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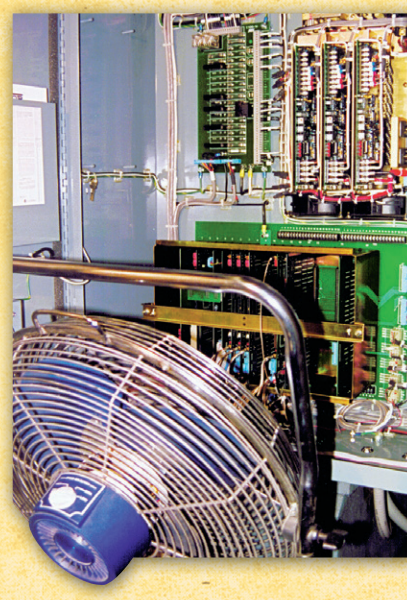

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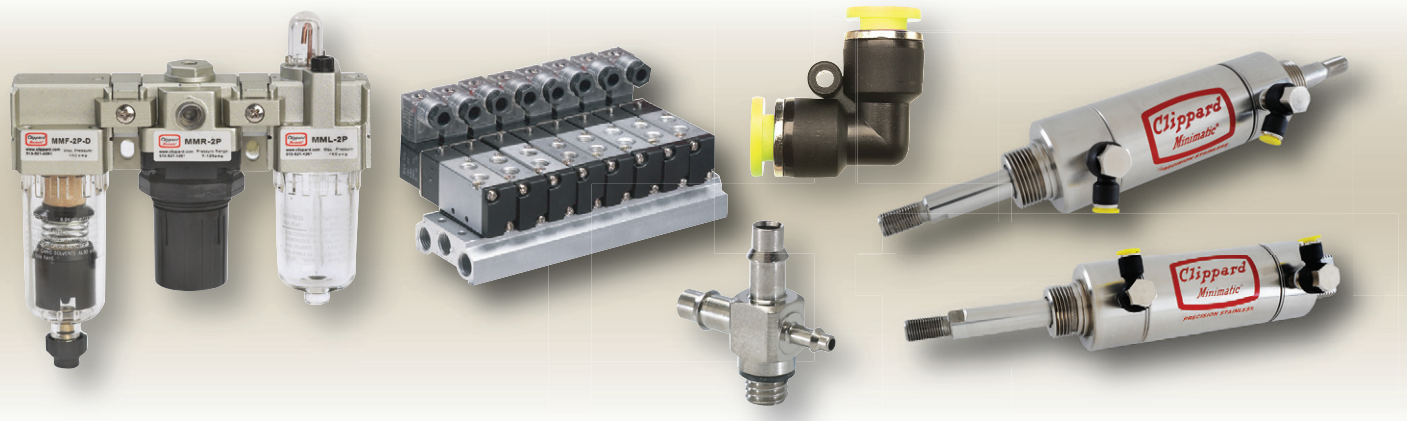

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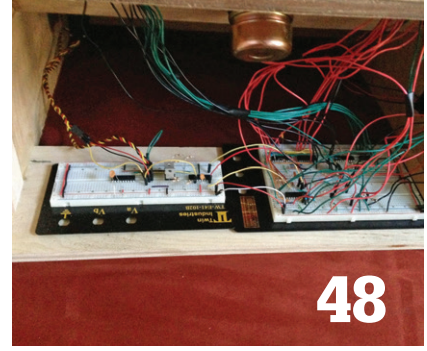

