advanced controls and simulations in our plants, but some are so reliable that many operators don’t get the experience of managing their systems in exceptional situations,” explained Lam. “Finally, we have to ask, is our IA vendor dealing with cost factors only, or do we have a strategic, value-added partner for growth?”

Consequently, as a process control end user, Lam has several essential requirements. “At a minimum, we require a reliable DCS platform, but sitting on this platform, we need software packages that can make our whole IA system a power tool to achieve short- and long-term financial objectives,” said Lam. “We must be able to use IA tools to reduce costs of maintenance through increased reliability; enhance safety with intelligent alarm management that ensures operational integrity; and use simulation software to further optimize production with tools we can use day-to-day that can also aid training. We also want to enhance training and retraining of operators by using more dynamic simulations because it’s critical to keep operators trained and alert, instead of being unable to remember important start-up and shutdown procedures after six years have gone by.

“One plant I know trained all its operators before major shutdowns and after major start-ups, while another stopped using its operator training system (OTS) after two years because they had to call their IA vendor too often and weren’t able to keep up with it. It’s critical to keep OTSs up to date for them to be useful, but they must also be simple enough to use and maintain.”
HELP DEAL WITH THE BRAIN DRAIN

Lam added that to assist young operators and technicians, and to help them avoid mishaps, some end users are employing artificial intelligence to help capture and disseminate the experience of veteran technical professionals. “Capturing and preserving steps in a process control application helps avoid possibly missing them later,” added Lamb. “We also need suppliers like Yokogawa that can enable us to avoid safety infringements or costly downtime, and help us establish audit trails and maintain statutory compliance.”

Likewise, Lam added that individual site managers expect IA suppliers to understand their unique business concerns and help them meet challenges by using their own industrial knowledge. “Site managers don’t think suppliers have to know everything, but they also don’t want someone to look at them with a blank face,” said Lam. “They just want someone who will really try to work with them. These days, we’re driven to collaborate collectively with consultants and IA suppliers to secure the right business architectures, embedded know-how and best practices to run sustainable, competitive businesses. This means we have to maintain long-term relationships with our suppliers, just as we provide the human resources needed to supplement our own business units.”
Headlining the systems technology update at this week’s Yokogawa User Conference & Exhibition in Houston are the company’s new software configurable input/output (I/O) subsystem, N-I/O, as well as a new “independent” offering of its ProSafe-RS safety instrumented system (SIS), designed to work with any supplier’s basic process control systems (BCPS).

“N-I/O uniquely combines universal I/O functionality with an optional signal conditioner for maximum flexibility,” said Eugene Spiropoulos, Yokogawa senior technical solutions consultant. “It’s the best of both worlds.” Similar to other configurable I/O systems on the market, N-I/O is Yokogawa’s approach to accommodating late hardware and software changes in the course of project execution. “Software application engineering and hardware design can progress independently without compromising overall project schedule,” Spiropoulos explained.

N-I/O is somewhat of a hybrid between other systems on the market that are 100% software configurable and those that require single channel hardware characterization. Analog (with HART 7 communications) and digital I/O are universal to the base I/O modules, but if a more exotic signal type is called for—say, a frequency input—characterization via a plug-in signal conditioning module is needed. Yokogawa plans to formally unveil its “Type A” N-I/O for basic analog I/O functionality later this fall, with other variants for intrinsic safety, high density and for SIS applications to follow.

Yokogawa’s ProSafe-RS safety instrumented system (SIS) originally was designed to work in tandem with the company’s Centum VP distributed control systems (DCS) and is widely installed in industrial applications around the world. New this year to the company’s SIS offering is an independent SIS offering that will work with essentially “any distributed control system,” said Jan de Breet, Yokogawa safety instrumented system consultant.

This special implementation of ProSafe-RS integrates with a plant’s existing
control system through redundant Modbus TCP links, and requires a separate operator/engineering station for managing safety system-specific information, such as SIS diagnostics. It’s targeted at end users with obsolete safety systems that need to be replaced, or with users looking to upgrade more basic protective systems to an ISA-84/IEC-61508-compliant solution. Skid builders and other original equipment manufacturers looking to demonstrate ISA-84/IEC-61508 compliance also could benefit from this approach, de Breet said.
The best process controls upgrade project is one that's so seamless, most people don't even know it's going on, according to Kevin Kelley, process control foreman at Solvay Chemicals.

It might seem impossible for such a huge, fast-moving and critical project to be so stealthy, but that's exactly what happened earlier this year at Solvay's trona ore mine and refinery in Green River, Wyoming. The facility migrated from Yokogawa Corp. of America's Centum CS3000 distributed control system (DCS) to its new Centum VP-R5 control system, and updated 21 field controllers and numerous other support components.

"We'd migrated from Honeywell's TDC to Yokogawa's CS3000 in 1998," said Kelley during his Sept. 9 presentation at the 2014 Yokogawa Users Conference and Exhibition in Houston. "So we had to upgrade now because our Microsoft Windows XP components were no longer supported in 2014, and their costs were going to go way up. We were scheduled for a five-year, total plant outage, and we needed to update our RIO field control stations with new templates and offline downloads that had never been done since they were initially installed. Also, we had an old infrastructure with PCs that were seven years old, so we were having frequent hardware failures. We also needed to upgrade our system security to meet Solvay's overall corporate IT standards."

Solvay's control system at Green River has about 7,000 individual, hard-wired I/O points and about 3,000 communication I/O points for its SCADA system, PLCs, Honeywell FSC system and other packages. Its controls cover processes that are up to 20 miles apart, and its Yokogawa system resources include two domains, 21 RIO and FIO field control stations, 17 operator stations, six engineering stations and eight different plant servers.

**WORLD'S LARGEST TRONA TROVE**

All of these control systems and devices help extract and process Green River's...
abundant trona ore, which contains sodium sesquicarbonate, a relatively rare, sodium-rich mineral that’s used to make soda ash. The mine and refinery’s trona reserve in southwestern Wyoming is the largest and purest in the world, in fact, it contains 80% of the world’s trona with more than 100 billion tons, including 40 billion tons that can be mined with conventional methods.

“The 10-foot seam we’re currently mining is 1,600 feet below the surface and is 10 feet thick,” reported Kelley. “We use four continuous bore miners to do room-and-pillar mining. They cut curved tunnels that are 8.5 to 9 feet high and 14.5 to 15 feet wide. We also do long-wall mining with equipment that’s 10 to 11 feet high and 625 feet wide, and creates tunnels that are a mile long. We mine about 11,000 tons of ore per day from the mine.”

Kelley added that the Green River facility also is defined as a hard-rock, gassy mine because its operations also free about 6 million cubic feet of natural gas per day, which must be vented to keep the atmosphere in the mine at less than 2% methane. Solvay used to simply burn off this gas, but it recently implemented a capture system that gathers the natural gas from its long-wall operation and uses it to help run its refinery. “We were the first in the U.S. to use our waste natural gas as fuel, and we’ve been doing it for a couple of years,” said Kelley. “We compress the 96% to 98% pure natural gas to about 70 psi, and send it to our kilns to subsidize our gas use, which gives us some carbon credits too.”

Once the trona ore reaches the surface, it’s crushed to 1/4 inch or less. Next, it’s run through one of four calcination lines that cook the rock at 350 °F. Then water is used to leach out about 6,000 tons of pure trona per day. The resulting liquor is heavy with sodium sesquicarbonate, which is filtered, crystallized and dried into soda ash. This product is an essential ingredient in glass containers and other products, chemical manufacturing, soaps and detergents, flue gas desulfuring, pulp and paper, water treatment and other products and processes. The refinery also produces sodium sulfite and sodium bicarbonate.

