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Answers for industry.
SOMETIMES THERE’S MORE to a new innovation than meets the eye. Google Glass is the latest bit of see-it-to-believe-it commercialized “wow” to show up in exhibit halls. The technology itself has been around for quite some time, but now it’s being touted as an interface for accessing controls data, viewing an instructional demo video on resetting a valve or asking the opinion of a colleague in another country about whether to use pneumatics, hydraulics or servos on a motion application.

We assume we know what Google Glass will enable us to do, but we won’t really know for sure until we start using the tool and figure out its potential applications. I can almost guarantee that in three years it will be used to complete tasks no one has even considered at this point. ‘The future’s so bright, I gotta’ wear Google Glass.’

The Internet of Things will enable access to an inordinate amount of data. How much? I recently attended a conference where one company rightfully boasted of the terabytes of data that it will be capable of managing in one application. And on first blush, that sounds impressive. But think of how quickly we’ve moved from kilobytes to megabytes to gigabytes and now to terabytes. It won’t be long before we look back fondly on the quaint past when you might have to use pneumatics, hydraulics or servos on a motion application.

Google already processes more than 20 petabytes of data on a daily basis. For Google, the hardware is simply a means for interfacing with the data. And we all know that Google knows data. Rather, Google knows what to do with data. It knows how to access it, how to index it and how to make just the right data available at the exact moment you need it.

Remember when you thought it was creepy for Google to be able to autofill your search request? Now you use it as a tool to find things you didn’t know you were looking for. So many of the brilliant things we have, from Teflon and vulcanized rubber to Coca-Cola and potato chips, were the result of a discovery that people decided to use differently. Google Glass will most likely take the same path. Put on a pair, and see what you think.
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5 Must-Have Programming Features

**WHAT ARE THE** most important programming software features? In my previous column (www.controldesign.com/articles/2014/industrial-controller-programming-top-needs/), I shared the supplier voice on this question, and this one shares what OEMs have to say. The five features listed as most important by suppliers were ease of use, automatic connection to the controller, one programming package for an entire family of controllers, ability to reuse code and support for multiple programming languages.

Machine and robot builders agreed with suppliers on three of these five features—ease of use, support for multiple programming languages and ability to reuse code. However, the OEMs listed two other features of greater importance to them—global acceptance and the ability to accommodate motion and robotic control along with traditional PLC functions.

Ease of use covers a wide range of attributes expressed by Mike Roth, electrical controls engineer for automated packaging equipment builder Massman Automation (www.massmanllc.com). “Flexible tag naming, array structures, motion instructions and PID instructions should be available and well-supported in the programming environment with online help and concise information pertaining to compilation errors. Features such as drag-and-drop, cut-and-paste and autofill fields all help reduce programming time and errors,” explains Roth.

Daren Myren, controls engineer at packaging system supplier Aagard (www.aagard.com), says programming software should have these three ease-of-use features—programming that’s easy to navigate and search, responsive communication with the PLC/PAC while online and trending/scope capabilities to monitor tag values and transitions.

Support for multiple programming languages is important to OEMs and suppliers alike, as is the closely related feature of support for a wide variety of instruction types. “At minimum, programming software should support ladder logic, structured text and sequential function charts (SFCs),” says Kevin Alexander, unified support manager for Bastian Solutions (www.bastian-solutions.com), a material handling systems integrator. “For machines operating very sequentially, SFCs provide a very robust and streamlined method for controlling a sequence of operations.”

Roth says the final feature of importance is the ability to accommodate PLC, motion and robotics. “Having to learn just one programming software package for multiple automation disciplines increases efficiency and creates an environment that brings an automation team together. Time and energy can be spent on the automation task at hand versus learning multiple software packages,” notes Roth.

“Massman has a partnership with a well-known robot manufacturer because its hardware can be programmed and controlled via a Rockwell Automation control platform. A single programming software language for multiple disciplines improves reliability, supportability and control simplicity, and it also allows information to be seamlessly shared between the PLC, motion axis and robot,” explains Roth.

PLC/PAC programming software. Rockwell Automation has an extensive distribution and support network in the United States and Canada. Because of this, most of our North American customers either mandate or readily accept equipment with their control platforms and programming software. It’s apparent that Rockwell Automation has also made gains in Europe because of an increase of the acceptance of its use with Massman’s customers outside North America.”

“As Alexander notes, a wide variety of instruction types allows for scalability and reusability, a third feature important to OEMs. “Software that works for a variety of platforms allows a programmer to generate standards that can be used from project to project, improving reliability and allowing for much quicker implementation,” concludes Alexander.

A feature cited by OEMs, but not suppliers, is global acceptance by the customer base of the software and its supported controllers. “The software must be globally accepted and utilized by factory managers, engineers and technicians,” says Roth. “End users must be able to extract production data, make program changes and troubleshoot factory floor equipment. Poor performance, downtime and uncertainty can be attributed to the lack of availability, familiarity or ability to use PLC/PAC programming software. Rockwell Automation has an extensive distribution and support network in the United States and Canada. Because of this, most of our North American customers either mandate or readily accept equipment with their control platforms and programming software. It’s apparent that Rockwell Automation has also made gains in Europe because of an increase of the acceptance of its use with Massman’s customers outside North America.”

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LEGOS ARE ADMITTEDLY great, but they aren’t the only game in town. With all the recent coverage of science, technology, engineering and math (STEM) education and related competitions, it can seem like the legendary plastic blocks from Denmark sprang out of nowhere, took over the world and are the only option for building systems. This is not true, and it would be good to remember it this holiday season, especially when you’re seeking gifts or have some extra time to spend playing with your kids or grandkids.

Legos are just one among many construction toys and hobby sets that all provide excellent opportunities for young builders to play and have fun. First with my brother and more recently with my daughters, I’ve been hip-deep in Legos many times. However, I also remember building with everything from big, plain wooden blocks to little, colored wooden blocks to Tinker Toys, dominos, playing cards, popsicle sticks and pretty much anything else we could get our hands on. I think mine and most other moms and dads drew the line at gravy-filled canals, dams and levies in the mashed potatoes.

The value of these activities is they help to instill and develop the spatial, mechanical and perceptual appreciation and the abstract and critical thinking skills that are the foundation of all good engineering practices. I believe understanding physical forces and environments is especially important in today’s mostly on-screen environments dominated by video games, CAD, software programming and the Internet. Connecting with the real world is even more crucial for staying grounded when building virtual ones.

Of course, blocks are only interesting for so long, but FIRST Robotics (www.usfirst.org) and all the latest technical competitions have their predeccessors and can be put into historical contexts, too. I recall blocks and Legos were accompanied by and gave way to Hot Wheels, model trains, slot cars, plastic models, rockets and early radio-controlled vehicles.

In one serious conversation in third or fourth grade, I was solemnly informed about the coolest place on earth, Polk’s Model Craft Hobbies in New York City, and, when I finally got to go there, I found the buildup fell far short of the reality. Unlike most small, cramped hobby shops, Polk’s filled an entire old office building on lower 5th Avenue. Each of its five or six floors was two or three times the size of an average shop, and each was devoted exclusively to a different model category—trains, airplanes, ships, cars, rockets. It was an eye-opener to be sure. It relocated to New Jersey in 1980 and closed in 2013. Its G-scale train division maintains an online presence at Polks Generationext.

Personally, I was just as amazed on another excursion to nearby and equally legendary Tannen’s Magic on 34th Street. All of the sales guys appeared to be trained magicians who spent much of their time levitating silver spheres and making canes appear from nowhere.

Likewise, having experienced the often flimsy construction and connection problems of at-home slot-car sets, I was similarly impressed by the huge, solid raceways and larger, more powerful cars at the rare and terrific commercial tracks. I don’t recall more than just looking on at Buzz-A-Rama on Church Avenue in Brooklyn, New York, but it made enough of an impact that I thought much more highly of Des Plaines, Illinois, when I began covering it for the local weekly newspaper in 1985 and encountered its Dads Slot Cars on Lee Street. Both are still up and running today. I also thought better of another town I covered, Morton Grove, Illinois, when I learned that most of the Revell models I’d built years before came from its headquarters there. It’s since moved to nearby Elk Grove Village, Illinois.

Though many of these magical places are long ago and far away, they remain vivid in my memory. Fortunately, though we may not have them physically nearby anymore, most retain websites and online presences, through which many of their products can still be obtained and played with by generations young and old.

Of course, the point of all this is that Legos and other well-known activities are just the tip of the iceberg when it comes to sparking kids’ interests and enthusiasm, and many of them are closer than you might think or are at least within reach. So do a little extra investigating this holiday season. You might start out giving the children in your life toys and hopefully playing with them and end up providing something much more valuable—the capability to become innovative engineers or other imaginative, well-adjusted professionals.
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THE OBVIOUS SIDE of packaging is building boxes, filling bags, packing cases and wrapping pallets. The less visible, but just as crucial side is fast, accurate, efficient and gentle material handling. Virtually all consumer products and other manufacturing sectors depend on unscrambling, sorting, orienting and moving raw materials, end products and their containers into, out of and between filling stations and then doing the same for progressively larger cases in more varied combinations.

Shuttleworth (www.shuttleworth.com) in Huntingdon, Indiana, knows these needs as well as any machine builder because it was founded by the inventor of Slip-Torque low-back-pressure conveying that’s been gently and speedily handling products and packaging for more than 50 years. Jim Shuttleworth started his company in 1962 after selling all but the machinery part of the canning business his father, Charles, started in 1938. The younger Shuttleworth worked in his dad’s company from a very young age, and, when he was just 13 years old, father and son jointly developed a can unscrambler that allowed cans to be fed in before spinning them out one by one.

Shuttleworth later earned a mechanical engineering degree from Purdue University, but his father died when he was 22 years old, and he sold the canning business to Hunt Foods three years later. The new machine firm didn’t lose any time and quickly developed its Shuttleworth Futurematic high-speed hydraulic case packer for placing bottles or cans into cases and began licensing it internationally in 1965. Over the years, the company grew to accommodate material handling tasks in the automotive, consumer electronics, energy, food, healthcare, industrial and paper industries.

These and other applications have all benefited from the Slip-Torque technology that Shuttleworth developed in the mid-1970s. It uses the coefficient of friction between rotating stainless steel shafts and loose-fit rollers with many different surfaces to control the driving force transmitted to conveyed products, and it then slips during accumulation to minimize damage on products, such as frozen pie crust shells. Slip-Torque gently accumulates, flips, stacks, rotates, pushes, diverts, indexes, combines and forms products into patterns between manufacturing processes.

“Traditional case packers weren’t very good at handling the tops of bottles and would move them and then be unable to find their necks. Slip-Torque was able to accumulate them better for more efficient packing, and then more applications were found on accumulation tables after filling and before lidding,” says Todd Eckert, Shuttleworth’s business development manager. “This buffer zone allowed fillers to keep working while lidder operations were set up and then meter out products as needed. This provided a lot more flexibility between filling and lidding, but Slip-Torque can do the same between unscrambling and filling or at the beginning or end of a whole production line.”

In addition, Slip-Torque’s flexible, modular components include multi-lane, multi-speed, multi-pressure capabilities, as well as forward and backward direction in one frame and delivered by one drive. It’s also ideal for sensitive material handling requirements, including Class 1 clean rooms; explosive, conductive or chemically sensitive or abusive environments; heavy washdown or blow-off cleaning applications; and production lines affected by powdered metal, paper dust or machining oil.

Though Shuttleworth himself died in 2003, his company and his legacy of innovations continue to serve users worldwide as a leading designer and manufacturer of conveyors for sensitive, fragile and difficult-to-handle items. His wife and longtime marketing director, Carol, ran the firm until 2011, when she retired and sold it to Pro Mach in Loveland, Ohio.

In the past eight years, Shuttleworth’s professional heirs have added new innovations and capabilities to the company’s machines, including speed modulation;
high-speed, gated in-feeds; servo motors and servo drives; and better sensors, including vision. During the same period, the company developed and launched its first standard, high-speed, gated in-feed machine, SmartFeed, which stages products coming in randomly, stops them briefly at a gate, uses a presence sensor to check each flight of products, and then times their release. SmartFeed previously used a 1-hp motor and belt drive, but now uses a 1/4-hp motor and chain drive, which can run up to an 80-ft conveyor frame section to better avoid product separations and gaps. The machine builder typically employs MicroLogix 1000 or 1400 PLCs, Allen-Bradley PowerFlex 4 variable-frequency drives (VFDs) and EtherNet/IP networking components from Rockwell Automation.

“This is a lot easier than traditional belt conveyors because they need multiple frames and drives, but SmartFeed only requires one frame for multiple drives,” explains Eckert. “The speed modulation and sensing we’ve added in the last eight or nine years allow us to run different lengths of the same conveyor at different speeds, which means we can tell a wrapping machine on the line to speed up or slow down and better match other materials to the production operations. We’ve been using fractional-horsepower motors, such as Brother or Dodge, for about 15 years, but we only added vision systems about four or five years ago. We can integrate Cognex, Banner or Dalsa for barcode reading, color sensing or whatever other functions our customers need to perform.”