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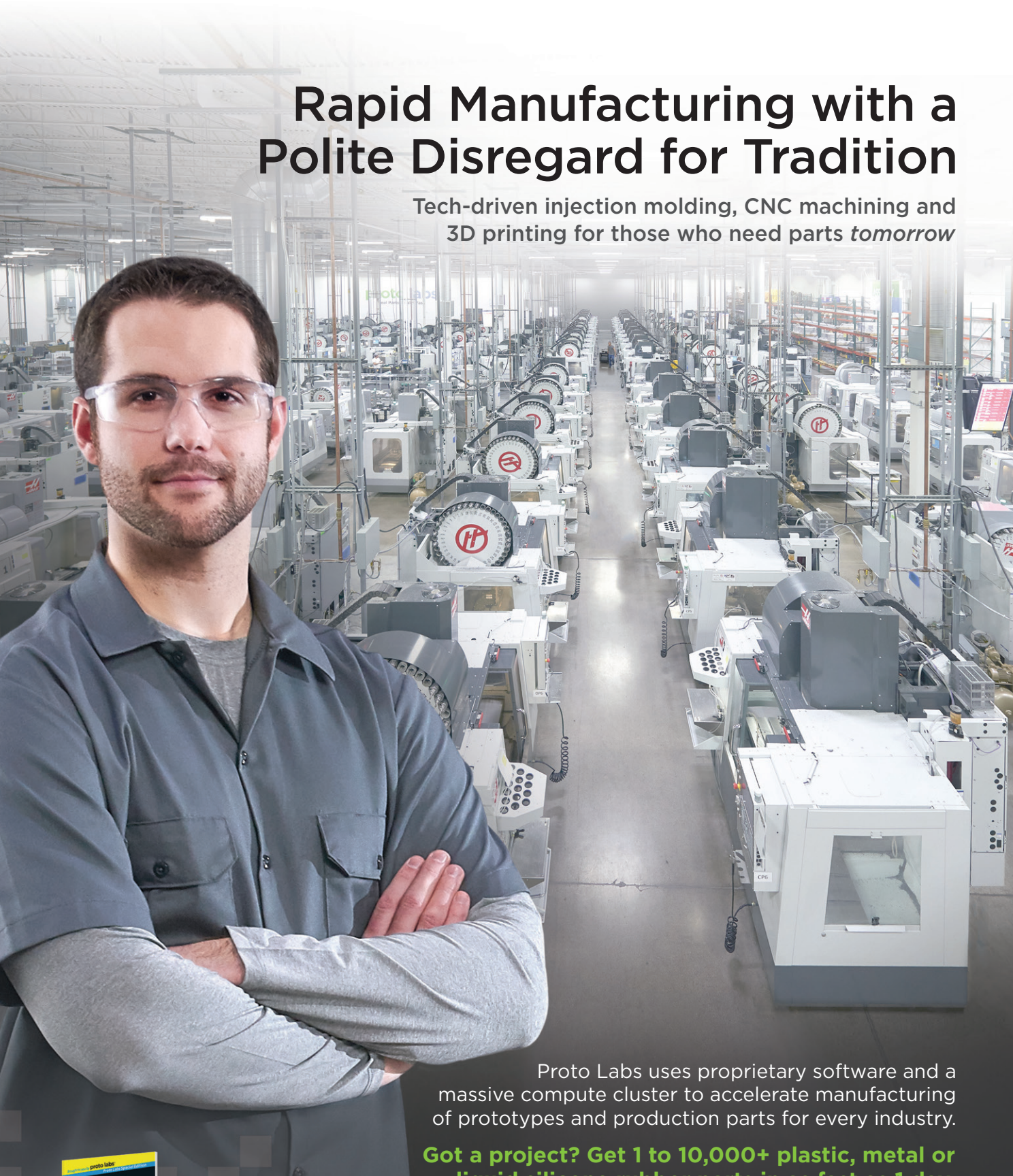

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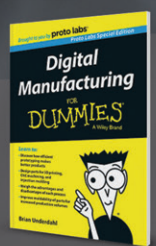

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My Opinion On ....

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Can't We All Get Along?

LATELY I'VE BEEN hearing and reading "tossing it over the wall" a lot from industry professionals. Engineers are intimately familiar with this phrase, which has begun to be conjoined to calls of "we need better collaboration" and a "multidisciplinary approach" to design and engineering. For that, all of us can thank, first, Apple, and now the Internet of Things.

Connected-everything is bringing us novel devices that manage our lives. Just about every new product has complex electronics, computer-based control, and telecommunications abilities, from wrist-worn fitness trackers to million-dollar industrial machines. As Chris Rahn, a Penn State professor, quipped to *Design News* recently , "Who would have guessed that a company making thermostats would be worth $3.2 billion?"

I am seeing two things happening as we dive into IoT and condensed product development cycles: greater integration between engineering and industrial design and demand for mechatronics expertise. Engineers may scoff, but think about how the original Apple iPod, with its interface and click-wheel control, revolutionized how people toted their portable music — the result of brilliant, holistic design and engineering, as Tom Kramer, president of Kablooe Design, put it in a recent *Design News* column (**http://ubm.io/1PXF5Vq**). Competing MP3 players at the time were technically and functionally just as sound as the iPod, but no one remembers iRiver, do we?

Now we are seeing an explosion of mobile and digital health devices with inventive form factors and user interfaces. These empowering tools mean greater servicing and managing ourselves, which means a big need for foolproof user experiences (UX). At the recent Atlantic Design & Manufacturing show, a *Design News* industry event, Sean Hughes of Philips spoke about interaction design's role has in preventing improper device usage and inaccurate data from being sent in telemedicine. With our health on the line, good industrial design is more than making things look pretty.

Mitch Maiman, president of IPS, a full-service product engineering and industrial design firm, in a *Design News* column (**http://ubm.io/1HY7Hhp**), described the uneasy alliance mechanical engineers and industrial designers have struck and how it is now commercial and industrial software engineering's turn with UX designers. Resist, as many engineers might, but look around the manufacturing plant. Machine HMIs are beginning to resemble the touchscreens and visual-based flows on our personal devices; eventually the E-stop might be the only button on a machine operator interface. This buttonless, icon-driven interoperability is not a dumbing-down movement but rather what has come to be expected from consumer technology that has proved to work.

Are you being asked to have Aunt Mary come on the plant floor and expertly operate a metal-cutting machine or an injection molding and assembly cell like she does with Facebook? Of course not, but in this day and age, an engineer with a good sense of ergonomics — or who can work with input by an industrial designer — is going to be more valuable than an engineer who simply wants to crunch the systems and then pass the project onward.

The consensus is that design and manufacturing companies that don't change from legacy organizational structures — those that silo and delineate product development functions — will struggle, while those that take holistic, systems-integration approaches will do well. And those that hire exclusively engineers with laser-focused disciplines could falter to those that seek the growing pool of mechatronics professionals with interdisciplinary knowledge and skills. Already, we are seeing successes by smaller, nimble firms with cross-trained engineers or which can synthesize their multidisciplinary teams.