**MIGRATION IS ALL ABOUT TIMING**

To keep its operation running smoothly, Kelley explained, “Our biggest challenge on this upgrade project was timing. The plant shutdown was scheduled for the last week of April 2014, and our total plant outage was the first Saturday and Sunday in May. However, although funds were slated for the upgrade two years ahead of time, they weren’t fully committed until the first week of February 2014, making the purchasing process difficult and putting Yokogawa’s standard lead time well past the shutdown deadline. This also made it difficult for us to have the time to install the needed upgrade to infrastructure, cabinets, switches, UPS racks, etc. Fortunately, Yokogawa worked very hard with us and went out of their way to meet our deadlines. The Yokogawa hardware arrived just in time to be installed.”
You might or might not care about Formula 1 auto racing, or that McLaren Racing has been in that business since 1963. You may be unimpressed by the pioneering of carbon fiber on the track in 1981, or the world’s fastest road car in 1998, or 12 driver and eight constructional F1 championships, or the introduction of the McLaren 12C production car in 2011. You might say, “Great. What’s that got to do with process control?”

“Speed of decision-making is critical to success,” said Mike Phillips, head of the advanced composites division, McLaren Racing, in his keynote speech today at the 2014 Yokogawa Users Conference and Exhibition in Houston. The company’s pioneering use of electronics and communications to support real-time decision-making has allowed it to win races and opened the door to advances in critical systems management that have direct relevance, but so far have only occasionally been applied to industrial facilities.

The racing pays the bills and fosters a dynamic development environment where measurements made on a car on a track anywhere in the world are immediately transmitted by satellite to an operations center in the U.K. There they’re analyzed by simulation to determine the appropriate action, which is sent back to the track. Information collected on Sunday fuels engineering on Monday, which determines how the cars will be changed before the next race.

“We’re monitoring both the cars and the people, and deciding what we should do. When should we pit stop—in three laps? How will that turn out? We model the what-ifs before we take action. What if there’s an accident? What if the weather changes?” Phillips said. “You typically have six seconds to make a decision. If we get it right, we win some trophies. If we get it wrong, there are 16 million people watching on TV.”

A typical Formula 1 car has 120 sensors streaming during a race. “We understand a great deal about the car, how it performs during a race to help us design and optimize systems,” Phillips said. “Then there’s the fleshy, irrational individual who sits in the middle of it.” Engineers can see how the driver behaves. His reactions to changes and his comments also feed the design process.

“If we get it right, we win some trophies. If we get it wrong, there are 16 million people watching on TV.” McLaren’s Mike Phillips on the six seconds the company’s race car crew has to react to changing conditions in the midst of a Formula 1 race.
Data is good, but you also have to know what to do about it, which is where simulation comes in. “Simulation is very important to us,” Phillips said. “We don’t have time to design, make and test every component.” Simulation applies to performance, as well as the parts. It predicts how the system of car, driver and track will perform.

FROM MILES HIGH TO A MILE BELOW SEA LEVEL

“If we get it right, we win some trophies. If we get it wrong, there are 16 million people watching on TV,” McLaren’s Mike Phillips on the six seconds the company’s race car crew has to react to changing conditions in the midst of a Formula 1 race.

McLaren has taken its racetrack experience and branched into applied technologies for energy, healthcare and transport, “industries where data is more and more important to get ahead of the competition,” Phillips said.

For example, Heathrow Airport is planned carefully to run at 99% capacity—every day, 700 flights take off, and 700 land. “But every morning at 5 a.m., they look up into the skies and nothing is as expected,” Phillips said. Some flights are early, some are delayed. Some have plenty of extra fuel and some do not. What’s the best way to direct the traffic? “Models are great, graphics are great, but if you can’t change it and make it better, what’s the point?”

Instead of holding above the airport, flight order can be changed while the flights are still far away. “You may come a little more slowly, but you won’t fly into London and sit,” Phillips said. A plane that might have left a distant airport with an extra six tons of fuel so it would arrive with an extra four tons to allow for delays won’t have to carry—and waste—that fuel.

An offshore facility can simulate and see the effect of changing a parameter, such as mud consistency, on its drilling schedule, Phillips said. “They can know what will happen.”

Bicycle designers have long used finite element analysis to minimize weight, paring a 7-kg machine down to the minimum by understanding stresses and strengths. “What about the 70-kg rider?” Phillips asked. “We can model how the whole system behaves.”

HUMAN HEALTH AND BEHAVIOR

The frontier is in instrumenting people. In the United States, this is being done this year with NFL football players. In the U.K., it’s rugby, “played by men with leather balls,” said Phillips. The players are wired with biometric systems to measure work rate and potential for injury, so coaches can anticipate and adapt in real time. “Predicting and avoiding fatigue-type injuries can keep them in the game.”

McLaren has worked with Pfizer and GlaxoSmithKline to measure human behavior and reactions to environments, activities, stress and medication. “In the Unites States as well as in the U.K., we can’t afford the healthcare system,” Phillips said. “What’s really effective? We can track whether the medication is taken and taken correctly, and how effective it is.”

Obesity programs can monitor people’s activity, and “they do better simply because they know someone cares about them,” Phillips said. In another program, monitoring electrocardiograph data, temperature, three-axis motion and audio (so they can comment on what they’re doing) has led to better understanding of mental stress, which has been correlated to variations in the time between heartbeats. Now there’s a measure of how stressed an air traffic controller or racecar driver or plant operator might be.

It may just look like auto racing, but the technology that empowers real-time decisions at 200 mph has applications far from Formula 1, and so does McLaren’s driven and creative mindset. “We don’t ask if it can be done,” Phillips said. “We ask how, and we find a way to make it happen.”
Dave Emerson Welcomed into Process Automation Hall of Fame
Quintessential Engineer and Process Automation Innovator Honored for His Contributions to Industry
by Keith Larson

Amid the technical presentations and networking events this week at Yokogawa’s 2014 Users Conference and Exhibition in Houston, the process automation community also paid tribute to one of their own: Dave Emerson, who earlier this year was inducted into Control’s Process Automation Hall of Fame. Emerson (left in photo) currently serves as director of Yokogawa’s U.S. Development Center and was congratulated for his contributions to industry by Paul Studebaker, editor in chief of Control.

“On behalf of Control magazine and our Process Automation Hall of Fame, thank you for letting us take this opportunity to welcome one of our 2014 inductees, Dave Emerson,” Studebaker said, addressing the Yokogawa User Group attendees. “The Control Process Automation Hall of Fame was started in 2001 and now includes 45 of the most famous, well-known names in the highly specialized field of process control. These already include two well-known Yokogawa people, Dr. Maurice Wilkins, inducted in 2011, and Dr. Yukata Wakasa, inducted in 2010.

“Becoming a Hall of Fame member is simple,” Studebaker explained. “Anyone can nominate a candidate by sending us a name. Once a year, we present the list of nominees to the members, who select their first, second and third choices. After a little math, we have our inductees, typically two or three, who receive decisive support from the members. Then the fun begins as we research their accomplishments.”

Dave Emerson graduated from Rensselaer Polytechnic Institute with a BS in electrical engineering in 1978.

He started his career with Taylor Instruments that same year. After four years with Taylor, he joined EMC Controls, a young start-up company that went through a series of owners and at various times was known as Rexnord, Texas Instruments and GSE Systems. Over the next 15 years, he gained experience with management, control technology and large and international projects.