Likewise, Eckert reports that product stops in Shuttleworth’s high-speed, gated in-feed equipment have transitioned over the years from all pneumatic controls to also offering servo-driven rotary actuators, such as those available from Rockwell Automation or Parker Hannifin, which allow more speed, accuracy and better placement of products. “For example, if we’re running at 80 ft per min, we can begin with low-back-pressure accumulating and speed-modulated conveying, better manage the end-to-end section in the middle and match the film speed of a wrapper on the end section,” says Eckert. “We also have a lot more choices with our family of solutions. A line running at 60 ft per min to a wrapper can still use pneumatic gates; a line running at 100 ft per min can use a servo-rotary gate; and a line running at 200 ft per min can use servo motors and drives, SmartFeed and servo-based correction zones.”

This level of flexibility is another tradition at Shuttleworth because, even though SmartFeed is a standard family of automated, in-feed solutions, almost all of the company’s material handling equipment and projects are still custom-designed and built for each user’s application. “We do industrial designs based on aluminum frames and use stainless steel and food-grade rollers in wipe-down and washdown applications. In fact, we can install 60 different types of rollers based on the requirements of each application,” adds Eckert. “As always, we just match the right technology to the speed and capabilities required by each customer and make sure it will deliver the best performance and return on investment for them.”
‘Jump the Curve’ to Foresee Innovations

SEEING THE FUTURE is easier if you take off blinders in the present. That’s because many potential and upcoming innovations are already foreseeable, given today’s capabilities and tools. What’s needed to reveal them is awareness and the humility to give up stuck-in-a-rut thinking patterns that stifle useful questions and possibilities. Then the will to action can turn these desired futures into new realities. This is easier said than done, of course, but futurist Jack Uldrich lit some sparks in his keynote address to Emerson Global Users Exchange delegates during the October conference in Orlando, Florida. Uldrich has written more than 10 books, including his latest, Foresight 20/20.

“The futurist’s job is to focus on the big picture and point out the 800-lb gorillas that others are missing because their attention is focused elsewhere,” said Uldrich. “I want to help future-proof your businesses against all the changes that are coming tomorrow. Many business models are changing quickly, while others are fading away, so it’s important to be aware of changes you might not be able to see.”

Uldrich reported that developing this keener awareness begins with “jumping the curve” to learn about and understand seemingly futuristic technologies that are already being applied now, but are rapidly dropping in price, increasing in capability and about to mush-room in the mainstream. Uldrich identified 10 major technical areas in which presently available technology and tools can enable future ingenuity and innovations.

1. Wearable devices, such as Google Glass, that are being used in some remote oil and gas applications to call up mentors and videos to provide immediate technical expertise and advice.

2. 3D printing, which is moving beyond making plastic trinkets in desktop boxes to additively manufacture metal in much larger, stronger forms. “GE reports it’s going to print aircraft engines in a couple of years,” said Uldrich.

3. Oculus Rift virtual reality goggles, which quickly raised $1 million in Kickstarter funding, raised $25 million more in venture capital and was recently sold to Facebook for $2 billion. Uldrich reported Tesla Motors already is using the goggles to visualize designs in three dimensions before it prints them.

4. Nanotechnology embraces a variety of different technologies. Some highlights include: Water Is Life’s Drinkable Book with silver nanoparticles for filtering contaminated water in undeveloped, poor and remote places; the first superconducting, electric power transmission lines in Essen, Germany, which are reportedly five times more efficient; and graphene-enabled batteries that may allow electric vehicles to be changed far more quickly.

5. Robotic innovations, such as Baxter’s touch-sensitive arms that can work directly with humans, Amazon’s proposed delivery drones and Google’s self-driven cars project.

6. Sensors, microprocessors and RFID tags embedded in far more varied and widely distributed settings, including bridges and smart buildings. Uldrich added that Emerson’s instrumentation, pervasive sensing and wireless solutions are reducing maintenance costs and identifying problems before breakdowns occur.

7. Genomics is doubling its capabilities every four months, according to Uldrich, which will revolutionize the healthcare and pharmaceutical industries, but will also aid applications like genetically modified bioreactors that can work with the sun to turn CO₂ into biodiesel or ethanol and make both commercially viable.

8. Computing power, in which solutions from IBM’s Watson to Apple’s Siri are increasing their data-processing power exponentially, so they can soon supply answers to users’ questions before they think of them.

9. Renewable fuel sources that Uldrich says can both assist and be enabled by the other primary innovation areas.

10. Collaborative consumption that changes business models for goods like automobiles, which don’t need to be individually owned in urban areas, but can instead be checked out as part of subscriber-based cars-to-go programs.

“Many large industries say change can’t happen fast, but North America was looking at importing natural gas just 10 years ago, and now we’re going to export it, thanks to the development of new drilling and fracking technologies,” added Uldrich. “The opportunities for ingenuity are being greatly extended, but we must have humility, keep an open mind and be aware of them. However, we’re conditioned to see the world in one way. So when something really new stares us in the face, it can be hard to see. So we have to work at seeing it, gaining the confidence to innovate into the future we want to build.”
JUST AS VIRTUALIZATION technology transformed the IT landscape and crept into the supervisory and execution layers of many a manufacturing facility, it’s now poised to invade real-time controls, too. “The technology is inevitable, and it’s coming sooner than you think,” said Rich Carpenter, chief technology strategist at GE Intelligent Platforms (www.ge-ip.com), in his presentation “Virtualization of Control in the Era of Software-Designed Machines” at the company’s User Summit in October in Orlando, Florida.

In making his case that the time for embedded virtualization has arrived, Carpenter pointed to other examples of systems that already mix critical and noncritical functionality. “Today’s cars will brake for you and park for you, yet play your favorite music too,” Carpenter noted. As in the automation industry, “this integration of critical and noncritical systems is driven by the desire to deliver new services and functionality.”

The move to embedded virtualization comes even as platform providers shift to increasingly powerful multi-core, multi-threaded systems. Indeed, multi-core systems are tailor-made for performing multiple simultaneous tasks; what makes them appropriate for industrial control is the ability to provide strong partitioning between critical and noncritical applications, according to Carpenter.

“For control system virtualization, you need to preserve the integrity of highly integrated architectures, yet allow noncritical functions to co-exist,” explained Carpenter. “The cost of entry is strong isolation of these applications.” This means real-time controls and other functions need to be partitioned in spatial, temporal and fault dimensions. In short, this means physically separated computing resources to ensure that timing constraints are met and preventing faults in noncritical applications from intruding upon the operation of critical ones.

Effective isolation, in turn, entails the use of Type 1 hypervisors that give critical applications direct, “bare-metal” access to dedicated computing, memory and I/O resources, while simultaneously providing a more traditional virtualization layer beneath the noncritical applications. A hypervisor is the virtualization layer that

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effectively abstracts guest applications and operating systems from hardware implementation details.

A Type 1 hypervisor setup also is referred to as para-virtualization. “With full virtualization using a Type 2 hypervisor, none of the guest applications even know that they are hosted,” Carpenter explained. “Whereas with para-virtualization, the real-time operating system (RTOS) is modified to take advantage of direct hardware access through the hypervisor. Para-virtualization fits with mixed-criticality systems.”

To take full advantage of the potential benefits of virtualization at the control layer, available configuration and management tools have some catching up to do, Carpenter added. Ideally, an integrated design environment would allow one to manage the hypervisor, operating systems and virtual machines, as well as the partitioning of physical resources. The tools also need to be able to validate nonfunctional requirements such as time, safety and security, provide support for legacy applications and support deployed systems once they’re out in the field. “The goal is to move from ‘design to certification’ to ‘design for certification,’ to use pre-qualified components in a way that doesn’t affect system behavior,” Carpenter said.

Carpenter admitted that virtualization of control is initially a bit much to wrap one’s head around, but once you do, “the sky’s the limit. A lot of things are possible with this kind of system. Virtualization has proven economic benefits. We’re seeing this as a natural progression of control.”

Global Motion Control Shipments Grow 6.2% in the First Half of 2014

FOR THE FIRST half of 2014, the Motion Control Association (www.motioncontrolonline.org) reports global shipments for motion control products have grown 6.2% to $1.5 billion.

Dana Whalls, MCA vice president, reports the solid growth in the motion control market can be attributed to the double-digit growth in the robotics and machine vision industries this year, and she expects the growth will continue.

“Strong increases in sales of motion controllers, motors and actuators/mechanical systems have driven the growth in the first half of 2014,” says Alex Shikany, MCA’s market analysis director. “Motion controllers have been especially hot recently. Since the beginning of 2009, the motion controller category has averaged 19% growth per quarter through the second quarter of 2014.”

The second quarter of 2014 followed a good first quarter with 8.4% growth to $764 million. The main growth categories for the second quarter were ac motors (36.9%), motion controllers (36%) and actuators/mechanical systems (12.4%).

MTConnect Institute Releases v 1.3.0 of Communication Standard

THE MTCONNECT INSTITUTE (www.mtconnect.org) has released MTConnect standard version 1.3.0. The standard is an open-source communication standard for interoperability of manufacturing equipment and devices.

This version provides significant features, which include interdevice connectivity to enable machine-to-machine communication and additional data items for equipment and devices, as well as improvement to readability of the standard documents.

With this release, the MTConnect Institute also launches the MTConnect User Portal (www.mtcup.org), a community site for implementation best practices and shared experiences about implementation of the standard. MTcup is a community portal providing information for implementation best practices and to share experiences for connecting devices on the shop floor. This site has associations with various open source projects housed on MTConnect’s github site at http://github.com/mtconnect.

MTConnect is an open, royalty-free, secure standard that provides a common transport and format for all manufacturing data from all devices. It enables interoperability, as well as reduces the complexity and increases the value that can be delivered by software applications.
2014 Manufacturing Technology Orders Up 5.2%

U.S. MANUFACTURING TECHNOLOGY orders (USMTO) in September 2014 totaled $647.63 million, according to the Association for Manufacturing Technology (www.amtonline.org). As reported by companies participating in the USMTO program, this total was up 77.3% from August and up 61.4% when compared with the total of $401.18 million reported for September 2013. With a year-to-date total of $3,738.72 million, 2014 is up 5.2% compared with 2013.

“We now have data to back up the anecdotal reports that IMTS was an exceptionally strong show. This is a great sign that manufacturers are eager to invest in equipment that will boost their productivity,” says Douglas Woods, AMT’s president. “But Washington’s cooperation will be essential to continuing our momentum going forward. With the midterm elections just passed, Congress now must focus on passing tax extender legislation during the lame-duck session and then taking on comprehensive tax reform once the new Congress convenes in 2015.”

The USMTO report, which is compiled by the trade association representing the production and distribution of manufacturing technology, provides regional and national U.S. data about orders of domestic and imported machine tools and related equipment. Analysis of manufacturing technology orders can provide a reliable leading economic indicator as manufacturing industries invest in capital metalworking equipment to increase capacity and improve productivity.

UP AND DOWN AND UP AGAIN
AMT reports that U.S. manufacturing technology orders for September 2014 numbers indicate that manufacturers are eager to invest in equipment that will boost their productivity, according to Douglas Woods, AMT’s president.
System integrator Patti Engineering (www.pattieng.com) will expand its collaboration with McClellan Automation Systems (www.mcclellan-automation.com), which designs and builds custom production automation manufacturing equipment. Based in Bedford, New Hampshire, McClellan is an advanced manufacturing systems company that designs and builds custom production automation equipment.

Schneider Electric (www.schneider-electric.com) has entered into an agreement to acquire InStep Software, a provider of real-time performance management and predictive asset analytics software and solutions. The transaction is expected to close in the fourth quarter of 2014, subject to customary regulatory and other closing conditions.

Epicor Software (www.epicor.com), a provider of business software solutions for manufacturing, distribution, retail and services organizations, has joined the Manufacturing Enterprise Solutions Association (MESA) International (www.mesa.org) as a Gold Keystone Sponsor. Epicor will join other manufacturing execution/operations management leaders in driving the association forward as part of MESA’s committees and working groups and its regional and international boards of directors.

Fives (www.fivesgroup.com) has acquired a portion of MAG, a global manufacturing technology group. Based in Paris, France, Fives includes about 90 companies, many of which provide large, engineered industrial solutions to cement and sugar processing facilities, aluminum plants and plate glass manufacturers. Fives acquired previous MAG companies including Giddings & Lewis in Fond-du-Lac, Wisconsin; Cincinnati in Hebron, Kentucky; Line Machines in Granby, Quebec; Forest Liné, which has plants in Albert and Capeenac, France; and the global services business in Hebron, Kentucky.

ATS (www.ats-global.com) acquired all of the shares in Widenhorn Industriële Automatisering B.V. in Rhoon, the Netherlands. WIA specializes in CADCAM software and services for manufacturers using advanced CNC machine tools. The full team at WIA and all the business will reportedly continue to serve customers in the Benelux countries under the new name of ATS EdgeIT B.V. The company will continue to distribute Edgecam, Partmaker, Vericut, Spaceclaim and Seiki Systems products.

THE AWARD GOES TO

Rockwell Automation (www.rockwellautomation.com) named Corning Environmental Technologies (www.corning.com/environmentaltechnologies) and Bevcorp (www.bevcorp.com) as recipients of its 2014 Manufacturing Safety Excellence Awards at the EHS Today Safety Leadership Conference. The annual awards commemorate the world’s safest manufacturing companies, specifically those that realize the widespread benefits of a holistic approach to safety.