Will you be throwing it over the wall and away?

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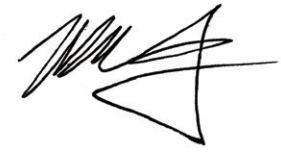

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Choosing the Right Simulation Table for the Design Job

Advances in simulation tables are allowing faster and more effective testing on new products, parts, and subsystems. What should a design engineer know when choosing the right simulation table for the job?

By Fons Hoeberichts, Moog

SIMULATION TABLES have supported the job of fatigue testing car components for years, but other industries are enlisting these industrial workhorses to replicate everything from the sensation of driving a tank to the vibration a package "feels" as it snakes its way along the global supply chain. Even the things you don't typically think moves, like a high-rise building, are getting a ride on simulation tables to assess the effectiveness of engineers' designs.

Advances in simulation tables (both electric and hydraulic) and the products underpinning them, such as fatigue-rated actuators, servovalves, and test controllers, are allowing faster and more effective testing on new products, parts, and subsystems.

What should a design engineer know to choose the right simulation table for the job?

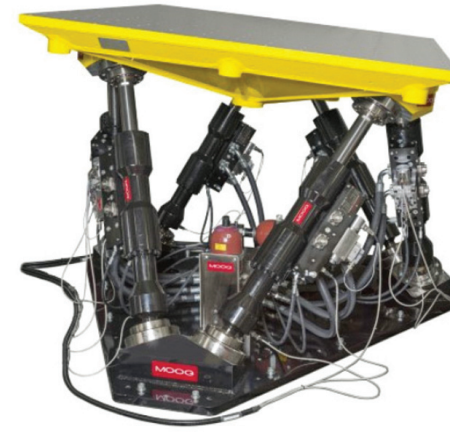
There are hydraulic and electric simulation tables. Both are also known as multi-axis shaker tables, or MAST, and are six-degree-of-freedom (DoF) systems. Both hydraulic and electric systems use integrated control hardware and application software to control position, velocity, and acceleration on the top platform.

A hydraulic simulation table is comprised of a very stiff, aluminum-welded top platform and a steel baseplate. Mounted in between the top platform and baseplate are six, weight-optimized hydrostatic-bearing hydraulic actuators.

Hydraulic systems can typically handle higher payloads than their electric counterparts. In fact, a modern, high-performance hydraulic simulation table in hexapod configuration can be rated for payloads as high as 680 kg (1,500 lb), while providing frequency response up to 100 Hz and high acceleration levels of 10 G. Hydraulic systems are mainly used for fatigue testing.

In comparison, an electric simulation table uses electromechanical actuators and an electric cabinet containing the necessary electric drives. Engineers use these tables for functional testing at frequencies up to 30 Hz and accelerations to around 1 G. Electric tables are cleaner (i.e., no risk of hydraulic fluid leaking) and quieter than hydraulic systems. Electric systems are designed to perform, for example, functional tests and driver training by adding the vehicle motion.

As for power requirements, an electromechanical system typically uses only a quarter of the energy used by a hydraulic system, which requires a hydraulic pump unit. The latter produces a lot of heat and requires additional technology to cool the oil. No real difference exists in terms of space requirements, as electric simulation tables have approximately the same size footprint as hydraulic simulation tables.



Moog hydraulic simulation table ordered by Thule.

Source: Moog

Hydraulic simulation tables require a bit more maintenance than electromechanical tables because owners of the former must periodically change seals and hoses and clean the valves.

Companies choose high-performance simulation tables for a variety of reasons, including reducing time to market and testing the viability of a design. In the world of automobiles, designs have become highly complex. Now there are control units for the suspensions, exhaust line, and steering system, to name a few. Software linked to the simulation table systems replicates and plays out time history drive files that were recorded

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at the test track, or performs resonant-frequency research.

Twenty years ago it might have taken three to four years to develop a new car model. With realistic simulation, that timeframe is now between 18 and 24 months. This is not only because of better engineered simulation tables but also computer-aided engineering tools, which are far more accurate.

There remain possibilities to further improve simulation tables. In the past, design engineers created single-axis systems replicating, for example, heave. To bring more realism to testing, engineers can now opt for six-DoF systems, instead of simulating each axis (i.e., X, Y, and Z) separately.

The hexapod designs offer vector-based motion and can perform translation and rotation functions in conjunction with an expanded frequency range up to 100 Hz (for the hydraulic types). When automakers perform testing analysis, a lot of damage occurs within the range from 50 to 80 Hz. With older MAST, results are often filtered down to 40 Hz, so any damaging events beyond that point are not captured.

Initially, the auto industry relied on simulation tables for fatigue testing, but now carmakers also use simulation tables for functional testing. With an eight-DoF system, carmakers can achieve total pitch and roll angles of more than 50 degrees to simulate a continual acceleration of up to 12 m/s for the testing of fuel tanks.

A simulation table's usefulness isn't limited to the automobile industry anymore. Simulation tables can mimic everything from the motion of driving a tank and piloting a ship to testing a stabilization system and sloshing fluid in containers.

There are even larger simulation tables (with top platforms measuring 3m by 4m) that designers can use as the foundation for testing the effects of earthquakes on an office space. A company in Japan recently commissioned a simulation table to carry a full-scale office and subject it to a prolonged vibration of up to 20 Hz to evaluate different construction designs as they were struck with simulated tremors.