In 1997, he moved from GSE Systems to Yokogawa’s U.S. Development Center, which was just being started by Kimi Takahashi, as a systems architect. Dave helped develop ExaQuantum/Batch, a new batch historian that worked with
Yokogawa’s Exaquantum historian and its DCS batch system, CS 3000.

Exaquantum/Batch was based on ISA-88 and the then-new ISA-95 standard, offering one of the first web-based user interfaces. Dave became increasingly involved in standards committees and industry groups, and in 2009, he became director of Yokogawa’s U.S. Development Center.

CONTRIBUTOR TO KEY INDUSTRY STANDARDS

Dave is, above all, the quintessential engineer, a quiet and avid technologist, who made his way by carefully designing and implementing innovative applications of electronic controls. But the reasons his now-fellow Hall of Fame members gave for supporting his nomination focus on his leadership in advancing standards that have become critical to process automation, batch control and the interoperation of business and automation systems.

Lynn Craig (inducted in 2003) summed it up well, noting that “Dave is so quiet that his (huge) contributions to the manufacturing control field are too often overlooked. He may be a giant in the field, but he is too often invisible.”

Over the past 25 years, Emerson has had significant roles in defining and advancing several critical control and operational technologies, including:

• A major role in the development of the pioneering EMC (later NovaTech) batch control product;
• Key contributions to the ISA88 batch control standard;
• A crucial role in the development of the ISA95 standard for the integration of enterprise and control systems, including several years as vice-chairman of the S-95 committee;
• A central and primary role in developing a technical report on integrating ISA88 and ISA95.

Emerson also created and led the World Batch Forum XML Working Group that developed the B2MML and BatchML schemas now supported by MESA. He currently leads the MESA XML Committee that maintains the schemas. For this work, he received a Yokogawa Chairman’s Technical Achievement award. He has been a vital contributor in many facets of the World Batch Forum organization, which led the organization to award him its prestigious Thomas G. Fisher award in recognition of outstanding leadership in the field of operation and control of manufacturing processes.

At the OPC Foundation, Emerson led the OPC Batch committee in creating the OPC Batch specification, served on the OPC UA committee and currently serves on the Technical Advisory committee. At MIMOSA, he is one of the principals in the Open O&M group. He was also instrumental in developing and proposing the new ISA106 standard for Procedure Automation in Continuous Process Operations, of which he is now the editor.

“In summary, Dave has worked diligently and tirelessly to advance real-time automation and information management in these critical areas and has demonstrated both leadership and success in improving technical solutions, promulgating standards and encouraging industry to move in a very positive direction,” Studebaker said. “We are proud and honored to welcome Dave Emerson to Control’s Process Automation Hall of Fame.”
Even when you’re a global energy player like Chevron, managing complex “mega” projects presents a tall order. Indeed, over the past 10 years, the project management workload of Chevron’s internal project management arm, Chevron Energy Technology Company (ETC), has grown from perhaps eight at any given time to several dozen simultaneous projects today. A main automation contractor (MAC) relationship with Yokogawa has helped Chevron in its efforts to standardize its project approach and become more consistent and efficient, according to Roy Corbett, technical team lead for MAC within Chevron ETC’s Process Automation Unit. Corbett shared how the company has leveraged its MAC methodology together with other work process improvements at this week’s Yokogawa Users Group Americas meeting in Houston.

Chevron’s Enterprise Automation Strategy to achieve “flawless automation” is based on three primary initiatives, Corbett said. First, the company uses a more limited number of suppliers, which is intended to promote deeper levels of mutual expertise and understanding between the user and supplier organizations. Second, where possible and practical, Chevron will promote the use of common work processes and drive standardization globally. Third, it will optimize project execution by using MAC contracts with a more select group of suppliers to ensure that Chevron standards are met on a consistent basis. “It used to be lowest cost; now the emphasis is on value,” Corbett said. “We’re relying on much closer collaboration with our suppliers to raise our game.”
CLOSER COLLABORATION, DEEPER UNDERSTANDING

Chevron’s MAC relationships in turn are based on Alliance Supplier Relationship (ASR) agreements, which stipulate twice-annual, executive-level meetings to set objectives and report on progress. The ASR core team meets every six weeks during the course of a project. These meetings also provide a venue for Chevron to provide Yokogawa with longer-term input, to influence their technology roadmap, Corbett explained. “It’s not all sunshine and roses,” Corbett added, “but there a commitment on both sides to resolve any issues.”

Chevron also has created an “Automation Toolkit” that is intended to help standardize and streamline 80% of project effort, while leaving room to accommodate aspects unique to any given project. “We’re looking for commonality from one project to the next,” Corbett said. “The Toolkit consists of best practices for achieving Chevron engineering standards with Yokogawa technology.”

Now that several projects implemented using Chevron’s MAC approach and Automation Toolkit are about to come online, Chevron is looking to document advances in execution time, capital expense and return on investment achieved, Corbett said. Some additional measures are anecdotal, but telling; for example, the number of alarms on day one of operation. “If that number is 10,000 it really tells you something!”
Yokogawa Electric Corp. announced today that it has signed a contract with computer-maker Dell Inc. for the global provision of select PC models, pre-configured and shipped directly to Yokogawa customers. "We are a leader in designing, engineering and delivering automation solutions where we integrate control, safety, instruments and more to meet the business challenges of our customers," said Chet Mroz, president and CEO, Yokogawa Corp. of America, to a gathering of industry press at the company’s 2014 User Group Americas meeting this week in Houston. "This has lead to a higher level of applications -- more IT-type projects, integrated and supplied with multiple servers," Mroz said. "As we do more and more of these, we have requirements for standardized PCs and data servers with our solutions in them. Today, we are announcing an alliance with Dell for just that purpose."

Yokogawa customers are increasingly relying on the automation supplier to implement solutions ranging from condition monitoring for leak sensing and corrosion to IT solutions for reliability, the Internet of Things (IoT) and security. "More customers depend on Yokogawa as the main automation contractor, a single source of responsibility to integrate Yokogawa solutions with alliance partners’ products and engineering services," added Chiaki Itoh, vice president, head of IA Marketing Headquarters, Yokogawa Electric Corp.

High-performance PCs that incorporate the latest technologies are being used more and more in the control systems field, for example, by replacing the dedicated terminals used as human machine interfaces and to connect with host systems. However, while a production control system usually remains in use for a period of one to two decades or even longer, new PC hardware, operating systems and application software incorporating the latest technologies and offering ever higher levels of performance are continually being released. When incorporating this new PC hardware and software in an industrial automation
(IA) system, the control system supplier must take care to ensure that the overall system continues to meet the highest quality standards. To satisfy this need and offer quality system solutions, Yokogawa has contracted with Dell for the supply of dedicated Yokogawa PC models.

"PC vendors release frequent updates, introducing challenges to mission-critical systems," said Nabuaki Konishi, vice president, head of PA Systems Business Center, IA Platform Business Headquarters, Yokogawa Electric Corp. "Dedicated and preconfigured Yokogawa PC models help to solve this problem. But new PCs and servers are only introduced after Yokogawa interoperability testing and certification to assure smooth transition."

TESTED FOR COMPATIBILITY

Under the terms of the contract, Dell will supply PCs that have been tested to verify their compatibility with Yokogawa products. Yokogawa will globally distribute these PCs as Yokogawa Certified Models for use with IA system-related products. These are "long-life products" that will remain available for twice as long as equivalent commercial off-the-shelf products. To meet a variety of operating conditions and installation requirements, they will be available in a rack-mount or desktop configuration with either a server or client operating system.