Maverick Technologies (www.mavtechglobal.com) received a Great Rated notification from the Great Place to Work Institute (www.greatplacetowork.com) based on an anonymous survey of its employees. Great Rated companies are given ratings in six areas based on current employees’ feedback on an anonymous survey. These areas rate the quality of the company’s challenges, atmosphere, rewards, pride, communication and bosses.

Fanuc (www.fanuc.co.jp) has been named one of the top 100 innovative companies in the world by Forbes. This is the fourth consecutive year Forbes has named Fanuc a top global innovator. “The World’s Most Innovative Companies” list recognizes leading-edge corporations that are most likely to be innovative now and in the future.

NEW AND NOTEWORTHY

Pentair’s Technical Solutions business has announced that its San Diego manufacturing facility has been awarded with AS9100 Revision C and ISO 9001:2008 Quality System Certifications. These certifications provide customers with the confidence that they are receiving a sustainable quality product produced within a quality management system that meets stringent aviation, space and defense requirements.
Experience Beats Degrees

THERE ARE A lot of “mes” out there. I don’t have an engineering degree, but I have a lesser, three-year diploma from a highly recognized institution. That’s a me. And some might say (well, they did back then) that engineers needed one of me with one of them, so they wouldn’t hurt themselves in the field.

No flak jacket needed. Engineers as engineers are theoretical peeps, while I was more practical in my education back in the day. There are some differences now, however, that make engineers better at playing in the field.

I was searching the jobs arena on an automation website, and, funnily enough, all the controls positions required a bachelor’s degree. So, if I have 30 years of experience on wide-ranging product lines and applications, would I be left out in the cold with these employment positions?

I was the software product manager for a company in Houston in the late 1980s, and, with the Free Trade Act that was just new at that time, I had to go through education equivalency and came out of the other end with two degrees. Would they count?

I also had to go through a right-to-work study that is basically a wait-and-see game. The company I was “working” for had to advertise in a few arenas for people to do the job I was going to do.

It seems the point was that this company had to hire an American citizen, should one be available, and I am Canadian.

The hoops were jumped through, and at the end I did not receive my permanent work visa. So I returned home very disappointed in the process, but more for my enthusiasm for the job and company I was leaving. The educational equivalency didn’t count.

At the time, I had 12 years of experience with the leading automation supplier at a time when the automation marketplace was just starting to boom. I could’ve made a difference.

But today, and not withstanding my age, I would be a very capable and willing participant in most companies that engage in industrial automation. And no, I’m not trolling for a job.

Canada instituted a program with foreign countries that subsidizes the hiring of workers for various jobs. There are many skilled jobs that are available with many companies that can’t get filled. The United States is suffering a similar fate.

And we’ve talked about the issues surrounding the youth of today and getting them involved in science, technology, engineering and math (STEM) activities. The numbers clearly show that STEM is lagging the workplace.

I work with a distribution retail company taking care of all its software needs. One of the gentlemen who works on the floor is a trained microbiologist from India. When he came over to Canada (the current employment program was not in place), he could not get a position doing anything else but taking blood in a retail lab environment.

His training from India will go unused since he had a family to support. He and I aren’t too far apart when it came to decision-making about jobs and futures.

This leads me to Anecdote No. 2. Our daughter works in a pharmaceutical laboratory as a microbiologist. For some reason, the company stated a few years ago, as the subsidized work programs were just coming of age, that anyone who didn’t have a degree could no longer work in the lab.

Huh? Imagine after doing the job for 15-20 years because you had a three-year diploma, you were told you couldn’t work there anymore. We are hiring new science-degreed people to replace you. What they didn’t say was they are hiring them from India through this new program.

No disrespect is intended, but the quality of work between the new degree peeps and the released workers with vast experience is incomparable. Experience does count for something. In my view, it counts for everything. If you can’t do the job, then it’s different. But if you can, then regardless of the letters after your name, you should be able to get a job, keep a job and be treated with a level of respect that only comes with paying your dues.

Regardless of the letters after your name, you should be able to get a job, keep a job and be treated with a level of respect that only comes with paying your dues.

There are many people in the automation field who don’t have degrees as such. There are many very good, if not excellent, practitioners of all disciplines of process and discrete manufacturing, and some of us can even teach our craft very well.

Experience is the best teacher, and remember what my dear ol’ mum used to say—you can’t put an old head on young shoulders. So be careful what you ask for.

JerEMY POLLARD, CET, has been writing about technology and software issues for many years. Pollard has been involved in control system programming and training for more than 25 years.
Many manufacturing plants outsource all or part of major capital projects, such as greenfield plants or new production lines. When these projects include a number of machines and a high degree of automation, such as a packaging line, the plant owner has a choice of two main types of outsourced partners—an OEM machine builder or an automation system integrator (SI). A third choice would be an engineering firm, but in this case, the main partner would be the automation division of the firm, so this alternative can be lumped in with the integrator option.

Table 1 compares the two types of outsource partners, and there are other factors besides those listed which drive the decision. In the integrator’s favor are production lines with machines from many different suppliers because integrators are used to working with many subcontractors and suppliers on their projects and because machine builders may have trouble working with other OEMs, particularly competitors. If the new line has a high degree of advanced automation, then a system integrator may be a better choice.

If the production line has many machines from one supplier, then the machine builder partnering option becomes more attractive. Another factor favoring the machine builder alternative is very high complexity of the main machines on the production line. This would tend to swing the partnering choice in favor of the OEM building the complex machines, assuming it also offered integration services, as no one knows machine operation as well as the OEM.
When it’s time to install your next production line, is it best to engage a machine builder or an automation system integrator as a partner?

by Dan Hebert, P.E., senior technical editor

Experts With Machines

OEM machine builders claim to have much more specific application experience than system integrators and are therefore better able to take on an overall project. Paul Strebig, controls engineering manager at USNR (www.usnr.com) agrees. Located in Woodland, Washington, USNR builds machines for wood processing, including everything needed to build an entire sawmill with 30 or more machine centers. “The experience and history that OEMs have in their industry is a great advantage, since this knowledge allows them to select the best products and solutions for each individual customer,” he says. “Most system integrators have limited history in a particular industry. Machine builders specialize in their industries, know how to be efficient and have fast and effective installations and startup.”

Deep knowledge of their equipment is also valuable. NC Electronics in Port Orford, Oregon, manufactures OmniTurn (www.omniturn.com) CNC turning/milling centers, and it knows how to interface its own systems (Figure 1). George Welch, CEO, explains, “We worked directly with one customer to produce the simplest, most cost-effective solution. The OmniTurn CNC can be configured to interface with various controllers, as well as imaging and gauging systems. Because we’re familiar with interfacing the Mitsubishi PLC with our CNC, and because we have experience machining parts on the lathe, we saved the customer time and money.”

Welch adds that working with an OEM also eliminates finger-pointing. “We accept responsibility for
the entire system hardware and building the complete system,” he says. “In other words, the buck stops with the builder. Also, training, service and repair, as required, are handled directly on a one-to-one basis without needing to train and equip a third-party developer.”

John Martin, vice president of engineering at custom machine builder ARC Specialties (www.arcspecialties.com) in Houston, agrees. “Machine and robot builder OEMs that are vertically integrated hold a unique advantage over traditional system integrators. We take full ownership of a project and drive it from conception, design and manufacture to integration and production. There’s no

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<th>Characteristics</th>
<th>Machine Builder</th>
<th>Integrator</th>
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<tr>
<td>Machine operation expertise</td>
<td>High</td>
<td>Medium to Low</td>
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<tr>
<td>Automation expertise</td>
<td>Medium to Low</td>
<td>High</td>
</tr>
<tr>
<td>Expertise and resources in non-automation disciplines such as mechanical engineering</td>
<td>High</td>
<td>Low</td>
</tr>
<tr>
<td>Project management expertise</td>
<td>Medium to Low</td>
<td>High</td>
</tr>
<tr>
<td>Ability to work with other machine builders</td>
<td>Low</td>
<td>High</td>
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<tr>
<td>Ability to work with a wide variety of automation systems and suppliers</td>
<td>Medium to Low</td>
<td>High</td>
</tr>
<tr>
<td>Expertise interfacing machine automation systems to higher level computing systems such as ERP</td>
<td>Medium to Low</td>
<td>High</td>
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<tr>
<td>Cost of machines</td>
<td>Low for their own</td>
<td>Higher</td>
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<tr>
<td>Factory acceptance tests on actual machines</td>
<td>With own machines</td>
<td>Not at all</td>
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<tr>
<td>Can select best-of-breed machines</td>
<td>Limited flexibility</td>
<td>Maximum flexibility</td>
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<tr>
<td>Knowledge of specific production process</td>
<td>High</td>
<td>Medium to low</td>
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<tr>
<td>Knowledge of local plant</td>
<td>Medium to low</td>
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<tr>
<td>Documentation</td>
<td>Good for machine</td>
<td>Good for system</td>
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<td>Turnkey responsibility</td>
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**MACHINE BUILDER VS. INTEGRATOR**

Table 1: When these projects include a number of machines and a high degree of automation, such as a packaging line, the plant owner has a choice of two main types of outsourced partners—an OEM machine builder or an automation systems integrator.
mix of hands to point fingers in multiple directions, but instead only one responsible company that understands every aspect of the system.” Like many OEMs, ARC Specialties has a large shop, enabling it to test machines and systems prior to shipment (Figure 2).

OEMs also have more resources available than system integrators, says Strebig. “Machine OEMs are better qualified to provide production line system integration since they are able to have tight control of the mechanical, electrical and controls aspect of a project. This control over design allows an OEM to make changes to optimize a complete solution package, whereas a system integrator will be stuck with the equipment they’re required to commission.”

Bob Fung, vice president of engineering at Owens Design (www.owensdesign.com), a custom machine builder in Fremont, California, adds, “System integrators generally buy existing hardware and put the system together. In general, we have a much stronger skill set and the ability to take on much more complex tools. We can create sections of a tool that a basic system integrator can’t.”

Conroe Machine (www.conroemachine.com) is a manufacturer of high-precision metal cutting machines, and it often combines its machines with other OEM products to create all or part of an integrated production line (Figure 3). On a recent project, Conroe designed and installed a hard-turning cell for measuring and sorting mud-motor bearings. The cell also boxes and palletizes finished parts.
This brings up the double-edged sword of equipment selection. Matt Wicks, vice president of controls and software engineering at Intelligrated (www.intelligrated.com), a builder of material handling equipment in Chapel Hill, North Carolina, says, “The argument for independent integrators is they pick the best equipment, regardless of who manufactures it. On the surface, this appears to open up competition and drive down initial purchased prices. In the long run, misapplication of equipment and conflicts between machine builders and integrators can lead to increased costs and project delays.”

On the other hand, Bill Savela, product manager at Delta Computer Systems (www.deltamotion.com), a supplier of motion control systems in Battle Ground, Washington, offers this observation: “A potential drawback to OEM-managed system integration is the need to use a majority of system elements that are manufactured by that OEM. This can limit accessibility to the industry’s best-in-class equipment by other vendors and lock customers in to the OEM’s product evolution path.”

No one knows machine operation as well as the OEM.

OEM BENEFITS

CMD (www.cmd-corp.com), a machine builder OEM in Appleton, Wisconsin, designs and manufactures converting machines for the blown-film and flexible packaging industries. Examples include continuous-motion machines for making bags and pouches and various types of automation equipment to package products made by the machines.

Chris White, project manager at CMD, explains, “Our automation systems range from taking finished product from one machine and placing it into another machine to fully customized automation using Cartesian and SCARA-type robots.”

On the integration front, White says, “CMD provides integration services ranging from integrating CMD equipment for specific product requirements to integrating our equipment with various suppliers of upstream and downstream equipment. Types of equipment we may integrate to complete a line include dosing units, extruders, bag-making equipment, conveyor systems, cartoners and case packers. We’ll integrate manufacturing lines that contain CMD equipment or a combination of CMD and other suppliers’ equipment—any combination the customer requires to produce the best solution.”

White thinks OEM machine builders are better able to perform integration. “OEMs typically have a very thorough understanding of the equipment and processes involved to provide the best solution,” he says. “Many times if an outside integrator steps in to integrate multiple pieces of equipment, they will not fully understand the manufacturing process.”

One example in the bag converting field is how to minimize impact on production if a portion of the line goes down. “If a production line is cartoning and casing rolls of bags automatically, what happens when the cartoner jams?” he asks. “An integrator without experience in the process may say, ‘If the line stops, clear the jam and start the line back up.’ The integrator may not realize the difficulties of starting the line back up, especially if it’s in line with an extruder, which may take a half hour or more to get back into production.”

He notes, “An OEM integrator very familiar with the process will have provisions to keep the line running and to introduce product back into the system while clearing the jam. Other things the integrator must consider are how to cull defective product; how to handle variances in product size, shape, colors and densities; and how to inspect for some of these items.”