Even packaged goods firms are now showing interest in placing their palletized packaging on simulation tables to generate the movement and turning of a delivery truck. All of this is done to better understand whether manufacturing and shipping companies are adequately protecting their products during delivery. Anything of value that can be put in motion is a candidate for simulation testing. **DN**

Fons Hoeberichts is a business development manager for test systems at Moog.

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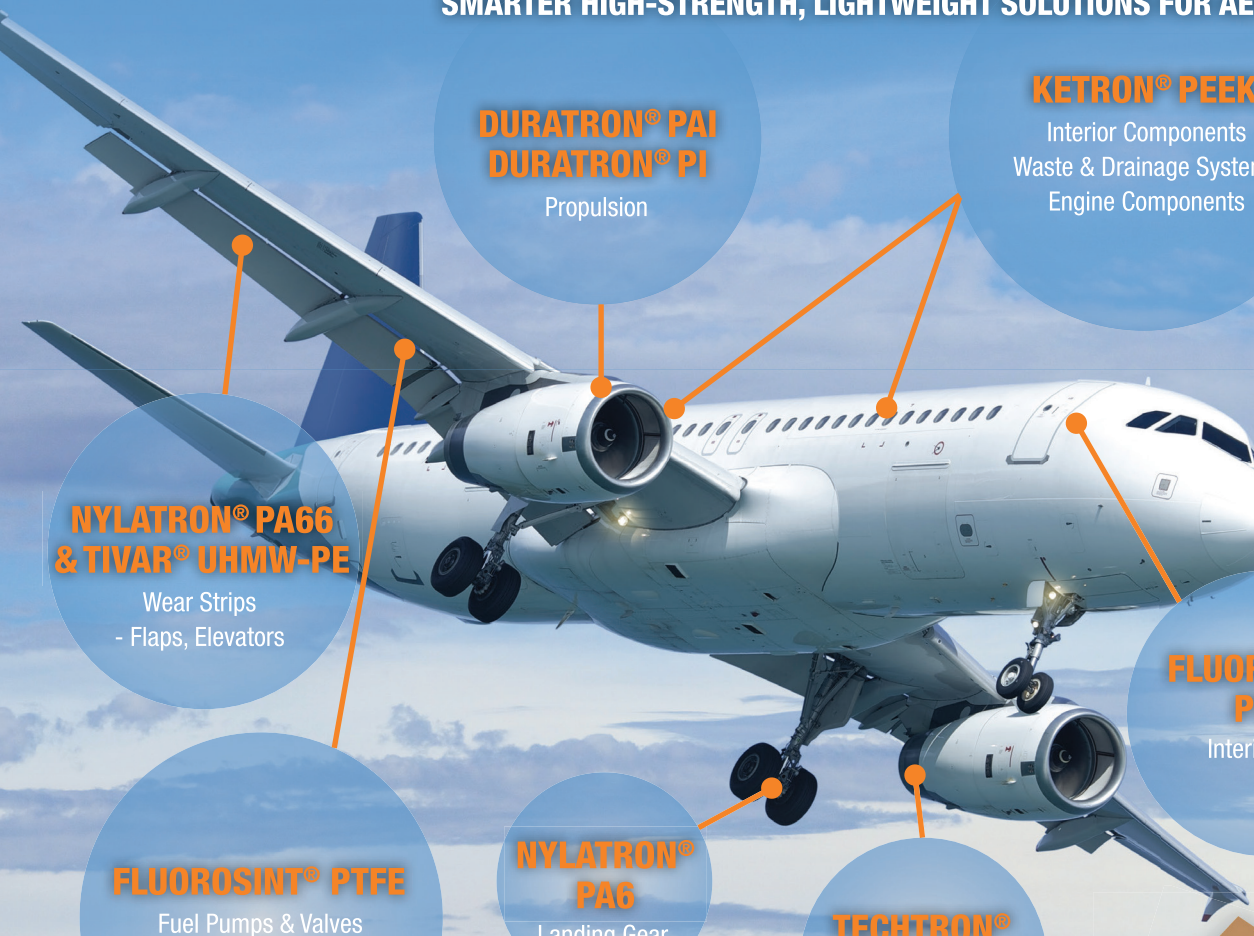

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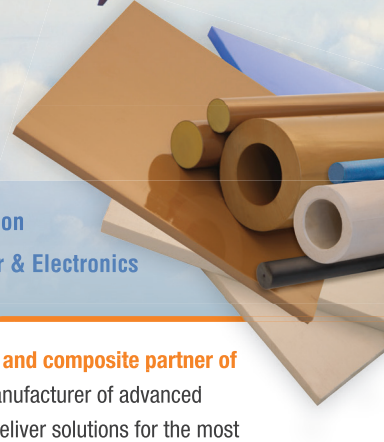

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Stove Has Owner Seeing Red

I was on the way home from work recently, when my wife called. She said the oven had started sparking and arcing, so she turned it off, but part of the oven element continued to glow cherry red. I guided her through the process of locating the circuit breaker for the range and turning it off.

When I got home, I continued to wonder, "How can the oven element have power on it when the oven is turned off?" I started looking around the Web for replacement parts and for any explanation as to why the element would continue to have power applied after it was turned off. I finally came across a post from someone with the same stove, and exactly the same issue.