The provision of Dell PCs under the terms of this contract is intended to enable Yokogawa to offer high-quality system solutions with reduced maintenance costs. Key benefits are:

- **Stable operation:** As the PC hardware and OS to be used with the Yokogawa system-related products is set for a specified period of time, stable operation is ensured.
- **Fewer model changes:** Because individual models are available for longer periods of time, model changes will be less of a concern when purchasing a new PC, either as an add-on or replacement.
- **One-stop maintenance service:** Yokogawa's maintenance service will cover both its system-related products and the PCs.

"How to combine IT and IA is an important management issue for manufacturers because they urgently need to strengthen their competitiveness in the global market and ensure that they are managed in a sustainable fashion," said Itoh. "By making the best use of Yokogawa’s IA technologies and know-how accumulated over the years and Dell’s latest technologies and extensive supply chain, Yokogawa will continue to be able to offer its customers solutions that achieve the goals of our VigilantPlant initiative," he added.
Settle In For Some Serious Control

Visitors to This Week’s Yokogawa’s 2014 User Group Experience One Vision of Tomorrow’s Operator Console

by Paul Studebaker

On the exhibit floor at Yokogawa’s Users Conference this week in Houston, Paul Studebaker, Control editor in chief, got a sneak peek at every control freak’s dream: an ergonomic console offering many features designed to keep the operator rested and focused, including three strategically positioned 24-inch monitors, wireless keyboard and mouse, cup holder and integral head, wrist and footrests. This personal control console offers a futuristic vision that’s available today for operators and managers who need or want to be surrounded by information, according to Wataru Nakagawa, product marketing consultant at Yokogawa’s Technical Solution Support Center in Sugar Land, Texas. Based on an Emperor workstation by MWE Lab, the highly stable steel structure includes powered tilting capabilities, integrated audio system and LED lighting that enable the user to experience unprecedented comfort and quasi total immersion, at the plant or, perhaps, in his or her den at home. Control fanatics can upgrade with Recaro seating, Bose surround sound, ionic air purification and two additional 19-inch monitors.

Seeking yet more control, Paul Studebaker contemplates an upgrade to Recaro seating and Bose sound system.
The only constant may be change, and the global energy sector has been getting more than its fair share lately. Principally, hydraulic fracking in U.S. deposits is freeing up so much natural gas and oil that it’s turning traditional process industries, infrastructures and economies on their heads. Even adding up all the types and locations of this turmoil is a daunting task, so it’s fortunate when someone like Mark Peters, publisher of Oil & Gas Financial Journal, can draw a detailed portrait of all these events and issues, and put them into an understandable and useful context.

Peters presented “Hydrocarbon Processing Industry in a Changed Global Environment” this week at the Yokogawa Users Group Conference & Exhibition in Houston. He reported that shale oil and gas is one of the primary factors shaping energy expansion for the next decade. It’s increasing U.S. petrochemical production, pushing the need for gas processing capability, and will even turn the U.S. into a liquified natural gas (LNG) exporter in the next few years. Other factors influencing the energy landscape are growth in world population, multiplying geopolitical changes and energy security issues.

“We’re seeing significant jumps in oil and gas recovery in the U.S., mostly in the past five years,” said Peters. “The theory of peak oil has been discredited because when more production and capacity is needed, new technology improvements make it possible, just like in other industries. In fact, recent development of shale gas reserves is causing a 15-year pause in climate change because natural gas produces less carbon emissions than coal. This is why the U.S. will have three or four major LNG plants coming online soon, which will help it become a net exporter of LNG by about 2017.

SHALE RESOURCES ASCENDANT IN U.S.

“Likewise, new technology for recovering tight gas and oil is turning formerly non-producing areas into producing areas.
This is increasing our energy security, but it’s also requiring the U.S. to make changes in transportation systems and infrastructures. Recent geopolitical events as with Russia and the Ukraine and with the Islamic State of Iraq and Syria (ISIS) have a tangential influence on energy resources, but they can’t be ignored, especially since Russia produces about 30% of Europe’s oil and gas.”

Besides the emergence of shale gas, Peters reported that the energy price spikes that began in 2007 encouraged development of everything from offshore resources to refining. Beyond the U.S., Central and South America are ramping up production, especially in deepwater locations and often doing it with the help of large investments from China. Some ultra-deepwater wells may soon get down to 20,000 feet below sea level, he said.

Despite these activities, the United States’ reversal of fortune remains the big news for now. “The U.S. is presently reversing 40 years of oil production declines. If someone had told me 10 years ago this was going to happen, I would have asked what they were smoking,” said Peters. “Also, we’ve recovered from the Macondo spill, and deepwater activity in the Gulf of Mexico is increasing again. So while oil prices appear to be range-bound between $100 to $120 per barrel, U.S. natural gas is poised for further long-term recovery. In fact, oil production in Texas in 2017 will surpass the state’s all-time high in 1972. Nationwide, the U.S. has already surpassed Russia as the world’s largest gas producer and even surpassed Saudi Arabia as the world’s largest oil producer. The downside on shale gas is that its fields can start strong and decline rapidly, but shale is still having a big impact on global refining, LNG, pipeline capacity and petrochemical activity.”

GAME CHANGER

U.S. shale gas remains a huge game changer because it affects energy producers and consumers on so many levels. “Again, carbon emissions are decreasing as cheap gas in the U.S. shifts power production from coal to natural gas, but shale is also enabling increases in the nation’s petrochemical production and allowing increased use of natural gas for automotive fuel, starting with fleets,” added Peters. “The U.S. is also succeeding with shale due to its unique geological structures and some other unique advantages compared to other countries. “For example, shale structures are found worldwide, but the U.S. is the only country that gives landowners mineral rights. So, while some people are getting rich here, shale gas will be slower to develop in other regions. In addition, the U.S. has a fully developed infrastructure service industry to handle the shale plays, including all the trucks and pipelines needed for processing. So, where you might not be able to get 200 trucks through a community in Europe without some residents objecting, it’s more likely that it can be done here. Also, shale is further aided by the fact that the EPA wants power generators to switch from coal to natural gas, especially in the Ohio Valley.”

Similar to natural gas, shale oil is also rapidly changing the U.S. oil industry. “U.S. dependence on imported liquids is dropping from 60% in 2005 to a projected 32% in 2040,” said Peters. “And, though there’s some controversy about whether we should become a net exporter of liquids, we also need to create jobs and grow our economy. Liquid consumption is being driven more and more by the developing world because there are a lot of people who want to live the way we do, and that’s going to require a lot of energy too.”
Chevron Downstream is reviving and improving energy management software systems at the three largest of its six refineries in North America. The Visual MESA systems were installed in the early 1990s and the upgrades promise to help automate and improve real-time operational decisions to minimize energy waste and costs.

"The focus is on the three largest, wholly-owned refineries because larger sites offer complexity and higher benefits for energy management," said Gavin Turk, process control BIN leader, Chevron, during his technical presentation today at the Yokogawa Users Group conference and exhibition in Houston. Chevron business improvement network (BIN) leaders are facilitators and coordinators for new technology and best practices in their given area of specialization. Turk’s presentation was co-authored by Dennis Cima, manager, process control network and control systems, Chevron.

The systems at two of the three refineries had languished because they were not maintained during modifications and overhauls, so inaccuracies had led to low use by engineering and operations. "Over a 10- or 15-year period, only one of the sites continued to use MESA. The others kind of fell out," Turk said.

"Now we've made an effort to get the other two large plants' MESA systems updated and back in operation." Chevron is also improving the usefulness at the third refinery where Visual MESA has continued to be used.

**VISUALIZE, OPTIMIZE, PRIORITIZE**

Visual MESA provides web-based graphics that give views of entire systems such as pump/compressor drivers, de-aerator operation, furnace/boiler efficiency and steam production. Equipment information is loaded into the models so users can track performance and efficiencies. Data is available through OPC for storage and tracking.