And OEMs have better access to non-automation resources. “Typically a machine builder OEM is going to have access to machine tools to make mechanical integration parts,” he explains. “The machine builder has purchasing leverage to buy manufactured parts and expedite deliveries of parts. For example, if a controller goes bad during integration, an OEM has access to a wide range of human resources with skill sets in all fields including mechanical, electrical, service and spare parts. System integrators may not have access to as broad of a range of human resources to solve any issues in a timely and efficient manner. These combined resources can be a very powerful tool during the integration/startup process.”
Integrators Know Automation
While there’s no argument that machine builder OEMs know their equipment and have great experience integrating their own machines into production systems, system integrators claim they have experience and knowledge, too. In their case, it’s in integrating a wide variety of machines into production lines of all kinds and more knowledge about particular plants.

The experience of system integrators in dealing with advanced systems is a prime advantage, says Joseph Snyder, president of Process and Data Automation (www.processanddata.com), a system integrator in Erie, Pennsylvania. “A packaging machine

STAY AT HOME
Figure 2: In-house machine shops like this one give OEMs an advantage over system integrators when it comes to pre-shipment testing.
application that requires a couple of simple in-feed and takeout conveyors would normally fall easily within the realm of an OEM,” says Snyder. “But as the system complexity increases along with the number of unique players and parts, an SI might be critical to ensuring smooth connection between the pieces. On a very sophisticated system, the SI’s experience in connecting to adjacent process areas and business systems might become very important, as most OEMs have not ventured into those arenas. I feel that the chief advantage of SIs over machine builders when installing new lines is their superior automation system expertise, from using and integrating automation hardware and software from different suppliers to tying the automation systems to higher-level customer software such as ERP systems.”

This can even affect equipment selection. “On a larger scale, the multi-platform experience of an SI will be hugely beneficial when selecting vendors because the overall production system may require multiple equipment manufacturers, which, in turn, may mean the introduction of different control equipment suppliers,” Snyder adds. “If nothing more, the project management discipline, where most established system integrators excel, might be critical for simply keeping the project moving forward.”

Gary Kirckof, system engineering group manager at control equipment supplier Beckhoff Automation (www.beckhoff.com), says, “Some OEMs offer integration services just to secure the sale of their primary product. By contrast, the primary product of an independent integrator is integration. Pure integrators are freer to select equipment from multiple vendors.
OEMs, on the other hand, may place a higher priority in specifying their own equipment to meet the goals of engineering efficiency, maintainability and spare parts management.

Del Younglas, owner of Texagon Services (www.texagonservices.com), an SI in Westlake, Texas, agrees. “Texagon Services can evaluate the project with the customer and make individual decisions of what component parts are to be retained and what should be replaced,” he explains. “In a majority of Texagon retrofits the customer chooses to retain the existing motors and drives and replace the CNC controller only, which can be a significant savings. Most machine builders and OEMs that do retrofits remove all electrical equipment including the CNC controllers, motors and drives and replace them with their preferred complete system. Economically, this is not the end user’s best choice.”

End-User Opinions
Essar Steel India (www.essar.com) in Gujarat, India, has used a wide variety of options when installing machines, making it well-qualified to speak on the subject. Anil Sharma, general manager, explains, “When Essar builds new or adds to a production or packaging line, we’ve used all three methods—in-house expertise, an OEM and a system integrator or engineering firm. It depends on the project. If it’s a big project, an OEM contributes 90%, while the rest is contributed by in-house expertise and a system integrator. For very small systems, a local system integrator or engineering firm is used.”

While Essar uses in-house support when it can, Sharma realizes the advantages and drawbacks of this approach. “If the company uses in-house expertise, there is the advantage of low cost,” he says. “Employee knowledge increases, they remain technically updated, and it boosts employee confidence and morale. On the other hand, if we use in-house expertise, there are disadvantages. Many times updated technology may not be adopted; the design may not be proper; it may take longer for implementation; and full technical support may not be there.”

Essar definitely leans toward using OEMs for integration in most cases, primarily because of their technical knowledge, but it also uses local system integrators when it can, particularly for smaller projects.

Logical Choice
The decision to use an OEM or an SI can be easy. If it’s a simple job involving one machine and some auxiliary equipment, the machine OEM is probably the best choice. The OEM has probably installed dozens, if not hundreds, of similar systems, giving it economies of scale and the benefit of extensive experience.

When projects get complex, involving high-level ERP software, multiple production lines and dozens of different machines and control systems, then an SI is probably the best choice. This is particularly true when the integrator is located nearby and local support will be needed long after the project is completed. In many cases, existing relationships with OEMs and system integrators will drive the decision, with the plant owner picking the partner with whom he or she has the greatest familiarity and trust.
Controller Standoff
Select Between PLC, PAC and IPC Based on How You Define the Technology, as Well as the Application
by Leslie Gordon, senior technical editor

ARE THERE A few key things that OEMs or system integrators say they’ve discovered programmable automation controllers (PACs) do better than programmable logic controllers (PLCs) or industrial personal computers (IPCs)? Perhaps not so surprisingly, the answer lies in a grey area, depending on how those in industry distinguish between the technologies.

James Ingraham, software development team leader at system integrator Sage Automation (www.sagerobot.com) in Beaumont, Texas, says, “I’m not 100% convinced that PACs are actually a thing, because any supplier that sells a PAC sells it to end users that call it a PLC. Historically, PLCs were, in fact, logic controllers, so they were really good at Boolean on/off, ‘check-a-photo-eye, turn-on-a-motor’ kind of stuff. The addition of servos, PID loops, analog control, communications and database access have complicated the issue. Yet, out here in the real world, we still call it a PLC.”

In an example of one project, Sage used a PAC to combine motion control and database integration with traditional logic control for the just-in-time order fulfillment of tires (Figure 1). “When it comes to end users that are running a bunch of conveyors, for instance, whether they have an Allen-Bradley shop or a Siemens shop down the street matters a whole lot more than a particular processor’s technical specs,” adds Ingraham. “Most of today’s technology is of relatively equal high quality. More important questions to ask are where is the support coming from, and which supplier do we have the best relationship with?”

The embedded PC is attractive from a cost point of view because it eliminates the rigid approach of a PLC in controlling machine processes.

The IEC 61131-3 standard implemented some years ago defines five languages for controlling devices with a PLC or PAC, explains Ingraham. “The languages are ladder logic, which we all know and love, structured text, sequential function charts, function block diagrams and instruction lists. In addition, a lot of PACs also provide more traditional programming languages like C. That said, an advantage of IPCs is that their processing power is vastly more than that of a PLC or PAC. A 12- or 16-core Intel processor with essentially unlimited RAM runs circles around a PLC or PAC. So if you have to scale up, that’s probably your best bet.”

In 2012, the firm replaced an outdated PC-based industrial control at a major retailer’s distribution center with a system driven by Allen-Bradley ControlLogix PACs from Rockwell Automation. Many goods sold in major department stores such as dresses, suits, appliances and accessories arrive at the DC in bulk shipments from manufacturers. There, they’re sorted using four tilt-tray sorters and then shipped to hundreds or thousands of retail locations. Packing-sorter machines carry items from the area where workers unload wholesale merchandise from palletized cartons.

PACs Handle Tilt-Tray Sorters
Another system integrator has a slightly different take. Pyramid Controls (www.pyramidcontrols.com) in Cincinnati, Ohio, specializes in developing automation solutions to optimize flow, increase accuracy, increase machine uptime and improve the productivity of product distribution centers (DCs). “Over the years, we started calling controllers PACs because they have more capability than traditional PLCs. A PAC or ControlLogix processor, for instance, can handle servos, all kinds of motion controls and so forth,” says Pyramid’s engineering director, Mark Hegge. “But in our minds the biggest difference between PC-based controls, PLCs and PACs comes down to the reliability of the equipment.”
and place individual items on tilt-tray machines, which feed the items into different chutes, depending on where they’ll be shipped.

The retailer’s legacy PC-based control system was aging and outdated. It couldn’t properly control the tilt-tray sorters, which are highly sensitive to the timing at which internal switches needed to fire, within 50 ms or, in this particular case, under 12 ms. Missing this window could shut the entire sorter down. The retailer also needed a technology that could synchronize more than 70 motors on each of the four loop sorter lines, as well as track products to eliminate the problem of lost inventory.

Pyramid replaced the outdated system with several ControlLogix PACs—two to control each of four packing loop sorters and one shipping sorter. The controllers are networked to the devices on the sorting line via ControlNet, a protocol that provides ongoing feedback to the controller from the system I/O. The controller communicates via EtherNet/IP with the Pyramid Director warehouse control system (WCS) developed by Pyramid. ControlNet and EtherNet/IP share the common industrial protocol (CIP), which supports the integration of I/O control, device configuration and data collection across multiple networks. The new control system provides advanced diagnostics and analysis of the loop sorter directly to the WCS, so operators are notified of errors. Operators can then call Pyramid for assistance, and it makes adjustments to the system remotely via VPN access.

“The Rockwell equipment is designed for industrial application and is more robust than PC-based control systems. PC-based controllers are typically upgraded more often because the hardware doesn’t last as long, and the software operating system isn’t supported as long,” says Mukesh Ram, Pyramid’s general manager. “And, from an end user’s perspective, the PC requires an IT programmer, as well as an individual with an electrical skill set, to maintain and troubleshoot the devices associated with the material handling equipment, whereas PLCs or PACs can be managed by one type of engineering individual—an electrical controls engineer. Another advantage of PACs over PCs is they let you do online programming and make changes while the system is running. In contrast, PC programs must be compiled and then executed, thus causing interruptions to operations.”

According to Keith Staninger, business manager for controller and I/O platforms at Rockwell Automation (www.rockwellautomation.com), a PAC can handle significantly more information than a discrete machine controller or PLC. “For example, users can implement loop control, predictive control and condition monitoring, all of which are different sets of information that make up what we call integrated control,” he says.

**PC-Based Capabilities**

One company that firmly believes in the PC-based control concept is Beckhoff Automation (www.beckhoffautomation.com). "Vital to our approach..."
is our TwinCAT software, which runs on PC-based hardware, such as embedded PCs, to support a wide range of machine automation functions including logic control, motion control and safety," says Aurelio Banda, vice president sales and marketing at Beckhoff North America. "It, along with our scalable hardware, allows the creation of more centralized architectures, depending on the particular machine and the processes taking place on it, while adding, for example, more motion or safety as needed, without having to rebuild the entire application.

The biggest difference between PC-based controls, PLCs and PACs comes down to the reliability of the equipment.

The technology uses protocols such as EtherCAT, the open Ethernet-based fieldbus system developed by Beckhoff, and provides data communication with user interfaces and other programs by means of open standards, such as OPC UA, and various software tools from Microsoft. The embedded PC is therefore attractive from a cost point of view because it eliminates the rigid approach of a PLC in controlling machine processes, which necessitates adding more processors, black-box hardware and completely different software packages to provide, for example, additional motion or safety functions."

**Dedicated Devices**

An important distinction between IPCs and PACs is that PACs are normally dedicated to industrial control, where IPCs typically run a Windows OS and may take on other functions, such as running typical Windows applications. “Unlike a Windows system, the PAC OS is real-time and often deterministic," says Jerry Sorrells, product manager for controls and HMIs in the electromechanical division of Parker Hannifin’s (www.parker.com) Automation Group. "PLC and PAC technology are converging such that traditional PLC manufacturers are adding functionality to keep up with PACs. This often includes adding modules for network communication or servo control. This approach, however, increases OEMs’ and end users’ costs by piling on additional hardware. PACs on the other hand are typically designed to communicate on multiple networks and execute multi-axis motion without the need for additional hardware. For instance, Parker’s PAC doesn’t require add-on hardware for common communication protocols or servo control, and it doesn’t set an arbitrary limit on the number of axes that can be controlled, since the practical limit is a function of the performance required for the application."

Parker’s PACs have been put to work in applications including driving 200 axes for a fiberglass machine, as well as controlling a newly developed additive manufacturing machine that uses a unique metal deposition process (Figure 2). Consider the example of Plus Manufacturing, +Mfg, (www.plus-mfg.com) in Erlanger, Kentucky. The designers there are in the final stages of developing a six-axis robotic gantry for 3D metal deposition that uses the new Parker Automation Controller to control the building of individual or multiple parts or multiple different parts—each from different metals. “The PAC interfaces with our master computer that delivers the part geometry and takes control of the six axes, so the gantry and build table follow the motion paths it gives them," says Paul Saleba, spokesperson for +Mfg. "The PAC provides the six Compax3 controllers inputs and reads outputs.
interdependently, all while communicating with the master computer to ensure that all the axes work together. The machine, which will be introduced at the Automate Show in March 2015 in Chicago, will be capable of building complex metal structures quickly and inexpensively to near-net shape, eliminating the need for casting, welding or forging.”

PACs Analogous to VFDs
The difference between PACs and PLCs can be a grey area, but one of the best ways to understand the distinction is to look at the history, explains Ben Orchard, application engineer at Opto 22 (www.opto22.com). “PLCs were a step up from older pseudo-control systems comprising relays and timers, and they were programmed with ladder logic because that’s how electrical diagrams were drawn,” he says. “The whole focus and design of PLCs was digital control of relays. PACs were an expansion of this and much better at handling analog signals and PIDs. Then came the age of networking, originally serial and then Ethernet. With Ethernet communication, PACs kicked into high gear and became the de facto standard for control systems because all it takes is one unit to control, monitor and communicate with multiple racks of analog and digital signals and multiple PID loops.” In short, a PAC can work with devices using analog, digital and serial I/O signals.