Apparently, the stove manufacturer put the controls for this oven in one side of the element, and left the other side of the element connected permanently to line power. Normally, the element is grounded by its outside covering, but what if that joint fails? Worse yet, what if the ground for the stove fails or is never properly connected, and the element heating wires short to the element covering?

— DAVE MAPLES

Karaoke Machine Owner Sings the Blues

We purchased an inexpensive but fairly full-featured karaoke machine for the kids. One selling point for this particular model was that it accepted two separate inputs. But just one week later, one of the kids asked, "Can you look at the karaoke machine? One of the microphone inputs isn't working."

We swapped the microphones around and determined the problem was internal to the unit, so I decided to open it up and see what I could find. The back of the unit came off easily, as it was attached with standard Phillips screws, only one of which was hidden by a label. After detaching the power input panel from the back cover, I had clear access to the internals.

My first impressions were good, with most connectors secured with an adhesive to help prevent them from vibrating loose. I started tracking the microphone signals through the plugs and cabling, eventually back to a board with potentiometers for sound adjustment. A check of the volume adjustment pots for the microphones seemed OK. The next step was to track the signals from the inputs, which led me to a dual op-amp. First, the op-amp is a JRC4558, which turned out to be obsolete. Second, a brief examination of the board revealed what appeared to be heavy flux residue and the beginnings of corrosion. Cleaning this area and some others led to the system working again.

— JAMES SEBASTIAN

Made by Monkeys highlights products that somehow slipped by the QC cops. Email your stories to Chris Wiltz at **christopher.wiltz@ubm.com**.

Captain Hybrid

designnews.com/blog/captain_hybrid

Yes, We Still Need a Better Battery

If we want to wave goodbye to oil, then we'll need a $100/kWh battery with 300 miles of range.

By Charles J. Murray, Senior Technical Editor

WHY AREN'T ELECTRIC CAR sales better? The answer, it seems, can't be repeated often enough: It's the battery; it's the battery; it's the battery.

Automotive engineers know this, of course. So do materials scientists. But consumers look in awe at the accomplishments of Tesla Motors and wonder why its electric success can't trickle down to mid- and entry-level cars.

General Motors recently blamed lack of demand. Plug In America cited lack of awareness and vehicle availability. "Some dealers are less enthusiastic about making the additional investment required to support PEVs," the organization wrote in a recent report (**http://bit.ly/1zVPcsd**).

Both are right. Demand on the low end of the market is weak. Vehicle availability and awareness are poor.

The question is, why? The answer: It's still the battery.

A recent study done by TrueCar.com stated the obvious: People with higher incomes purchase battery electric cars. The study showed that buyers of the Ford Focus EV had an average household income of $199,000 a year, whereas the buyers of the gas-burning Focus averaged $77,000 a year. Similarly, buyers of the Fiat 500e electric car earned $145,000, while gas-burning Fiat 500 owners came in at $73,000.

In an interview with *USA Today*, TrueCar president John Krafcik suggested that the affluent buyers were more bargain conscious, and therefore wanted a car with lower operating costs. Left out of the explanation was the fact that the more affluent owners can afford to buy a relatively expensive second or third car that offers less utility. Less affluent owners can't do that. If they can afford a second vehicle, it's a beater.

In the next few years, economies of scale will push electric vehicle technology forward. Batteries will get cheaper; car prices will drop, volumes will grow. Overall penetration of battery electrics will rise — maybe to 5%, maybe even 10%.

If you're looking for an explosion of sales — one that makes us wave goodbye to oil — then good luck.

But if you're looking for an explosion of sales — one that makes us wave goodbye to oil — then good luck. Economies of scale won't do that. For that, we need the so-called "God battery" — 300 miles of range, $100/kWh.

That's a tall order, of course. We know this because we've heard about countless new battery chemistries over the past 25 years, from sodium-sulfur to nickel-iron to nickel-metal hydride to advanced lead-acid to lithium-ion to lithium-air to lithium-sulfur to aluminum-air and on and on. We're still waiting. Apparently, it's harder than it looks. **DN**

What Caused the Hummer's Rough Ride?

By Scott Moore, Guest Writer

A WHILE BACK my 2006 (out of warranty) Hummer H3 started to idle roughly and I was presented with an amber "check engine" light on the dash. I went to the local auto parts store and borrowed their code reader, and plugged it into the connector beneath the dash. The system was reporting that cylinder five had been misfiring.

I had rough idle issues previously and I was able to correct the issue by cleaning the throttle body, but this time there was no improvement. I also ran a couple tanks of fuel with fuel injector cleaner through it with no improvement.

Having received a recall regarding a bad aesthetic trim clip, I brought the vehicle into the dealership. Since I was there anyway, I had them check into the rough idle issue.

I was told that the inline 5cyl motors occasionally had issue with the last cylinder (number five) in that it doesn't cool as well as the others and as a result the valves have a tendency to hang up and cause rough idling. I was also told that I should replace the throttle body, and the cylinder head which would cost approximately $4,500 plus labor. Just as shock was starting to set in, the service manager told me the work would probably resolve the issue. I told him that I was not about to spend that much money for a "probably."