A real-time optimizer uses model data and makes recommendations to minimize energy costs, such as swapping turbines for electric motors. Optimizations...
are typically run every 30 minutes. "Recommendations are downloaded to the operators, and they decide whether to make changes," said Turk. Some plants use the system in closed-loop, but not Chevron. "Recommendations are sent out by email to operators, maintenance and utility operators. Not everybody is responsible to implement them, so they may not be."

Powerful "what-if?" modeling allows users to see the effects of operation or equipment changes. New plants, modifications, turnarounds and shutdowns can be modeled, and the consequences made clear for planning ahead. "This also works for anticipating unexpected changes," said Turk. "What if a steam plant or turbine is shut down? You can see what will happen and plan ahead for those events."

Auditing and accounting features help users uncover waste. For example, a "balloon feature" shows locations of energy imbalances as symbols that expand according to the size of the imbalance, and can be color-coded. "You can look for hidden events, hidden blowdowns," said Turk. "You may find a huge imbalance due to a valve that’s not even shown in the PID."

Key performance indicators (KPIs) can be configured. "We have KPIs for each site, and we can compare them to industry standards," said Turk. "The software improves the accuracy of these KPIs, and we can push them into the historian for use by other groups."

The refinery that has continued to use Visual MESA since the beginning has done so because of the people involved. "They managed their model to fit their purposes. They did not try to add new systems they didn’t need," said Turk. They focus on fired boilers, turbine/motor swaps, make-up fuel to the fuel gas system (natural gas), letdown vents and flow rates, Turk explained.

Now each of the three large refineries has a team that includes an optimization operating assistant, furnace specialist, utilities specialist and energy technician. The two languishing plants completed updates to their models in 2013 to cover fuel system, detailed cogeneration and electrical, and they improved the system correlations.

RESULTS RELY ON OPERATIONS

But successful energy savings still largely depend on operations. "Out in the operations world, they have their structure," Turk said. "The operating assistant is a 24/7 role focused specifically on optimization using multivariable control." You have to have his attention.

Keeping resources focused on saving energy is a challenge. Like any project, "Implementing tools without the associated work processes and associated organizational capability compromises results," said Turk. "You don't get all the benefits that you target.

"We aim to get the right people on projects, but we don't always afford them the time to get it done," Turk said. Also, frequent personnel changes result in turnover that affects getting projects done, and key decision makers have to provide resources and guidance to avoid roadblocks.

"These are typical Project Management 101 problems," Turk added. "We don't always apply good practices to small projects."

You need a detailed plan scope definition, and to define console operator expectations. "The expectation setting of console operators is critical to success. If operators are not in agreement of what’s expected of them, you can put in the best system, but not gain the expected improvements," Turk said. "On the flip side, if console operators can see that they’re doing good and reducing costs, they’re more likely to use the system."
Finding tiny, significant or potentially hazardous gas sources is an essential safety capability in many process applications, but just sensing is no good unless those signals and data can be delivered to people and systems that need them.

To help advance efforts to provide better protection, ExxonMobil Upstream Research Co. is investigating the use of wireless components to get gas indications where they need to go. Bin Xu, an instrumentation control engineer at ExxonMobil, recently sought to demonstrate and verify the feasibility and reliability of a battery-operated, ISA100 wireless gas detection system with a redundant gateway at Exxon’s lab in Houston.

“We wanted to examine wireless because it’s faster to install and costs less to deploy compared to a hardwired solution,” said Xu. “Also, this cost benefit could be particularly attractive for a brownfield project.”


“Overall, we installed three GS01 gas detectors from Norway-based GasSecure with a redundant YFGW 410 wireless gateway system and YFGW 510 transmitter from Yokogawa at an ExxonMobil site,” explained Xu. “The wireless protocol we used is ISA100.11a, which uses a Modbus interface into the control system. Initially, we collected wireless data without feeding it into our safety system. Also, all three instruments were installed right next to existing wired gas detectors for comparison, and sensor and network performances were tracked as well.” ISA100 just became a global IEC standard last week.

Xu added that the wireless-enabled gas detection system was configured all the way to a Modbus tag and was plug-and-play for ExxonMobil’s site. The test system’s gateway and instruments were pre-tested by GasSecure and were shipped from Norway directly to ExxonMobil. “The trick is to complete commissioning as simply as possible, so
we asked the vendor to configure these components all the way to the gateway and make sure this was done before shipping to us,” said Xu. “We asked each supplier to do the same. We provided parameters, IP addresses and other needed details, they did the configuration, and then we could just do the interface. This made our wireless system easier to set up and made it simple for us to pull diagnostic information into our other systems.”

In addition to the savings, Xu added that using wireless for gas detection is also a very flexible method and even allowed him to establish it as a redundant system. “You just have to make sure that your device doesn’t go beyond the capabilities of the gateway,” said Xu. “This system could also be used in a SIL2 application. We asked for and used Profisafe networking and were able to get this project up and running in just six weeks, which was a lot quicker than we expected. We want to promote wireless for safety in oil and gas applications, and what we really need to make it happen is standards like ISA100 and common guidelines and experiences—the more prescriptive, the better.”
These days, safety systems engineers need all the help they can get. Major capital projects (MCPs) have grown by an order of magnitude, and so have their systems. “A project that was $500 million used to be a large project. Now it’s tens of billions,” said Joe Pittman, safety instrumented systems team lead, Chevron ETC, in his presentation today at the 2014 Yokogawa Users Conference and Exhibition in Houston.

Safety systems are becoming much larger and more complex, and their design often must be distributed over multiple contractors and companies. “We’re not all on four or five floors in one building, all talking to each other,” Pittman said. And competency is a scarce commodity. “When the market is down, we lay off. When it comes up, we hire, but the result is a lot of people don’t have the experience. It’s worse overseas, in areas like China and Africa.”

Pressure is rising on speed of execution. “Companies are selling the product of these big, expensive new plants as of the day they’re scheduled to start up,” Pittman said. “But we still have delays in design and engineering; then we compress the schedule. This puts a lot of pressure on the contractors, especially the automation contractors.”

It’s an ongoing battle to create and maintain accurate and consistent documentation, and then there are the regulatory requirements. “Regulators are more and more in our business to see that we meet industry standards,” Pittman said. “Ten years ago, that wasn’t happening.”

To implement a safety instrumented system (SIS) successfully, it’s critical to reduce human errors when capturing design requirements, and to get those requirements correctly into the hardware design and the application code that controls the safety controllers.

**WHY iDEFINE?**

Pittman has found that Chevron can streamline SIS design by using Trinity Integrated Systems’ iDefine Software Suite. But first, his disclaimer: “I don’t work for Trinity, I just find the tools effective...
and easy to use,” he said. “The iDefine suite is a vendor-neutral requirements capture and configuration tool designed to reduce error by allowing engineers to work in a more natural interface.”

The suite uses state machines for sequential logic, and cause-and-effects for shutdown logic. This allows the engineer to concentrate more on functionality and less on translating the source documentation into function blocks and ladder logic.

The tested application can be used to generate vendor-specific SIS code, and the suite includes tools that provide management of functional safety, document generation and code simulation testing capabilities.

One of today’s large projects might involve 30 or 40 coders. “The suite provides the consistency you want to expect in a system,” Pittman said. Its templates conform to Chevron standards and “save configuration and test time, allowing code generation to be done later in the project lifecycle,” Pittman said. “This is a great advantage if you need to be able to squeeze the contractor.”