“Currently, just about every manufacturing process is becoming more and more analog,” continues Orchard. “A good analogy is that of the variable-frequency drive (VFD). In the past, we simply turned a motor or pump on or off, and it ran at full speed. In contrast, VFDs let device such as pumps be more efficient at different stages of the process by running at different speeds as opposed to flat out.”

In more detail, end user Zuno Engineering (www.zunoengineering.com) of Fort Wayne, Indiana, explains how Opto 22 technology takes a different, yet robust and cost-effective approach. “Our company uses Opto 22 in several ways,” says Adam Brososky, principal at Zuno. “For example, we might replace an existing PLC system or a new system where a new machine is being designed and implement the Snap-PAC controls. Then, depending on the application, we’ll either install a touchscreen PC for the HMI or Opto 22’s Groov technology, which is a Web-based HMI that lets users employ an iPad or smartphone to control their machines.”
Packaging at the Speed of Imagination

Machine Flexibility, Validation, Data and Reliability Are There for the Thinking

by Mike Bacidore, editor in chief

PACKAGING AND CONVEYANCE machine builders face increasing needs for speed, flexibility, validation, data and reliability. New technology has enabled new options, but machine builders are discovering ways to enable new systems that weren’t even conceivable 10 years ago. We gathered input from a variety of exhibitors at Pack Expo 2014, which brought approximately 50,000 attendees to McCormick Place in Chicago and found out what technology is enabling them to design these new innovations and what challenges they’re facing from end users.

Participants include Craig Souser, president and CEO of JLS Automation (www.jlsautomation.com) in York, Pennsylvania; Ted Geiselman, president of Weiler Labeling Systems (www.weilerls.com) in Moorestown, New Jersey; Mike Krummey, electrical engineering manager, and Marc Willden, vice president, general manager, at Matrix Packaging Machinery (www.matrixpm.com), in Saukville, Wisconsin; Paul Kuharevicz, engineering/R&D manager at Dynamic Conveyor (www.dynamicconveyor.com) in Muskegon, Michigan; and Jack Chopper, chief electrical engineer at Baltimore-based Filamatic (www.filamatic.com).

Krummey: Our new machine, the Morpheus, is a departure from what we’ve done in the past, with respect to controls. Typically we’ve used PLCs and worked around some of the limitations when it came to data gathering and data porting. With this machine, we’ve gone into PC-based controls. One of the things, as an OEM, that I’ve always attempted to do is use the most cost-effective PLCs to provide accurate motion control for our machinery. The world of PC-based control has changed a lot of the way that we think. With increased scan times and the availability of the EtherCAT system for control of the motion axes, we have opened up an entirely new world of possibilities. As an OEM, you’re always conscious of your creeping costs on these control platforms. The beauty of a PC-based control system is, next year, that PC that you’re using is either going to cost less with the same features or going to cost the same with increased memory and better scan times. This is a perfect world for an OEM to be in when it comes to designing long-term solutions for customers. Of particular interest is the EtherCAT network system. So far, this has been very proven for everyone who has used it to be the best motion control network. It has allowed us here at Matrix Packaging to provide a very innovative solution for a continuous motion machine. Thankfully, we’ve partnered with a very capable supplier, Beckhoff Automation, and they have helped us to design a solution for this line of machines. Typically we’ve been limited to producing only intermittent machines. We’re looking forward to a future with more data available for customers to more intelligently run their operations. The natural ability of PC-based controls to provide this information in a Windows environment is a good fit for more customers who want to start off with just some of the basics and then eventually want to move into a more complicated type of data reporting. We believe that the PC-based architecture is the future for automation in this country.
**Souser:** The Osprey Case Packaging System is unveiling PIVT (package integrity validation technology), a family of technologies designed to test leaking in packages that are vacuum-packaged. We have a system designed for meat, dairy and frozen food markets that deals with high sanitation, irregular flow and random orientation of packages and loads them into cases very reliably, and, in this instance, makes sure they don’t leak. That’s the bottom line. When a leaking package is detected, it’s dropped and goes right off the end of the conveyor.

**Kuharevicz:** One of our new conveyor lines, the DynaClean, is a new innovation relative to sanitary food design conveyance. We don’t use stainless steel, and that is a conscious choice. We are known as a modular conveyor manufacturer. We have joints that allow for relatively easy expansion of the system. This show system is only 8 ft high, but it’s typical to go 20 ft high for form fill seal systems. As the conveyor gets taller and taller, our motor choices change. We usually rights-size the motor. We use a variety of motors. They’re all NEMA 4X. We choose to sell the correct size motor, depending on the size of the conveyor. One of the more interesting features of our conveyor is that we don’t use the buckets. We tend to use a solid belt that has no joints or seals and has a lot less surface area, which makes it a lot easier to clean. All of our conveyors can be broken down with just one tool. We also use a NEMA 4X control that is dovetail-mounted so that during cleaning it can be moved out of the way and cleaned separately, and you can get behind the dovetail and clean. One of the other motors we use is a drum motor. The teeth, the lagging, are cut right into the motor. One of the reasons to use this motor is for hygienic purposes. Once the belt is off, this motor simply picks up and can be moved and cleaned away from the conveyor, and the conveyor itself can be sanitized throughout. So for some applications the drum motor is the way to go, versus an externally mounted motor.

**Geiselman:** The RL-840N is our new cut-and-stack labeler. It’s a brand-new technology collaboration with NuLabel Technologies. They’ve developed an activatable adhesive that is applied to the back of the raw paper to make cut-and-stack labels and then is activated with a proprietary spray. We have exclusive rights to develop new machines with that technology, and we’ve done that with our rotary machine. It was a match made in heaven because we’ve been developing rotaries for more than 20 years in the pharmaceutical industry and are a leader in that industry for pressure-sensitive labeling. But we haven’t had anything in the cut-and-stack arena, and we didn’t want to go into that without having something special. With NuLabel Technologies, we have that. They look like traditional labels on a beer bottle, but these labels were applied with no glue. To make this possible, we have to have a machine with excellent controls. To do that this time, we turned to B&R controls because, from a motion perspective, they have a low-cost stepper solution for us that we can put in instead of servos. That gives us a price point where we can be competitive with traditional machines, only much more capability to be able to rotate the bottle, specifically to wipe down the label in a way that we need with the stepper-motor motions, addressable from the HMI. Just plug in a recipe of choice. In addition, we have laser printing that we do on the bottle label with a Domino laser on this machine. It’s super-critical to do that accurately with super-fast communication. With PowerLink from B&R, we’re able to trigger this laser accurately and phase it wherever we want on the bottle to move that print around, as required.

**Wilden:** We focus on flexible package machinery, specifically vertical form fill seal. The Morpheus represents our new generation of machine. It provides a new level of flexibility that other machines don’t have. One of the challenges we have is a lot of companies are packaging a wide range of products, particularly contract packagers. They might be working with General Mills one week, and they might get a contract from Frito-Lay six months later, and they need equipment that can adapt to those varying needs. That’s a challenge.
The Morpheus addresses some of those issues. A lot of vertical form fill seal packaging machines operate in intermittent motion fashion, but there are times when you want to run higher speeds, and the sealing time on the film may require something more than just coming closed and waiting for the film to set up before you open up the jaw. With a continuous motion machine, we can actually seal the film while we’re moving it. That may not seem like a big deal, but the ability to have more time to be able to dwell and get that seal properly set up means, for a lot of applications, we can deliver a much higher-speed machine.

A lot of this has been enabled with the new generation of controls. We work very closely with Beckhoff Automation on this machine. The backbone is all EtherCAT technology, meaning that every device on the network has the ability to communicate with the controller. It allows us to bring in a lot of data from all of those devices and coordinate it. The great thing about all of this though is that we’ve utilized One Cable Technology, which reduces the number of cables we’re using to connect all of these devices. It allows us to take care of power, machine control and data acquisition over one cable, so we can do all of that without having wiring all over the machine. We use Beckhoff servos pretty extensively throughout the machine to provide the motion control that we need. We’re tied into the Beckhoff controller, which takes advantage of the TwinCAT system. It’s a Windows-based system, but with TwinCAT there is an abstraction layer that is between Windows and the hardware that really solved a lot of problems created by Windows. We know that in certain circumstances Windows isn’t completely stable. We also know that Windows is not particularly deterministic. If we don’t need high-speed performance, maybe that’s not a huge deal. But, in our world, things have to happen fast. This machine might be producing 225 bags/min. There’s a lot of motion going on, a lot of coordination going on, and you can’t accomplish that unless you’ve got a very deterministic system and a very fast system. The TwinCAT layer provides that. It allows us to know exactly when certain operations are going to be executed, and we know it’s going to be stable, even if Windows loses its mind temporarily. The machine is still going to function very, very well.

**Chopper:** Flex packaging refers to the ability to change over different products, different sizes, different fill technologies, different capping technologies and cartoning technologies. The challenge for the OEM in that regard is being able to provide a system that doesn’t end up being a Swiss-army-knife solution. What we want are solutions that are robust for every individual product, and yet robust enough to handle future products that maybe we don’t have defined, maybe we don’t know about and maybe we can’t predict. As an OEM, we want to make the efficiencies, make the changeovers, make the usability and make the diagnostics as robust as we possibly can, so the products you make now are running extremely well. The difficulty is figuring out whether we picked the best solution. The only tools we have are our abilities to test at our facility with your products. That is a particularly difficult thing to deal with in terms of the future. The ones in front of us, we can do. The ones ahead of us, maybe not so much. But that is a trend in the industry that we are very aware of and are working extremely hard to address. We try to provide solutions that offer the best technology available for what you might want to do now and what you might want to do in the future. One of the tools we work with our customers on is OEE (overall equipment effectiveness) for their products.

Machine validation is for regulatory compliance that gives confidence that the machine is doing the things it should do. One of the things we’re faced with is the wide variety of approaches to machine validation. Because we’re an OEM, and because we service many different markets, we see a wide berth of testing and validation requirements. We spend a lot of time testing widgets, testing functionality, testing machine capability, ranges, sizes and speeds, all of those things. But what I rarely get asked about are the limitations of the systems that are delivering those functionalities and delivering those performance criteria. What we typically have today are a group of systems that are knit together. Even a single controller programmed in a single development environment has other things surrounding it and tied into it that could affect what that system does. One of the struggles we have as an OEM is providing that functionality and providing that validation environment, such that we can help with deciding and determining and testing against those limitations. In today’s model,
when the network gets too crowded, things will slow down. That will make a huge difference in what that machine does because there are so many things on the network. What is acceptable? The 2-to-1 rule? The 3-to-1 rule? That’s a grey area, and it’s something that’s rarely talked about in validation. Something else that’s missing in validation is the human involvement (read Chopper’s white paper, “Dirty Dishes, the FDA and the Fire Department,” at www.controldesign.com/dirty_dishes). Some of our customers would like to remove the human element, and I think that’s just a bad move. While we shouldn’t rely solely on that environment, human intervening certainly is helpful when we do have qualified, knowledgable, capable people involved in the process, who are routinely checking whether that machine is doing what it’s supposed to do.

More and more customers desire to get information out of their machines and diagnose problems when they occur, as well as learn more about what their systems are doing in real time. Unfortunately, the best way to do that is to tie our systems into the plant-floor network, so that we can remotely access them in real time and collect that data, as well as process that data and present it in meaningful terms and meaningful ways they can use to make their operations better. Unfortunately in many cases there’s a disconnect between the IT folks and the plant-floor folks as to how best to do that or even if that’s possible. With all of the problems with computer security, viruses and issues with the surrounding ramifications of possibly having a system compromise, that becomes increasingly difficult. It limits significantly our choices for what we can do with those tools that are readily available. As the technology has gotten better, the number of tools available to us is much greater. But it’s difficult as an OEM to be limited in providing the information that our customers want in an efficient, meaningful, scalable way. Our challenge is to find ways to get around that disconnect, find ways to knit our system into the architecture in a way that doesn’t violate what IT wants to do and what the plant floor really needs to provide those functionalities, solutions and information to the end user.
AS THE OLD saw goes, the only constant is change, and this certainly holds true in the ever-improving world of industrial personal computers (IPCs). Consider, for example, current-generation processors such as those based on Intel’s Haswell architecture. “The processors are generating the latest buzz because they outperform and outprice their predecessors,” says Eric Reichert, product marketing specialist for industrial PCs and HMIs at Phoenix Contact. “Along with visualization and next-generation SCADA, the technology helps fill industry’s need for 64-bit compatibility and extended RAM.”

In another take, Derrick Stacey, solutions engineer at B&R Industrial Automation, reports that industrial computers are evolving in much the same way that consumer products are. “Users are pushing for smaller footprints, higher speeds, increased modularity and reduced energy use. Today’s IPCs are highly configurable, so one form factor works for all capability ranges and costs. Current designs have lowered the heat created by internal components because it negatively affects the unit’s energy usage. The resulting improved efficiency lets IPCs run fanless and allows the removal of a moving part that would require maintenance during its lifecycle.”