When I got home I thought about it a bit and went back to basic troubleshooting. In order for an engine to run, it needs air, fuel, and an ignition source. Since I had cleaned the throttle body, and checked the air filter, I figured it was a safe bet that it was getting air, and having run a couple tanks of fuel with a fuel injector treatment, I was most likely getting fuel, so the only thing left was spark.

Interestingly enough, the engine has five identical ignition coils, one for each cylinder. So I swapped the ignition coils of cylinder five, where the problem was reported by the code reader, and cylinder one where I had never had any issues. A couple days later, the rough idle returned and was accompanied by the check engine light. Again, I went to the auto parts store, borrowed their code reader and … the system was now reporting misfires on cylinder one! Therefore, the problem had to be the ignition coil since the problem followed it to cylinder one.

I brought the code reader back into the store, purchased a new ignition coil for $60, and installed it right there in the parking lot in a couple minutes.

The engine ran wonderfully smooth and I have not had any problems since. I was very pleased that just some basic troubleshooting saved me from a $4,500-plus repair bill, which incidentally would not have solved the problem! **DN**

Scott Moore is the chief engineer for Alliant Techsystems' Sporting Group. He has been with the company for 11 years in the manufacturing engineering department where he has served as engineer, engineering manager, and now chief engineer.

DesignNews.com

Balancing Efficiency and Comfort in a Ford
Building a prototype of a car is a tough way to find the optimal balance between efficiency and comfort. The Sherlocks at Ford are finding the balance using simulation.
http://ubm.io/1KsQNbr

Have you applied your deductive reasoning and technical prowess to troubleshoot and solve an engineering mystery that even the fictional Sherlock would find most perplexing? Tell us about it!
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Spanish Firm Designs Bladeless Wind Turbine

One of the chief ecological complaints about wind turbines is how birds can fly into their blades and be killed. To solve this problem -- as well as reduce the amount of materials it takes to build a turbine and make it more cost-effective -- a Spanish company has designed a new bladeless wind turbine, aptly named the Bladeless Vortex.

The concept of a device that makes wind without blades is not a new one; Dyson already sells a bladeless fan, although the Vortex design is on a larger scale and has a different look than Dyson's product. The Vortex in complete form looks like the base of a typical turbine that gradually gets slightly thicker at the top.

Instead of capturing energy via the rotational motion of a turbine's blades, the Vortex takes advantage of what's known as vorticity, according to the company. Vorticity is an aerodynamic effect that occurs when wind breaks against a solid structure. When this structure starts to oscillate, it captures the energy that is produced.

By generating energy in this way, the Vortex not only doesn't kill birds, it also has a number of other benefits, the company said on its IndieGogo campaign page, on which it's aiming to raise $50,000. At the time this article was written, the company already had exceeded its goal by nearly $10,000.

According to the company, funds from the campaign will be used to finance a pilot study in India.

Bladeless Vortex says its turbine is more environmentally friendly and more cost-efficient than typical wind turbines.

The Bladeless Vortex has five main parts: foundation, rod, generation system, tuning system, and mast. Engineers have streamlined the design of the turbine so none of the parts are in contact, which means it has no gears or linkages and thus requires a smaller amount of raw materials for manufacturing, the company said. This also cuts production costs and the time it will take to produce the turbines.

Unlike turbines with blades, the Vortex doesn't make any noise, another benefit to the design, according to the company. The turbine's designers also estimate that the Bladeless Vortex will produce energy at a 40% lower cost than a comparable wind installation due not only to its lowered production costs but also lower maintenance costs. This is because the turbine has less parts that will suffer wear and tear -- and none that come into contact and thus cause friction that can break down materials -- than conventional turbines.

The company aims to design Bladeless Turbines for both small-scale and large-scale deployments. Within a year 100W and 4 Kw turbines will be available for small-scale and residential use, according to the company.

Visit DesignNews.com to see the Bladeless Vortex in action: ***http://ubm.io/1L0eckP***

—Elizabeth Montalbano,
Contributing Writer

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News

Trends \\\ Breakthroughs \\\ Developments

All-Plastic Engine Revs Up

Solvay is taking a leadership role in developing an all-plastic car engine, the Polimotor 2.

LEADING PLASTICS COMPANIES are getting more involved with OEMs, from cars to medical devices, to help design lighter and stronger components and assemblies while also tweaking their own material formulations. Belgium-based Solvay is already known for its extensive work helping Solar Impulse 2 designers get their second 100% solar-powered plane off the ground earlier this year. Now, the plastics innovator is taking what it calls a leadership role in developing an all-plastic car engine, the Polimotor 2.

Version 2 of the Polimotor plastic engine is a four-cylinder, double-overhead CAM engine that will weigh between 138 lb and 148 lb (63 kg to 67 kg), or about 90 lb (41 kg) less than the standard, all- or mostly metal production engine in today's cars.

Working with the engine's original designer, US engineer Matti Holtzberg, Solvay will replace up to 10 engine components usually made of metal with parts made from seven of its high-performing thermoplastic materials. The components include the oil pump, water pump, water inlet/outlet, throttle body, fuel rail, and cam sprockets, among others. Solvay says it contributed a major role toward the success of the first Polimotor engine, also conceived by Holtzberg, in the early 1980s.