**FOUNDED ON STATE LOGIC**

State machine technology is easy to understand, and helps operations and engineering collaborate on what the safety system needs to do. A state analysis tool is used to build state chart-style models to describe detailed behavior. It begins by simply defining the various states and transitions of a piece of equipment. States are outputs, and transitions are the inputs required to move from one state to another. For instance, the states of a furnace would be:

1. Tripped,
2. Stopped,
3. Starting,
4. Running,
5. Stopping.

The next step is deciding what the outputs are for each state. Then define transitions by determining how to get from one state to another. For example, to get from tripped to stopped, you might press reset.

The iDefine State Transition Tool leads operations and engineers through designing the system. The suite’s Logic Editor is an IEC 61131 function block diagram (FBD) editor that helps graphically build diagrams. “A change in one place appears everywhere,” said Pittman, which greatly helps in reducing errors and maintaining documentation.

A Simulation and Test Case tool allows the user to apply logic to an easily developed simulation graphic for functional testing and simulation. Test cases are transformed into scripts that can be executed in emulation or a target programmable logic controller (PLC). In operation, “It’s a great troubleshooting tool,” Pittman said. “You can see exactly what tripped and why.”

White Board and Documentation tools are among Pittman’s iDefine favorites. “The designer says the thing he hated the most is documentation, so he did a great job on this tool,” Pittman said. “A change in any item of project data is reflected automatically in the documentation.” A Management of Functional Safety tool prevents users from proceeding to the next step before the previous step is completed.

Chevron is working with Trinity to develop a specialized version for itself and its vendors, and “Yokogawa is working closely enough with Trinity that when we make a change, they can look at it and verify it,” Pittman said. “Today, iDefine changes can be transferred automatically into Prosafe, but not the other way. In the future, I expect that ProSafe and iDefine will stay in sync, so any change made in one will show up in the other. Then we’ll be able to pull the code out of a dying PLC and put it right into ProSafe.”
Engineering is a challenging discipline, but sometimes it’s a snap compared to dealing with people. While technical and operational details are, of course vital, to running process operations, it can be at least as crucial to use the right people skills to successfully communicate among leaders, managers, supervisors and operators.

To encourage more effective use of these often-neglected soft skills, Steve Anderson presented “Creating a Culture of Safety Through Effective Leadership” today at the Yokogawa Users Conference and Exhibition in Houston. Anderson is the founder of Integrated Leadership Systems, a leadership training and executive coaching firm based in Columbus, Ohio.

Anderson began by asking: “What are some examples of cultural issues in your organizations that make it difficult to ensure the safety of your employees? What are the critical ingredients in a culture that has an excellent safety record? And what must leaders do to develop and maintain that culture?” He reported that the critical ingredients of safe cultures are aligned and engaged employees, effective communication, reinforcement of desired behaviors, and challenging of undesired behaviors.

“You can’t just tell people when they’ve screwed up. They have to know when they’re doing right much more often,” said Anderson. “This is a more effective way of letting them and their colleagues know what you want them to do.”

Anderson reported that his program was developed and taught to a large construction company in Ohio as a part of its commitment to improve safety after a fatality. “They completed safety checklists and quarterly safety audits and posted the results. The result was this company and one of its subsidiaries both recently won national awards from the Associated General Contractors (AGC) of North America as having the best safety record in their class in the U.S., and they went from being an $80-million company to being a $250-million company during the same time period. A culture of safety isn’t just safer—it’s also more profitable.”
However, achieving these kinds of results means changing some traditional practices and assumptions. Anderson says the old, top-down, do-as-I-say leadership structure should be replaced by a servant-leadership model. “This means the most important people in the company are those on the front lines, serving its customers and making the money, and it’s the leader’s job to help them succeed by finding and providing what they need to be most effective.”

**WORDS CONVEY ONLY 7% OF MEANING**

Anderson explained the most important part of this servant-leadership model is effective communications, not so much with emails, but by face-to-face interaction. “About 55% of personal communication is body language, 38% is tone of voice, and only 7% is words, so text loses about 93% of the information that senders want to get across. This is why we need more face-to-face,” added Anderson. “Email is especially deadly to discussing complex issues effectively because it doesn’t establish the feedback loop that face-to-face does to show that recipients understand what’s wanted of them.”

This old disconnect is exemplified by the fact that many bosses think employees just want money, while what they really value is interesting work, appreciation and the ability to contribute opinions and ideas. “Research by Development Dimensions International Inc. shows that highly engaged employees have far fewer quality errors than disengaged employees—about 52 errors per million pieces made versus 5,658 for disengaged employees.” Further, engaged employees feel that their work is appreciated, and they feel that their opinions count. “For optimal motivation, employees need four positive stokes for every one time they’re criticized, and this means catching them doing right daily,” Anderson said.

“According to the book Positive Discipline, recognition is most effective when it’s timely, specific, personal and proportional. Timely means don’t wait until the review—do it now! Specific means telling the person exactly what they did right. Personal means delivering the input in a way that each person finds meaningful. And proportional means making that communication appropriate to what the person did.”

To avoid destructive control-dependency loops that reinforce aggressive and passive-aggressive behavior, Anderson stresses that leaders must truly listen to their employees and encourage them to speak the truth. This also requires all players to be assertive, but not aggressive or excessively emotional with each other. “This requires participants sitting face-to-face, describing what was done and how it made them feel, making a plan for the behavior that’s wanted, and staying positive,” added Anderson. “Managing emotions means acknowledging, accepting, assessing and acting on them, so you manage them instead of being managed by them.”
Connect Operations to Business Systems with IoE
How the Internet of Everything (IoE) Closes the Gaps Between Systems and People
by Paul Studebaker

From the steam engine to electrical power, the history of technological innovations shows that the Internet is a real step change, “that next big phase,” said Greg Carter, general manager of Cisco’s IoE Solutions Group. Thus far, its effect has been felt most in businesses and in offices. “Now it’s stretching out into operational environments,” Carter said in his presentation today at the Yokogawa Users Conference and Exhibition in Houston. The Internet of Everything (IoE) “extends the power of convergence to deliver business outcomes in operations by extending the network outside of IT and into the operational environment. All that data from all those processes is now available to business systems, and all those people are now connected.”

Cisco’s efforts to support IoE in industry are focused on oil and gas, manufacturing, utilities, transportation, cities and healthcare. Its developments include ruggedized routers and switches with form factors that can deal with vibration, noise and weather. They’re designed to join disparate and proprietary networks, and above all, to ensure security. “It’s a difficult problem, but it’s worth doing to allow free flow for collaboration, analytics and intelligence,” Carter said. “We’re going to see huge improvements in productivity.”

For example, connecting people, processes, data and things in industrial automation systems offers compelling advantages for unmanned and remote operations. “We’re seeing huge investments in figuring out how to keep people out of dangerous environments, as well as leveraging limited resources to help deal with the lack of skilled people,” Carter said.

IT/OT Integration

Connecting many different kinds of wired and wireless networks takes a lot of information technology (IT) and operation technology (OT) system integration, which means IT and OT people have to work together, Carter said, “bridging the culture gap between IT and OT.”

“It’s a difficult problem, but it’s worth doing to allow free flow for collaboration, analytics and intelligence.” Cisco’s Greg Carter on why it’s worthwhile to solve the security concerns that limit more widespread use of IoT technology.
Cisco studies show that 53% of industrial cyber attacks have been made on the energy industry. Only 20% are intentional, and 50% are from the inside, primarily from non-intentional malware introduced through USB media. "We used to think we could air-gap and be safe, but that’s not true," Carter said. "Insiders will accidentally bring in a threat."