Rapid technology advances and demanding applications are also adding to the fray. “We’re seeing a convergence between electronic operator interface (EOI) systems and industrial PCs,” adds Matthew Hansen, product manager at Rockwell Automation. “To access ERP systems requires higher-performance technologies and higher-end graphics—in other words, more capability than traditional EOIs alone can provide. Industrial PCs add the necessary flexibility and performance. Software also is racing to keep up with rapid hardware advancements. In the coming years, look for software that will better leverage more powerful CPUs, graphics and multi-touch displays, all of which are becoming the norm on current industrial computers.”

In addition, consider that current multi-tasking, PC-based controllers leverage Intel’s latest multi-core processors to support the building of smaller-footprint machines.” says Reid Beilke, industrial PC product specialist at Beckhoff Automation. “In fact, end users are increasingly adopting all-in-one automation devices that can bundle the work of several traditional hardware controllers into one unit using flexible PC-based control software such our TwinCAT 3. Historically, this meant one PC-based controller ran multi-purpose software to handle the work of the PLC, motion control, HMI and database management. Today though, PC-based controllers with multi-core technology can handle additional functions, including robot control, advanced measurement, condition monitoring and more.”

ANALYTICS APPLIANCE
Proficy Historian IPC is an appliance for collecting real-time production and process information that integrates the PACSystems RXi XP, the company’s IPCs, and Proficy Historian 5.5. The IPC platform enables numerous data collection tags on a rugged form factor small enough to install with machine controls in harsh environments. Proficy Historian’s special compression algorithms reportedly let greater volumes of data be stored on the IPC’s hard drive as compared to other data historians. Proficy Historian IPC can handle 100-5,000 data collection points on one compact device.

GE Intelligent Platforms; 800/433-2682; www.ge-ip.com

COMPACT PANEL PC
Panel PC 2100 uses Intel Atom technology, comes with single-, dual- or quad-core processors and is fully scalable. The unit requires no fans or other rotating components, eliminating maintenance issues. Other standard features include two Gigabit Ethernet interfaces, as well as one USB 2.0 and one USB 3.0 interface. Fieldbus connections such as Ethernet Powerlink or CAN can be individually configured through the use of interface modules, and compact MLC-based CFast cards with 60 GB or more are available.

B&R, 770/772-0400; www.br-automation.com
WORKSTATIONS FOR HAZARDOUS ENVIRONMENTS

VisuNet IND SlimLine operator workstations have Zone 2 certification for use in hazardous environments and also provide HMI visualization in Class I, Div. 2 hazardous locations. The units have a thin but rugged NEMA 4/4x IP 64 stainless or painted steel housings, and as full PCs, provide a remote monitor (RM) or kernel-based virtual machine (KVM) monitor solution. The RM technology requires no software installations, provides standard Ethernet networking connections to the server and access to multiple servers from one workstation.

Pepperl+Fuchs; 330/486-0001; www.pepperl-fuchs.us

IPC PACKS MORE POWER

Designline IPCs are now available with an Intel Core i7 processor in 15-, 18.5- and 21.5-in. screen sizes. The units are IP65-rated and have a fanless design. VESA-mounting hardware mounts these IPCs securely on machines. The IPC features multi-touch capability for intuitive gesture control. The unit measures just 60-mm deep, and an integrated button on the front allows brightness adjustment, an easy-to-access software keyboard and a right-click function.

Phoenix Contact; 800/322-3225, www.phoenixcontact.com

INTEGRATED DISPLAY COMPUTERS

Allen-Bradley 6181 integrated display computers include standard, performance and advanced models that provide all-in-one industrial PC options for most information and visual interface requirements. The rugged industrial computers combine multi-touch touchscreens, high-performing processors, field-replaceable components and remote management capabilities.

Rockwell Automation; 414/328-2000; www.rockwellautomation.com

TURBO-BOOSTED MICROBOX

Simatic 427D Microbox IPC sports the third-generation Intel Core i7 (1.7 GHz) processor for high system performance. A turbo-boost feature delivers up to 2.4 GHz, while the unit’s memory provides up to 8 GB of RAM. This fanless IPC operates in ambient temperatures up to 55 °C, has a rugged, chemical-resistant housing, can withstand vibration and shock, and provides a retentive signaling buffer for WinCC.

Siemens Industry; 800/743-6367; www.industry.usa.siemens.com

MULTI-FUNCTION IPC

With a 21.5-in, high-definition display, the C21 industrial PC provides slots for plug-in cards, ports for PCI, PCIe and mini-PCIe, and a secured USB port. The device comes with two Ethernet ports, built-in WLAN antennas, integrated Bluetooth and mobile wireless capability. Programmable function keys are available to start frequently used functions or switch between applications.

Noax Technologies; 704/992 1606; www.noax.com

PANEL PC

PPC-6120 panel PC lets users install any fourth-generation processor from Celeron to Intel i7. The PC is a 12.1-in., five-wire resistive touchscreen that connects directly to devices through an integrated isolated RS-422/485 port, which protects the port in the event of power spikes. The device has an input range of 12-30 V, and also includes a IP65 front bezel, four RS-232 and USB 3.0 ports, and dual Gigabit ports. Users can add a PCIeX4 or PCI card.

Advantech; 800/205-7940; www.advantech.com/ea
MINI IPC
LPC-681 mini PC measures 6.54 in. x 6.18 in. x 1.89 in. It has an Intel 4th-generation Haswell Core i7-4800MQ mobile processor. The PC also includes Intel HD Graphics 4600, providing for three video ports with optional adapter cables for VGA and DVI connectivity. Other features include one Gigabit LAN, two USB 3.0, two USB 2.0, one serial, two eSATA and audio In/Out ports, as well as optional 802.11 b/g/n wireless networking.

Stealth Computer; 905/264-9000; www.stealth.com

MULTI-TOUCH MEETS MULTI-CORE
CP22xx Panel PC series is designed for cabinet installation, and uses a multi-touch interface and high-performance multi-core processors including Intel Celeron, Core i3, i5 (all with 2 cores) or 3rd- and 4th-generation i7 (4 cores). A range of screen sizes from 12- to 24-in is available. CP22xx features a free mini PCI slot for factory-installed cards, 2 GB DDR3-RAM (extendable to 16 GB), a hard disk, CFast card or SSD, an on-board dual Ethernet adapter with 10/100/1000 Base-T connection and an on-board Sata RAID-1 controller. The equipment also includes a serial RS232 interface and four USB 2.0 ports as well as up to four further optional Ethernet ports.

Beckhoff Automation; 877/894-6228; www.beckhoffautomation.com

DOGGED PERFORMANCE
Seppala-T panel PC for HMIs connects with installed PLCs and automation systems. Available in 10-, 12- and 15-in. touchscreen sizes and built on Intel’s Atom processor, it has solid-state drives and is fanless. The front panel is IP65-compliant and is designed to meet NEMA 4/4X standards. It’s preloaded with InduSoft’s Web Studio HMI software.

CCS; 800/277-3077; www.ccs-inc.com

INTEL INSIDE
Model SPC-190T’s standard configuration is Intel i5-3360m CPU-based and integrated with a rugged, projected, capacitive, multi-touchscreen recessed into a 0.375-in. thick, 6061 aluminum bezel. Power input can be 120/240 Vac or 12/24 Vdc.

Industrial Electronic Devices; 908/806-2255; www.industrialdisplays.com

PU FOR IQ
WinCPU industrial PC mounts directly to the backplane of the company’s iQ-Series controller and is powered by a 1.66-GHz Atom processor with a solid-state drive. It includes two Ethernet channels, USB and standard CompactFlash card slot for external storage.

Mitsubishi Electric Automation; 847/478-2100; www.meau.com

GET ENOUGH FIBER
The 4123CF industrial computer incorporates carbon fiber and aircraft-grade machine aluminum, NEMA 4X, Class I and II, Div. 2 enclosure with Com Express dual-core Atom processor, SSD drive, network and USB ports, Wi-Fi, 15-in. sunlight-readable display and multi-touch, projected capacitive touchscreen. Operating range is -40 to 65 ºC.

Daisy Data Displays; 717/932-9999; www.d3inc.net

STAYS PUT
The SPC-1840WP, 18.5-in., waterproof, widescreen, multi-touch, stationary panel PC for areas that require frequent power washing has all-around IP65 protection. It has an AMD 1.6-GHz processor with an independent, graphical processing unit that supports Windows 8 and DirectX11, and includes 1 x RS-232, 1 x USB 2.0 and 2 x GbE LAN.

Advantech Industrial Automation Group; 800/205/7940; www.advantech.com/ea
POCKET POWER
CP-Pocket control cabinet computer in 3U CompactPCI format has an Intel Celeron 807UE processor and expansion options via CompactPCI peripheral boards, which are accessible without removing the enclosure. A smart cache of 1 MB and up to 4 GB of DDR3 SDRAM memory with 1333 MHz provide high-data throughput. Peripherals connect via one USB 3.0 port, two USB 2.0 ports and one serial port. Three Gigabit Ethernet ports enable horizontal and vertical integration in automation networks.

Kontron; 858/623-3006; www.kontron.com

GO DISKLESS
PS4000 diskless industrial PC has Windows XP Pro and Windows 7 Ultimate operating systems, Core Duo processors and PCI Express expansion. WinGP and GP-Pro EX HMI development software provide connectivity and the ability to create HMI screens and logic programming.

Pro-face; 800/289-9266; www.profaceamerica.com

HAZARD-CLASS IPC
I/O Server industrial PC with UL certification for Class I, Div. 2 Group A, B, C, D hazardous locations with volatile substances has an Intel Atom or AMD Geode CPU and an integrated carrier card for up to four plug-in I/O modules. More than 20 I/O modules provide high-density A/D, D/A, discrete-level control, counter/timer and serial communication functions. CAN bus, Mil-Std-1553 and configurable FPGA modules offer advanced control capabilities.

Acromag; 248/295-0310; www.acromag.com

TABLET PC
Guardian Series of 7-, 8- and 10-in. tablets include Mil-Spec IP65, Mil-Std 810F and Mil-Std 461E standards, daylight-viewable options, and a range of communication options and expansion slots for specific requirements.

Industrial Computing; 781/890-3111; www.industcomputing.com

MOUNTING OPTIONS
iPC-Series industrial computers with Intel i-Series Core embedded processors include 12-, 15-, 17- and 19-in. LCD versions with LED backlighting. All are available with five-wire, analog-resistive touchscreens and NEMA-sealed, panel-mount front panels, or as a non-display node computer for mounting in constrained spaces.

Nematron; 734/214-2000; www.nematron.com

EMBEDDED COMPUTER
CEC is a highly integrated, compact and robust embedded computer system, based on the Intel Atom Processor E3800 Series with single-, dual-, and quad-core CPUs. The unit operates in a wide supply range of 8-36 V without a fan, heat pipes or case openings. The CEC has a low power consumption of 8-18 W, and it offers a configurable power management feature to provide sleep currents down to 100 µA, supporting wake-up sources such as an ignition signal, RS232 ring indicator or wake-on LAN. The CEC operates in a temperature range of -40 to 85 °C, and withstands reverse polarity voltage, overvoltage, surge and burst voltages, as well as electromagnetic discharges.

MPL; 480/513-8979; www.mplag.com

FANLESS EMBEDDED SYSTEM
The eBOX670-883-FL embedded system features an LGA1150 socket for 4th generation Intel Core i7/i5/i3 and Celeron processors (Haswell) with Intel Q87 chipset; fanless operation design with full feature I/O; and two 2.5-in. SATA drive bay, 1 CFast slot and mSATA. The unit includes two internal PCI Express Mini Card slots and one SIM slot. It supports 2 HDMI, VGA and DisplayPort for triple independent display. Its operating temperature range is -40 to 55 °C.

Axiomtek; 626/581-3232 www.axiomtek.com
WE’VE ALWAYS USED a lot of analog I/O to capture process variables. Electrical noise is becoming a bigger headache for us and our customers as the machines’ locations co-exist with a lot more legacy electronics, including old drives and motors, power supplies, as well as just an increased density of devices everywhere. We already use digital I/O via EtherNet/IP (and sometimes other fieldbuses) more frequently for other types of machine signals to save on wiring, gain some device intelligence and increase system flexibility. Are we better off just moving entirely to digital I/O?

ANSWERS

What About HART?
Digital is good, but let’s not go overboard. An example is plants where consultants specify that all instruments must have HART. The idea is that the operator can configure and read all parameters and status in all instruments in the field from a central control room. For a big process plant, besides the increased cost of HART instruments, the cost of remote stations also increases many folds because of the need for HART multiplexers or PLCs with HART pass-through capabilities. On the downside, the operator now just sits in the control room, becomes passive and has no feel for the process in the field. Ninety percent of all the information at the central control room is hardly used. Operators don’t understand most of the information. I prefer to link digital or analog I/Os, whichever is appropriate, to local PLCs. Only the relevant information from these PLCs will then be linked to the central control room. Operators need to “walk” the plant. I had many incidences where operators do not know where instruments and valves are located.

Chua KM, director, Bistanika Sdn Bhd

Keep It Simple
Unfortunately the answer is not a simple yes or no. The question is worded oddly. In my way of thinking, digital means discrete inputs and outputs, like relays and transistors. If the question is to use a fieldbus intelligent sensor versus a simple analog device, then the question makes a lot more sense. The concern appears to be that there may be a more inherently noise-immune way of conveying process variable signals back to the processor. Electrical noise that may create problems with the traditional sensor can also be troublesome to fieldbus devices and a lot more difficult to diagnose, as well. My best answer is to keep it as simple as possible and clean up the noise using proven techniques. Adding complexity in an electrical noise situation is an invitation to reliability problems.