Source: Norma Auto Concept

Solvay plastics on the initial bill of materials for the new engine include the company's Torlon polyamide-imide (PAI), Amodel polyphthalamide (PPA), KetaSpire polyetheretherketone (PEEK), AvaSpire polyaryletherketone (PAEK), Radel polyphenylsulfone (PPSU), Ryton polyphenylene sulfide (PPS), and Tecnoflon VPL fluoroelastomers.

The all-plastic Polimotor 2 engine will be installed in an M-20 C Coupe concept car from French race car designer and builder Norma Auto Concept, and raced competitively next year at the Lime Rock Park auto racetrack in Lime Rock, Conn.

In an article in Engine Labs, Holtzberg is quoted as saying he had already begun to work on a next-generation version of the Polimotor engine when Solvay approached him to restart the project. He says there that the new engine's architecture will be the same as the original's. What will be different are its new materials.

—Ann R. Thryft, Senior Technical Editor

Automation & Control

A Champion Is Crowned in the 2015 DARPA Robotics Challenge

A South Korean team took the top prize in DARPA's robotics challenge.

HOW LONG BEFORE ROBOTS can be sent in to rescue victims in crisis situations? While there's no fast answer, participants in the DARPA Robotics Challenge (DRC) collectively brought us one big step toward that stage.

After two days of challenges (and plenty of falls and accidents) held last month at the Fairplex in Pomona, Calif., Team Kaist from Daejeon, Republic of Korea emerged in first place with its robot DRC-Hubo (That's DARPA Robotics Challenge HUmanoid RoBOt). In development since 2002 the Hubo robot is a bipedal humanoid robot that also uses wheels on its knees to move faster and more easily traverse certain obstacles.

Twenty-three teams from the US, Japan, Germany, Italy, Republic of Korea, and Hong Kong participated in the outdoor challenge. Robots were tasked with completing a series of increasingly difficult challenges — all related to needs for disaster response — including driving a vehicle, walking while avoiding obstacles, tripping circuit breakers, turning valves, and climbing stairs. Robots were untethered and performed their tasks using a combination of remote control and automation algorithms. Teams had an hour to complete the obstacle course and were scored by time and number of tasks completed. South Korea's Team Kaist came out on top with a finishing time of just over 44 minutes for all eight tasks.

Source: DARPA

Team Kaist from Daejeon, Republic of Korea won first place with its robot DRC-Hubo.

The DRC was spearheaded following the 2011 Fukaushima nuclear disaster with the hopes of advancing technology to create robotic aids for rescue workers that need to venture into harsh or dangerous environments. With its win, Team Kaist takes home a $2 million prize. Second place finisher, the Running Man robot from Team IHMC Robotics from Pensacola, Fla., took home a $1 million prize, and third-place finisher, the CHIMP robot from Tartan Rescue of Pittsburgh earned a $500,000 prize.

In a press statement, DARPA Director Arati Prabhakar said, "This is the end of the DARPA Robotics Challenge but only the beginning of a future in which robots can work alongside people to reduce the toll of disasters."

—Chris Wiltz, Managing Editor

Automation & Control

Industry Group Pushes for Free Open-Source Ethernet Standard for Machine Communications

The Ethernet Powerlink Standardization Group believes in an open-source, software-based Ethernet communication standard.

AS WE ARE ON THE CUSP of the Industrial Internet of Things and its extensive connectivity potential, one organization believes that industrial machinery and components can communicate data rapidly and reliably among themselves, system controllers, and ultimately to their human overseers via an open-source, software-based Ethernet communication standard.

This organization, Ethernet Powerlink Standardization Group (EPSG), supports Ethernet Powerlink, which was developed in 2001 by B&R Industrial Automation and links PLCs, I/O devices, sensors, motion controls and actuators, and HMI (human-machine interface) systems.

B&R formed EPSG in 2003, and Powerlink has been available since 2008 as downloadable, patent-free software.

EPSG has hundreds of members, counting mostly machinery and component OEMs and processing companies. Members test and certify Powerlink for their equipment (Powerlink meets IEEE 802.3 standards for Ethernet networks). Access to the software, though, is not restricted — any company can download it from sourceforge.net for free.

What this means, according to Sari Germanos, technology marketing manager at EPSG, is machinery and device manufacturers and plant operators can readily build broadly interconnected, real-time automation networks using Powerlink.

Companies have promoted open communication standards for automation for some time. Examples include Sercos III from Rexroth, Beckhoff's EK9500 Ethernet/IP bus coupler, Simatic Net from Siemens, and Rockwell Automation's Ethernet/IP Network.

Germanos, who is also business development manager at B&R, believes Powerlink has broader potential. B&R, alone, manufactures 1.2 million PLCs equipped with the communications technology, and the company is the fourth-largest PLC maker in the world.

Powerlink got a major boost in 2011, when China's national standard GB/T 27960-2011 recommended it for the country's huge machinery industry.

Germanos said OEMs that use the software can instantly communicate with Powerlink-enabled devices. "Everything works right out of the box," he said. "There is no need to license code, pay royalties, do paperwork, or involve lawyers."

Powerlink connects up to 240 nodes per network. Each network, in turn, can be connected and synchronized in an infinitely expanding capability.