To help address the situation, Cisco's Secure Ops Solution brings access control inside the facility, delivered as a hosted managed service to help manage costs. For example, Cisco has worked with Yokogawa and a key customer to secure an industrial IT control network. The solution addresses the most significant attack vectors within process control networks by establishing required controls associated with best-of-breed security practices. The solution is tuned to the special needs of control systems. For example, a commercial system might prioritize integrity and confidentiality over availability, requiring log-in authentication to allow access. But a safety system has to allow instant access to mitigate an incident, so its priorities are availability, then integrity, then confidentiality, Carter said. "Instead of a password that might delay upset response, we might put a better lock on the control room door."

Yokogawa and Cisco complement each other’s strengths. "We don’t have experience in automation; Yokogawa doesn’t have our expertise in IT," Carter said. "We put our strengths together. The end customer sees a set of dashboards showing the health of their environments and their security. They have true situational awareness for industrial risk management."

SECURE, EFFECTIVE REMOTE ACCESS

On another front, "Industrial customers are panicked, worrying about security, but pressured to give remote access and let contractors into their plants to perform monitoring and maintenance,” Carter said. For this, Cisco offers Collaborative Operations Solutions (COS).

"We have a rich set of collaborative tools for businesses. For example, telepresence lets you have a real business meeting, with all the visual cues that let you progress much faster than just talking on a phone,” Carter said. Meanwhile, on an oil rig in the ocean, all you have is a sat phone. "It’s difficult to hear, the guys are speaking in accents—you have about a 60% chance of solving a problem over the phone. When you don’t, you get on a plane and a helicopter and go out to the rig. You have lots of downtime.”

People have told Carter, "I don’t need to look the guy in the eye; I need to look through his eyes.”

Cisco’s response was that "We took assets that we have and rearranged them to work over satellite, to bring video from fixed or mobile cameras, on a hardhat or on the equipment, as well as audio from the phones of everyone that needs to collaborate,” said Carter. The result is a Webex designed for operational environments, "with multiple screens with data from wherever it’s needed,” he added. These are just a few examples of how IoT can be leveraged to improve operations. "We have the security to confidently connect IT and OT, and to bring big data in for collaboration and analysis,” Carter said. "It’s worth investing in security and network systems to unlock the potential and productivity.”
AUTOMATION AND CONTROL
IN THE PLANT OF THE FUTURE
From Pervasive Sensing to the Cloud, Change Is Coming Quickly
by Paul Studebaker

It’s an interesting time in our industry, and not an entirely happy one,” said Walt Boyes, principal, Spitzer & Boyes, to open his keynote speech today at the Yokogawa Users Group conference and Exhibition in Houston. “Changes are coming; changes are here, and all at once. Our traditional slow movement in adopting new technologies is breaking down.”

The cloud, mobility, sensing, millennials, big data and analytics, the Internet of things (IoT), apps, social interaction, analysis, control technology, work practices and preferences are all coming at once. It’s going to affect how plants are built and operated, both new plants and brownfield plants, “and it’s not going to be unpainful,” said Boyes.

The process industry workforce is going through its biggest change in history. The current generation went from manual and single-loop control to distributed controls and advanced control. “We can walk through a plant and hear a problem, but that situational awareness is going away. The panel men who could look, see a problem and go fix it are going away,” Boyes said.

The current generation has never operated a plant in manual mode, and a modern plant can’t be run in manual. They require readouts and alarms to tell what’s wrong, but they don’t know what to do about it. We can’t give them enough training to know what to do in an upset, Boyes said. “To them, the plant is a magic box. They use the tools, but they don’t understand the controls or the process.”

Millennials think differently. They see a mouse, keyboard and display as limiting. They say, “Where’s the tablet? Can’t I just use my phone? You mean I have to type stuff in?” They want mobility, not to be trapped in a control room. “We had the opportunity to learn by doing; they want to learn by doing, too, to replace our situational awareness model with one of their own,” Boyes said.

THE FLATTENED ENTERPRISE

Boyes predicts that the enterprise hierarchy will be flattened to two
layers—a real-time layer of production and control, and a transactional layer of supply, enterprise and distribution. He said, "We will be using business parameters as the feed-forward variables to run the plant, and the controls will provide feedback and constraints.

"Today, we operate the whole plant in open-loop control—the operator is an open loop. When the plant drops out of an operating state, you have an uncontrolled failover. We depend on the safety instrumented system [SIS] to handle this. That's like relying on the emergency brake every time you bring a train into a station. We can make the control system smart enough to handle that 90% of the time."

**SENSORS AND ANALYZERS EVERYWHERE**

Sensors are increasingly simple, less costly, wireless and able to measure many parameters, to perform control and to calibrate themselves. "We do single-loop control because Foxboro couldn't figure out how to multiplex a pneumatic controller, so they gave us only the most important parameter," Boyes said. "We don't have to do it that way. Now we can measure temperatures continuously all the way up and down a fractionating tower, and control on them."

Boyes predicts that there will be no analog outputs. "It will be all digital, and wireless will take over because wires cost too much, and wireless is just as reliable," he said. "Analyzers will be online, and their outputs used as control variables."

**BIG DATA, THE CLOUD AND IOT**

Aggregation of data will revolutionize control. "Equipment will wake up, see if it has a problem, and if it can't fix it itself, write and send its own work order," Boyes said. "Maintenance and control people will work to optimize, not gather and analyze data."

The industrial Internet of Things (IoT) will do for sensory data what the PC did for control. A modern DCS can run on commercial, off-the-shelf (COTS) PCs, and industrial control can run on COTS networks, Boyes said. "COTS networks will have to be more robust than industrial networks, because they're designed for housewives and kids."

New businesses will develop cloud databases of publicly available information, useful for refining operations and control systems—things like weather and injury statistics. "These knowledge bases are already here," Boyes said. "Google is trying to put together an oracle. Putting all these facts in one database allows you to start connecting the dots: Ask a question, get a fact, with a factor indicating its level of confidence."

The process industries kill hundreds and injure thousands of people every year, usually during start-ups, shutdowns and upsets. "It's not just the big-boom plants; it's also food and pharmaceutical facilities," Boyes said. Worker and asset safety must
and will improve. "We need procedure-controlled automation, smarter loops and better safety systems," he added. "With pervasive sensing and wireless networks, we'll know where everyone is so we can go and pull them out. We'll even know where we parked the fire truck."

**APPS TO MODULARIZE CONTROL AND HMI**

"Apps will fit together like Legos. You'll be able to pull the ones you need and the ones each employee needs," Boyes predicted. They'll be easy to program and upgrade, so you won't have to upgrade the whole system.

Human-machine interface (HMI) design will be decoupled from the control system. "Today, Southern Company has eight different control systems in its plants, each with its own HMI," Boyes said. "It's developing an HMI template overlay that gives any one of the systems the same look and feel as any other, so an operator trained on one system can work in any plant.

"We'll have people running around the plant in Google glasses with tablets in two to five years. We'll have to change how we classify hazardous areas to accommodate them, and it's not a problem, because with fugitive emission laws, most hazardous areas already aren't."

With more sensors, more data, much more complex models and information in real time, "We have virtual augmented reality control systems," Boyes said. "Operators can walk through the plant virtually within the control system, point at a pump and see what's going on with it. The cost of this technology is dropping every day.

"Yes, it's a security nightmare. We have to work out a security design for an entirely new paradigm. The rapid pace of change means only automation suppliers will be able to stay current on the technology, and they'll increasingly become the main automation contractors."

The proliferation of technology and productivity will put many people out of work, "just as horses could not be trained to become cars or tractors," Boyes concluded. But that's a subject for another story.
Even experts need advice and support in new and unfamiliar areas, and the best ones know when to seek it out. Knowing what you don’t know is half-way to knowing, right?