Mike Krummey, electrical engineering manager, Matrix Packaging Machinery, www.matrixpm.com

Missing Link
We seldom use analog I/O any longer, just due to speed issues. And IO-Link should make the number of those instances even fewer.

Craig Souser, president, JLS Automation, www.jlsautomation.com

Signal Transmission
Analog signals have been the mainstay since pneumatic signals were first used in industrial automation. Analog signals offer a reliable way to communicate data from sensor to controller. But long runs of analog cables are susceptible to noise.

Electrical noise elimination is a major issue with the use of analog signals. Depending on the length of the distance between the sensor and the controller, a range of electronic equipment can distort the information being relayed.

To solve this problem, digital fieldbus technology provides the ideal solution. Depending on the operating environment, distributed I/O (like the 750 Series) can be utilized in conjunction with a fieldbus to relay data from an array of sensors back to higher-level control systems. This topology, mounting distributed I/O near sensors, will shorten analog cables to help eliminate noise. Costs associated with I/O enclosures can also be eliminated using IP67-rated distributed I/O (like the Speedway 767 Series). This allows for cost-effective signal transmission directly in the field.

Using digital fieldbus also eliminates the need for wiring multiple sensors back to the controller. Fieldbuses can provide communication between the control unit, system and machine, eliminating the need for lots of home-run wiring.

**IO-Link**

There is a migration across the industry toward intelligent I/O for good reason. Intelligent sensors provide more valuable information on the health of the machine than standard on/off sensors.

Intelligent I/O encapsulates many technologies that provide more than just object detection information to the controller or PLC. This includes DeviceNet, Ethernet, AS-i, Profinet and IO-Link. A recent transition in this space has been to IO-Link-enabled sensors. These sensors can provide significant benefits that prior open standards were not able to achieve. IO-Link technology can provide diagnostic information, such as temperature, operating hours and the received signal strength of the photo-eye or proximity sensor. The technology also delivers digitized information and is less susceptible to electrical noise compared to analog solutions, helping to simplify installation and maintenance.

In addition, IO-Link was designed to be forward- and backward-compatible. Users can continue using the same connectivity and sensor catalog numbers. Sensor companies are adding IO-Link functionality to their existing sensor models as opposed to introducing specific IO-Link catalog numbers. Users can apply a single product in standard I/O and IO-Link applications as needed, without an increase in the number of product models they need to stock or the confusion associated with more part numbers. To enable the IO-Link functionality, the user must install an IO-Link master where the additional diagnostics are requested. This also gives flexibility to upgrade or modify a machine easily in the future without rewiring the machine or buying all new sensors.

One more consideration is speed requirements. For the most demanding high-speed applications, analog I/O may still be necessary. While more costly, analog I/O can perform at speeds higher than the speed for which IO-Link technology was designed. However, we estimate that IO-Link will meet or exceed the vast majority of application requirements.

Kevin Zomchek, product manager,
Rockwell Automation, www.rockwellautomation.com

**Noise Matters**

Analog I/O is susceptible to noise, particularly now that analog-to-digital converters have moved from 12-bit to 16-bit, and even 24-bit, conversion. These extra bits split the signal into ever smaller divisions, with the smallest divisions found way down in the “noise region” (<100 mV). Nevertheless, regardless of the inherent challenges with noise, consumer demand is trending toward better granularity of the signal at these larger conversion sizes, so OEMs need to adapt.

Currently, manufacturers are using smart digital filtering techniques to quantify the noise and move it out of the measured region. Beckhoff analog I/O terminals, particularly analog EtherCAT terminals, have the ability to adjust the digital filter to rid the signal of 60-Hz hum and, of course, utilize low-pass filtering to remove drive noise, which generally occurs at a much higher frequency than the analog signal most of the time.

Ninety percent of all the information at the central control room is hardly used. Operators don’t understand most of the information.

The next hurdle with analog I/O comes as a function of getting signals back to the controller via a fieldbus rather than long runs of analog sensor cables. The current trend in digital systems makes the conversion from analog to digital as close to the actual analog device as possible and then transmits those signals back to the controller via a fieldbus. The controller used in the system generally dictates the choice of fieldbus, and most PLC manufacturers typically want you to use the fieldbus system(s) they themselves designed and support. With the EtherCAT industrial Ethernet fieldbus, however, Beckhoff Automation manufactures couplers and gateways that can seamlessly integrate with nearly every major openly published brand of fieldbus on the market today. The data from these connected fieldbus devices is transmitted through the EtherCAT system. Thus, nearly any make of the controller can be connected in most systems.

Fieldbuses often vacillate between use of fiber or wire cabling. Fiberoptic media is excellent for high noise situations, as well as being ideal for long-distance applications. Plastic fiber can be run up to 50 m, and glass fiber can run for kilometers. Plastic can be spliced in the field with very little training and no special tools. A catch with glass fiberoptic cable is that it can fracture easily without special training and tools in the field, so generally glass cables are purchased, and then they are cut and finished by the vendor at the required length.
In a nutshell, the choice of analog or digital boils down to the needs of each individual application. Noisy applications will often greatly benefit from a digital I/O solution, where low-noise applications may not need this type of solution.

Kurt Wadowick,
I/O and safety specialist, Beckhoff Automation, www.beckhoff.com

Complicated
While it is clear IO-Link (analog digitized remotely instead of in PLC, as traditionally done) is clearly less susceptible to electrical noise compared to standard analog solutions, I question the vendor’s statement about “helping to simplify installation and maintenance.” Increased complicity of a device often comes with the tradeoff of increased total cost of ownership due to increased cost to modify, work with and maintain, added up over the lifecycle of the equipment. Sometimes with more complicated devices comes reduced reliability, too. So I advise end users don’t upgrade unless necessary, and the rewards outweigh the risk over the life of the equipment. If you have a lot of noise problems due to poor design or layout, then IO-Link may be a more cost-effective solution, definitely if you need the added functionality. The smart sensor has additional advantages for analog signal such as no degradation over great distances. Either way, with new equipment design and purchases, the latest equipment will be used, so eventually greater complexity in end users working with equipment will be inevitable. Just saying one should first weigh out the need, for example, if you don’t have a high percentage of analog signals or the distances between sensor and processor are not that great.

While more costly, analog I/O can perform at speeds higher than the speed for which I-O Link technology was designed.
WIRELESS SENSOR RESOURCES

A SIMPLE WAY TO ADD NEW SENSORS?
WirelessHART is pertinent to the wireless sensors topic because all those sensors have to connect to a control system somehow, and WirelessHART is an important way of doing so. Most plant expansions entail adding more I/O, which can easily be brought about by using WirelessHART. A handy booklet titled “System Engineering Guidelines” can help you in this endeavor because it describes the application of WirelessHART technology in different project execution stages, starting from conceptual design through to the operation phase. The booklet explains in detail the various terminologies and provides technical guidelines. Download it at http://bit.ly/1xm9d6O.

Emerson Process Management; www.emersonprocess.com

EYE OF THE VOLCANO
Industry is now placing Bluetooth Low Energy (LE) sensors on the factory floor. This eliminates the need to put costly custom-built HMIs on a machine, instead letting operators with tablets employ them as virtual HMIs, using short-range communications to their devices over Bluetooth LE. Read more about B&B’s wireless sensor technologies at http://bit.ly/1AJ2hEF.

B&B Electronics; www.bb-elec.com

SEEING IS BELIEVING
Posted on YouTube on Jan. 22, 2014, this video entitled, “Introduction to Wireless Sensor Networks, Quick Start!” explains almost everything you need to know about wireless sensor networks. Learn how to set up and start monitoring your own wireless sensor network with this step-by-step guide. Find out how to connect sensor nodes to the cloud by ZigBee, 802.15.4, 6LoWPAN, Wi-Fi, 3G and GPRS. Watch it at www.youtube.com/watch?v=urWv-_EqS9M.

Libelium; www.libelium.com

PRODUCT SHOWCASE

KEEPES AN EYE OUT
eWon Flexy is a modular industrial M2M device that consists of a base module and a maximum of four extension cards allowing an almost unlimited number of connectivity options including Ethernet/Serial/MP, WAN, Wi-Fi, dial-up, 3G and 4G. The device provides embedded alarms, data logging, remote access and routing/web HMI applications with easy web-based configuration and programming tools for customization. It can work with the company’s hosted Talk2M industrial cloud connectivity on multiple servers worldwide, and with its VPN server appliance for real-time control applications.

eWon; 412/586-5901; www.ewon.biz

SEE THE WAY
EZ-Light TL70 modular tower light features a big, bright, 70-mm tower with advanced LED technology, providing highly visible operator guidance and equipment status indication. The tower light can display up to five colors and allows multiple colors to be lit simultaneously. The loud, 92-dB-plus audible alarm module provides user-selectable tones including pulsed, chirp, siren or continuous. For optimal performance, each light segment can be selected solid “on” or flashing, and appears gray when off to eliminate false indication from ambient light.

Banner Engineering; 888/373-6767; www.bannerengineering.com

ON THE EDGE
Edge sensor PosCon 3D can reliably measure objects independent of their color and surface, and regardless of their movement toward and away from the sensor. The sensor’s design allows easy system integration in an early planning stage using the sensor’s CAD data. This ensures tight tolerances on beam placement. The unit reliably detects edge positions even when installed in a non-vertical position with a lateral angle up to 30°. It identifies object width in fractions of a second with an accuracy of 0.02 mm. PosCon 3D can also identify an object’s center position.

Baumer; 860/621 2121; www.baumer.com
SAFETY ENCODERS
The company’s functional safety incremental encoders are certified by TÜV Rheinland. They can be used in industrial safety-related applications up to SIL3/PLe Cat. 4, and are mechanically and electrically designed to safety standards EN ISO 13849-1, IEC/EN 61 508 and IEC/EN 62061. The encoders come with a standard sine/cosine analog electronic output or a digital (TTL or HTL) electronic output. Model choices include 58- or 90-mm body sizes, shafted or through-shaft styles with cable or connector terminations, resolutions up to 2,500 PPR, and a variety of shafts and bore sizes. Standard units feature aluminum housings. Options include encoders with stainless-steel housings that have high ingress protection ratings up to IP69K.
BEI Sensors; 805/968-0782; www.beisensors.com

CIRCUIT POWERS WITH CONTROL
Emax 2 is a low-voltage circuit breaker with integrated energy management functions that monitor power usage and control installed loads and generators. Emax 2 breakers manage power by disconnecting non-priority loads during times when consumption should be limited, and reconnecting them as soon as it’s appropriate. Emax 2 circuit breakers also include direct communication capabilities for common industrial protocols. The Emax trip unit features color touchscreen navigation with embedded ANSI codes and a wide variety of easily installed accessories to tailor the breaker to its application, as well as increase safety.
ABB; 800-435-7365; www.abb.com

CONTROLS 64 AXES
SPiiPlusEC motion controller and EtherCAT network manager work together to deliver multi-axis and scalable distributed control for motion-centric applications that require higher profile generation, fast EtherCAT cycle rates and network redundancy. SPiiPlusEC controls up to 64 fully synchronized axes. The network can comprise any of the company’s EtherCAT servo and step motor drives and I/Os modules, as well as any other certified EtherCAT module that comply with the CAN over EtherCAT (CoE) protocol.
ACS Motion Control; 800/545-2980; www.acsmotioncontrol.com

SEALED LINEAR ENCODERS
Absolute LC 185 and LC 485 sealed linear encoders provide options for EnDat 2.2 with or without incremental signals, Fanuc, Drive-CLiQ and Mitsubishi encoder interfaces. Dual sealing lips provide an extra layer of protection against contamination, and both encoder extrusions ensure high vibration resistance. Existing users can upgrade their slim-line linear encoders from incremental to absolute without drilling or tapping new mounting holes. Units feature a durable laser-etched ID label.
Heidenhain; 877/887-6431; www.heidenhain.us

FRAME GRABBER
Karbon KBN-PCE-CXP4 is a four-channel video frame grabber that uses the CoaXPress (CXP) digital interface standard. CXP transmits high-speed serial data from a camera to a frame grabber at speeds of up to 6 Gigabits/second, while also sending control commands, 13-W safe power and camera triggers over one 75-Ohm coaxial cable. The unit has four independent channels, letting users sync four single-link CXP cameras onto the same board for simultaneous image capture, or connect one quad-link CXP camera, two dual-link CXP cameras, or a combination of one dual- and two single-link CXP cameras. The cameras are linked via individual BNC connections, so the Windows OS sees a separate frame grabber for each.
BitFlow; 781/932-2900; www.bitflow.com

CLAMPS FOR TIGHT SPACES
8700 series pneumatic lever clamp is a lightweight, space-saving alternative to traditional pneumatic toggle and swing clamps. The clamp provides a consistent clamping force on materials with up to 3.8-mm of variation, depending on clamp size. The device is available in 25-, 32-, 40- and 50-mm clamp sizes. Clamping forces vary from approximately 45-170 lb, depending on the bore size.
De-Sta-Co; 888/337-8226; www.destaco.com
VALVE TERMINALS
MPS series of valve terminals feature identical valves, but different layouts to target different applications. MPA-S is highly communicative and can be equipped with many additional functions. For example, an integrated serial communication system enables up to 128 solenoid coils, the function integration of proportional pressure regulators and pressure sensors, parameterisation and diagnostics. Units can handle a 24-V ±25% range of operating voltage connections.
Festo; 800/993-3786; www.festo.com/us