Well, multi-talented engineering, procurement and construction (EPC) firms often have all the answers for their industrial clients. However, when they need some added or more specialized know-how, especially if it’s related to Yokogawa’s many technologies and solutions, they can consult with several of its engineering services organizations, which were also organized around EPC needs about two years ago.

Several representatives of these teams discussed their capabilities and answered questions during an EPC panel discussion this week at the Yokogawa Users Conference and Exhibition 2014 in Houston.

"The main goals of EPCs are meeting schedules, minimizing costs and mitigating risks on a project, and Yokogawa does the same with our VigilantPlant Solutions (VPS) for automation systems, Advanced Analytical Solutions (AAS), and Measurement and Control (M&C) program," said Ken Trimble, Yokogawa executive account manager, who moderated the panel. "In fact, our VPS group includes more than 300 engineers, designers, fabricators and other discipline personnel and has completed more than 500 projects from $500,000 to $120 million, including main automation contractor (MAC)-type services." Similarly, the AAS division has installed more than 8,000 analyzers as part of projects in more than 24 countries. It has experienced sample-system engineers, dedicated sample-system fabricators and complete factory acceptance test (FAT) facilities.

**PLAN AHEAD, MONITOR CLOSELY**

Because all projects have their own unique issues and problems, Trimble reported that Yokogawa’s EPC teams work closely with each one to develop a detailed project-execution plan for completing its project successfully. These
plans include conducting risk analyses, developing contingency plans and dealing with hard issues as they occur. "We have good knowledge of our market space and competing offerings and technologies, but we have superior knowledge around our own products and offerings," said Trimble. "If we tell the customer something, then they can take it to the bank. We'll also build panels and dedicated sample-system buildings as needed because maintaining a single source makes sense. We may not be the lowest bid, but we'll have the right bid. We're honest with our customers—sometimes brutally so—taking the philosophy that we would want to be told as soon as an issue arises, so the right mitigation plan can be developed or the proper decision can be made."

VPS works out of two buildings with a total of 160,000 square feet in Newnan, Georgia, and Sugar Land, Texas. These two facilities have a combined 80,000 square feet of fabrication and staging space. More recently, the Newnan site also expanded its measurement and control (M&C) flow lab to handle more shale gas and greenfield projects. The Texas office opened at the same time as its counterpart facility in Singapore, but even though they're far apart, they still collaborate effectively, according to Ron Eddleman, Yokogawa's sales manager for Advanced Analytical Systems Integration in North America. "We communicate very closely and attend each other's meetings and factory acceptance tests (FATs) to get projects off the ground," said Eddleman. "In fact, we just finished a large project with three system integrators for which we did 80% of the work in Singapore, but managed it from Sugar Land."

**ACT PROACTIVELY TO HEAD OFF SCHEDULE RISK**

Trimble added that typical risks to the costs and scheduling of most projects include incomplete specifications, late submittal of requests for quotes (RFQs), incomplete stream data, long drawing review cycles, long lead-time analyzers, exotic materials requirements, design changes after drawings are approved, unrealistic schedules and international shipping delays. "We meet these challenges with our sample-system design experts, who also offer classes in sample-system design, as well as our dedication to analytical systems integration, strong project management teams, veteran sample-system fabricators, complete FAT facilities and our gas chromatograph (GC) lab in Sugar Land," said Trimble. "Every project is assigned a dedicated project specialist that serves as a single point of contact for all matters," added Trimble. "Project kick-off meetings are held to discuss deliverables and expectations at the beginning of each project, and they're staffed with a project documentation team that prepares all project documentation. Also, varying reporting methods are used as dictated by individual project requirements, and frequent status meetings are held to update all stakeholders on project status and resolve any open issues."

Curtis Casebier, Yokogawa's vice president for VigilantPlant Solutions in North America, added that, "All projects can be done better, and our industry is all about learning experiences. So we gain a lot from lessons learned over time about how projects can be better organized and carried out. However, we're not going to get the best data on the first day of any project, so we plan activities along the way to take advantage of the most useful data we can find. You can't realize what not to do until you have that good data. At the same time, many EPCs bring in too much instrumentation and other data that quickly becomes unusable, so we can help them and their clients prioritize upfront and focus on what they need to know to make better decisions."
ENERGY CONSUMPTION VISIBILITY IS FIRST STEP TO SAVINGS
Rigorous Models, Complete with Equipment Limitations and Emissions Constraints, Help Users Optimize Energy Costs
by Paul Studebaker

Sometimes enlightenment just means a deeper understanding of what’s already familiar. For example, process control applications have been so focused on performance optimization over the decades that energy consumption was sometimes an afterthought. Not anymore.

Today, process engineers are seeking every means possible to rein in high energy expenses, and Yokogawa Corp. of America and its partners are coming up with some innovative and easily applied ways to help. For instance, Visual MESA energy-management software from Soteica can help users examine and analyze their energy use much more closely and find efficiencies they couldn’t before, according to Oscar Santollani, Soteica’s CEO.

“Everyone wants to know how to leverage their existing infrastructure to assist operators and shift supervisors in reducing energy costs 24/7/365 within emissions constraints; solve their energy and carbon balances; and give their organization validated and consistent energy and emissions key performance indicators (KPIs),” said Santollani, who presented “Improving Energy Performance: Industrial Case Studies of Monitoring and Optimization” today at the 2014 Yokogawa Users Conference and Exhibition in Houston.

START WITH FIRST PRINCIPLES

Because they’re process control engineers, many users want to apply the same procedures to energy that they do to their regular applications. “They want to make the principles of process engineering seamlessly available through a rigorous, site-wide, real-time energy and emissions mathematical model like Visual MESA,” said Santollani. “These principles consist of plant-wide mass and energy balances, including interactions among all energy subsystems, such as steam, boiler feed water, condensate, fuels, power, hydrogen, chilled water, etc. They also include first principles-based equipment models and thermodynamic calculations, as well as theoretical..."
combustion calculations. These can all help improve optimization and economics. It’s becoming extremely important for users to think about how entropy may affect economics."

Santollani added, “By applying rigorous first principles, such as mass and energy balance, you’re ensuring sound engineering calculations as well as consistency. By including economics in the rigorous model, you’re bringing real, money-generating KPIs to the control room and aligning operations with your company’s profit and loss statement. And by including optimization in addition to simulation, you’re fulfilling the true purpose of your decision-support systems.”

However, before Visual MESA and other helpful energy-analysis software can be successfully deployed, Santollani added, they must pass the “reasonable operator’s test.” The software has to be able to run unattended and achieve typical uptimes of greater than 90% in both open-loop and closed-loop where applicable. “Also, it has to be measurement driven, but at the same time able to adapt to faulty measurements on the fly. Finally, the model must be able to be maintained over time.”

Santollani reported that Visual MESA gives users several primary capabilities for improving energy performance, including utilities optimization, energy management KPI calculations, monitoring, auditing and accounting. He added that BP Ligen’s facility recently implemented Visual MESA, which produced operational recommendations that added up to 2 to 4% of its energy costs. “Utilities systems models can deliver a financial gain by reducing the impact of exceptions,” said Santollani. “Having all the information of your site-wide utility systems, as well your equipment limits, your emission limits, your reliability constraints and your contracts in one model brings immediate value, and can serve up validated and consistent energy and emissions KPIs to the entire organization. Utilities have always been the ugly duckling of process control because no one really wanted to look at them. But they’re a lot more attractive now because users can make some real gains and money by addressing them.”