EYE ON THE PRIZE
EyeVision 3.0 integrated image processing software runs on cameras such as the Currera R smart camera by Ximea, on Linux (Ubuntu) and Windows. The software allows users to create inspection programs via drag-and-drop programming with only a few mouse clicks. Users can also create standalone solutions for machine vision applications, such as register mark recognition, position and rotation detection, solder joint and sealing inspection, closure and status inspection, carton folding, and volume control and fill level inspection.
EVT Eye Vision Technology; 800/468-6009; www.evt-web.com

SOFTWARE DRIVES DRIVES
Fast Winder module works with the company’s Fast application software to provide a basic programming framework featuring error-handling, prepared communication interfaces and machine-specific winding functionality. Fast modules incorporate multiple basic drive tasks, including feeding, unwinding, cross cutting/sealing and conveying. For the common machine task of winding and unwinding, for instance, the software enables manual jogging, homing and positioning among other standard drive functions. Various module extensions are available to meet different winding drive requirements, including sensor, dancer, tension and traction control. The software was developed in accordance with IEC 61131 for programmable controllers and OMAC’s PackML packaging industry standard.
Lenze Americas; 800/217-9100; www.lenze.com

SPLITS IN TWO
-C2 Models F and FS
PC-mountable, split-pack transformers meet UL5085 Class 2/3 requirements and include TÜV approval. The transformers use Class F insulation, suitable for operating environments up to 155 °C. The units are non-concentrically wound, with the primary and the secondary windings placed side-by-side, which eliminates the need for costly electrostatic shielding. They range in size from 1-1/8 x 1-3/8 in. to 2-3/16 x 2-5/8 in.
Triad Magnetics; 951/277-0757; www.triadmagnetics.com

SUPPORTS LONG STROKES
R-Plus System rack-and-pinion actuator is attached to a robust 160- or 200-mm wide aluminum alloy beam with single piece lengths between 700 mm and 5,700-mm to permit large loads with minimal deflection. The actuator provides accelerations of up to 20 m/s² and repeatability of ±50 μm. It supports multiple carriages and associated pinions on the same axis, with each carriage capable of independent motion. The device is also suitable for vertical applications and comes pre-installed with a precision speed reducer ready to mount to the desired motor.
Rollon; 973/300-5492; www.rolloncorp.com
NO MORE HYDRA
RSA-HT rod-style actuator can replace hydraulic units because it has force capabilities of 12,900 lbf (57.38 kN). Features include an IP67 option, standard purge/breather port and a lubrication system. The actuators have a grease zerk fitting for easy lubrication without disassembly. An improved polyurethane timing belt with carbon-tinsel cords is available in 1:1 or 2:1 reduction configurations. The actuators come in three sizes (32, 50 and 64), and are available in strokes up to 60 in. (1,524 mm).

Tolomatic; 800/328-2174; www.tolomatic.com

WIRE STRIPPER HANDLES TOUGH INSULATION
The stripax ULtimate high-precision, wire-stripping tool is intended to strip wires that have tough, halogen-free insulation. The unit’s self-adjusting blade automatically adapts to the wire size. For large gauge or wire with hard insulation, users can make additional adjustments by turning a screw beneath the strip blades. The tool also features a three-stage partial stripping function to retain a portion of stripped insulation on the tip of the conductors and help prevent the wire strands from fanning out, which simplifies the process of ferrule placement.

Weidmüller; 800/849-9343; www.weidmuller.com

DIN-RAIL TERMINAL BLOCKS
WT Series DIN-rail-mounted screw-clamp terminal blocks feature an enhanced push-in jumpering system that forms a low-resistance, vibration-proof connection when inserted. This capability is possible because the rugged steel spring for mechanical fastening is separated from the jumper’s copper current bar. The system supports extended jumper lengths and the capability to link alternate terminals, such as every second or third block, using notched jumpers. The terminal blocks feature a screwless (snap-on) design.

Wieland Electric; 800-943-5263; www.wielandinc.com/en-us

SIMPLIFY CABLING TO CONTROLLERS
Passive junction boxes with stainless-steel M12 ports come in four-, six- or eight-port configurations with one to two discrete signals per port capability. A single cable then connects the junction box to a controller, eliminating the tangle of cables when individual lines are run from each discrete device. Discrete signals can be either inputs or outputs from the controller. The junction boxes are available in PNP LED, NPN LED and no LED options. The devices feature fully encapsulated nylon housings, include IP68 and IP69k ingress protection, and are certified for a temperature range of -40 to 85° C.

Turck; 800/544-7769; www.turck.us

SIGNAL CONDITIONERS
2857 Series signal conditioners provide conversion, isolation and transmission of many different signal types for factory automation and process control applications. The 2857 can be configured via DIP switch, software, the company’s Jumpflex-To-Go app or an optional, plug-in LCD display. The 2857 features an temperature range of -40 -70° C.

Wago, 800/346-7245, www.wago.us

PROGRAMS PLCS WITH VISUAL STUDIO .NET
Net.Ablink v5.0 software is a plug-in library that provides direct communication access to Allen-Bradley MicroLogix, SLC and PLC-5 families of PLCs. The software allows Visual Studio .NET programmers to upload the tag list stored in PLC memory, then browse for data items of interest. Using tags to reference PLC data makes developing complex PLC programs much easier, and the browsing capability lets programmers easily find and integrate data items into their HMI visual control applications along with SCADA data acquisition programs. Net.Ablink v5.0 is available for immediate download and is a free upgrade for qualified Net.Ablink v4.0 users. Get the free upgrade at www.ingeardrivers.com/ablink/ablink.htm.

CimQuest InGear; 866/935-7979; www.ingeardrivers.com
GIGABIT POE+ SWITCHES
EKI-9361P and EKI-9312P DIN-rail switches are communication solutions for high-bandwidth Ethernet-powered devices in industrial applications. They units feature a high power output (up to 30 W) intended for industrial heavy-duty PoE devices with Gigabit Ethernet capabilities for large bandwidth network transmissions and easy management tools (PoE Power Budget Control) for monitoring PDs. The switches come with tools including a power management function for system optimization and a diagnostic function to detect PD conditions including failure detection and LED indicators.
Advantech; 800/205-7940; www.advantech.com

REMOTE MONITOR ETHERNET/IP-EQUIPMENT
Netbiter Remote Management solution lets automation devices using EtherNet/IP be monitored and controlled via the web. Via the LAN port on the Netbiter Gateway, users can connect via UCMM (UnConnected Message Manager) which is an acyclic messaging channel separate from the control loop messaging. This lets users configure EtherNet/IP devices remotely using their regular configuration software (RSLogix for example); log trends and view performance over time; and get alarm or event notifications whenever critical thresholds are reached.
HMS Industrial Networks; 312/829-0601; www.hms-networks.com/home

ALIGNMENT STAGES
Low-profile XY (theta) stages are intended for high-precision alignment applications. The stages move in an XY-plane and rotate around the center of the XY-plane. The stages can also rotate around the center of the XY plane up to +/- 6°. They have preloaded cross-roller bearings and come in standard models with accuracies of +/- 1.75 µm to +/- 2.5 µm and precision models with accuracies of +/- 0.7 µm to +/- 1.0 µm. The models have linear travels from +/- 2 mm by +/- 2 mm up to +/- 30 mm by +/- 30 mm.
Optimal Engineering Systems; 888/777-1826; www.oesincorp.com

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Smart, Connected Machines

INDUSTRIAL MACHINES AND systems that are created for them need to move toward a connected enterprise with a seamless value chain. An interconnected manufacturing value chain working toward demand, visibility and planning, and optimizing production within existing business models has not yet been affordably and comprehensively achieved.

For the food industry, a primary focus is product quality and food and human safety. The value chain and the speed of information that is needed to go “from farm to fork” or from first concept to the commercialized product is constantly increasing. Machines and systems need to connect in such a way to allow for agile, demand-driven response. A customer-centric perspective requires that our manufacturing enterprise and all of its components have a nimbleness that we’ve never seen before.

This next-generation manufacturing environment will require data from all machines, suppliers and manufacturers to be integrated into a context that allows decisions to be made that optimize the value chain. This starts with data accuracy. We need to be able to trust all of the data we have, so that we can act on it. Can we? We all have heard of big data and most of us have it, but we need to act on it to get value.

■ It’s going to take a full collaboration across industry to make a connected manufacturing value chain that we all envision to be highly successful. ■

Our challenge is to produce the best quality product in a safe and sustainable manner and at the most competitive costs, delivered at the right time and place, with the assured, sustained support for its lifecycle. This is the comprehensive approach to manufacturing enterprise management that the Smart Manufacturing Leadership Coalition (SMLC, www.smartmanufacturingcoalition.org) focuses on. SMLC is a nonprofit, industry-led coalition building a cloud-based, open-architecture platform that integrates existing and future plant-level data, simulations and systems across manufacturing seams and orchestrates business in real time across the enterprise.

Smart manufacturing marries cloud technologies with real-time manufacturing data and operational requirements, making it possible to access new IT technologies, build dynamic enterprise data systems, scale IT infrastructure and manage applications locally. These new capabilities will transform the business and operations in manufacturing to achieve next-generation value chains. Creating agility that significantly increases market and demand response, new product innovation, speed to market and improved manufacturing process and performance are outcomes that SMLC drives toward.

Today everyone relies on core systems to drive the business, but every system requires its own architecture. In most cases, core systems provide capabilities to do certain things and are usually purpose-built. When you look at all of the for-purpose applications needed in a value chain, you soon have a mountain of core systems and supporting architectures. Many times the optimal solution will join or cross these systems. The industry needs an open infrastructure that can stitch disparate systems and seams together to create innovative solutions. These point solutions cry out for a comprehensive approach to manufacturing. That’s the fundamental challenge in today’s manufacturing space.

Working with customers as a team, machine builders can use the inherent capabilities of the affordable, open architecture, open-access SMLC platform to enable business real-time decisions. Improving customer support while gaining information, intelligence and knowledge that can drive better performance of their machines in the field and the ability to affordably modernize that equipment, while providing insights on new designs, are key benefits for machine builders when adopting an SMLC platform.

Machine builders and manufacturers are aligned on the value of asset lifecycle management. OEMs will affordably be able to knit and orchestrate their current data, systems and predictive maintenance services with the capabilities of their customers in both proprietary and nonproprietary manners with other machine builders. This will allow visibility and transparency of machine and component performance, as well as the impact on production to finally piece together the assets’ true performance.

The time is now, but it’s going to take a full collaboration across industry to make a connected manufacturing value chain that we all envision to be highly successful for all stakeholders. Partnerships driving the platform’s development are composed of manufacturers, machine builders, manufacturing consortia, third-party integrators, solution providers, universities, government laboratories and agencies.

JIM WETZEL is the recently appointed chair of the Smart Manufacturing Leadership Coalition. He’s also director—system engineering and platform reliability at General Mills. Contact him at jim.wetzel@genmills.com. You can learn more about SMLC at www.smartmanufacturingcoalition.org.
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Industry in Transition: The Information Driven Enterprise for the Connected World

FEBRUARY 9-12, 2015 • ORLANDO, FLORIDA

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Now with EtherNet/IP™ as a native protocol, we make it easier to connect the powerful, cost-effective Productivity3000 controller to your existing systems. Configurable as a Scanner, Adapter, or both simultaneously, the P3-550 CPU supports Explicit or Implicit "I/O" messaging. Connect to EtherNet/IP enabled devices such as ControlLogix and CompactLogix controllers or Flex drives using the Productivity3000’s fill-in-the-blank style configuration and Message instructions. Whether you are configuring a new application or looking to expand an existing one, we can get you in control and connected for less.

Performance + Value = Productivity3000

www.productivity3000.com

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<th>AutomationDirect Productivity3000</th>
<th>Allen-Bradley ControlLogix</th>
<th>Allen-Bradley CompactLogix</th>
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<td>16pt 24 VDC IN</td>
<td>$116.00</td>
<td>$240.50</td>
<td>$343.50</td>
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<tr>
<td>32pt 24 VDC IN</td>
<td>$158.00</td>
<td>$423.00</td>
<td>$432.50</td>
</tr>
<tr>
<td>32pt 24 VDC OUT</td>
<td>$158.00</td>
<td>$482.00</td>
<td>$611.00</td>
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<tr>
<td>8pt Isolated Relay OUT</td>
<td>$96.00</td>
<td>$263.00</td>
<td>$427.50</td>
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<td>$1,413.00</td>
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<tr>
<td>4 ch voltm/A Analog OUT</td>
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<tr>
<td>8 ch THM &amp; mV IN</td>
<td>$433.50</td>
<td>$915.50</td>
<td>$2,519.00</td>
</tr>
<tr>
<td>Total System Price</td>
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<td>$10,655.50</td>
<td>$20,760.00</td>
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Thermocouple module from AB is 6-Ch vs. Productivity3000 8-Ch.