Powerlink bus frequencies meet stringent real-time requirements, Germanos said. Typical motion applications run at 400-microsecond cycle times, and some Powerlink applications run as fast as 100 microseconds.

Among the benefits of Powerlink for are more effective remote diagnostics for machinery OEMs, detection and correction of problems for plant operators before they cause unscheduled downtime, and more productively (and profitable) process lines.

Germanos said the protocol is effective for all types of manufacturing and can be used on almost all types of equipment. As long as PLCs need to connect to remote I/O devices, Powerlink is good to go, he noted.

—Pat Toensmeier, Contributing Writer

Design Hardware & Software

3D Systems Going Mainstream in Heathcare

3D printing is becoming a go-to for customized healthcare solutions.

3D PRINTING'S MOVE to the medical industry is accelerating rapidly, due largely to its ability to offer solutions to patients who seek a more customized form of healthcare, an expert told engineers at the Medical Design & Manufacturing East show in June. Katie Weimer, vice president of medical devices for 3D Systems Corp., said 3D printing's strength lies in its ability to provide custom parts for modern patients who typically want medical devices that fit and look better. "We're moving

toward patient-specific, patient-centric healthcare," Weimer told *Design News*. "And, for that, 3D printing will always be a wonderful tool because of its efficiency in building complex parts." In a speech titled, "3D Printing: Changing the Game in Healthcare," Weimer cited examples of customized hearing aids, neck braces, fracture casts, orthodontics, prosthetics, orthotics, and dentures that have been custom-designed for 3D printing. She added that tens of thousands of hearing aids have already been manufactured using 3D printers. "You can print hundreds of them, and they will print in hours, not days."

Signs of mainstream acceptance of the technology are everywhere, she noted. *Parade Magazine* recently published a story about a girl whose prosthetic hand was 3D printed, and *GQ* told the story of a man whose face transplant was planned by virtual surgical techniques and 3D printing. Other media outlets have told stories of 3D printed jaws, arms, legs, and spinal disks. To show how mainstream the technology has become, Weimer cited an episode of *Grey's Anatomy*, in which characters 3D-printed a reference model of a heart with a complicated tumor in it.

One of the big advantages of 3D printing is its ability to bring beauty to healthcare products, Weimer said. Eyewear can be custom-printed in various colors and shapes, and fracture casts can be decorated with the names of patients. She also cited the use of 3D printing in the creation of braces for scoliosis patients. Because many scoliosis patients are teenaged girls, ugly braces are unpopular and often go unworn. "Wouldn't a young woman feel better about wearing a brace that's a piece of art?" she asked. "If she feels beautiful in the brace, her compliance increases, and she gets better faster."

Weimer traced the popularity of 3D printing to two events. The first was the invention of the stereolithography printing process by 3D Systems cofounder Chuck Hull in 1983. The second was the coincidental invention of CT scanning and medical imaging, which has made the design of custom medical parts possible.

"It's very difficult to make a patient-specific implant or a patient-specific design if you don't have any data on the patient," Weimer said. "But when you take that data and fast-forward 30 years to today's market, you can see why 3D printing is suddenly going mainstream."

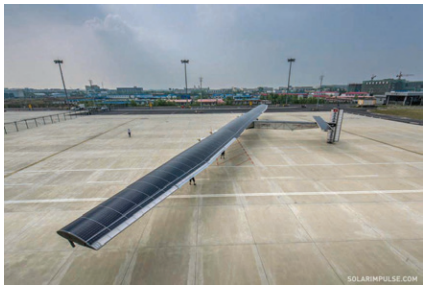
—Charles J. Murray,
Senior Technical Editor

Materials & Assembly

Solar Impulse 2 Forced to Abort Transpacific Flight

Adverse weather conditions forced the Solar Impulse 2 to delay its record-breaking, round-the-world journey.

SOLAR IMPULSE 2, the solar-powered aircraft attempting a round-the-world flight, had its record-breaking attempt derailed last month when weather conditions forced the aircraft to abort a leg of its flight from Nanjing China to Hawaii. Adverse weather conditions over the Pacific ocean forced the crew to make an unscheduled landing in Nagoya airfield.



Source: Solar Impulse

Weather conditions forced the Solar Impulse 2 to make an unscheduled landing in Nagoya, Japan.

The flight from China to Hawaii, one of the longest legs of the Solar Impulse 2's flight since leaving Abu Dhabi in March was estimated to take about five to six days. Before being forced to land, the aircraft was about 44 hours into its flight, reaching a maximum altitude of 28,000 feet and covering about 1,772 miles.

The 2.3-metric-ton Solar Impulse 2 is powered by 17,248 solar cells on its wings (which span 236 ft). The craft contains about 1,395 lbs of lithium batteries, which are recharged by solar energy and allow the plane to fly by night. Making sure these batteries are fully charged during the day is key to the Solar Impulse 2 completing its mission as the plane is only traveling at about 60 mph on average. The lack of clear skies over the Pacific contributed to the decision to make the landing in Japan. Even at this stage the Solar Impulse 2 has already traveled 1,860 miles since leaving China — the longest flight ever by a solar-powered aircraft in both distance and duration.

As of printing the plane is still awaiting an open weather window to resume its flight. Its next stop will be in Hawaii. **DN**

—Chris Wiltz, Managing Editor

BIG DATA
Lumbers into Product Design

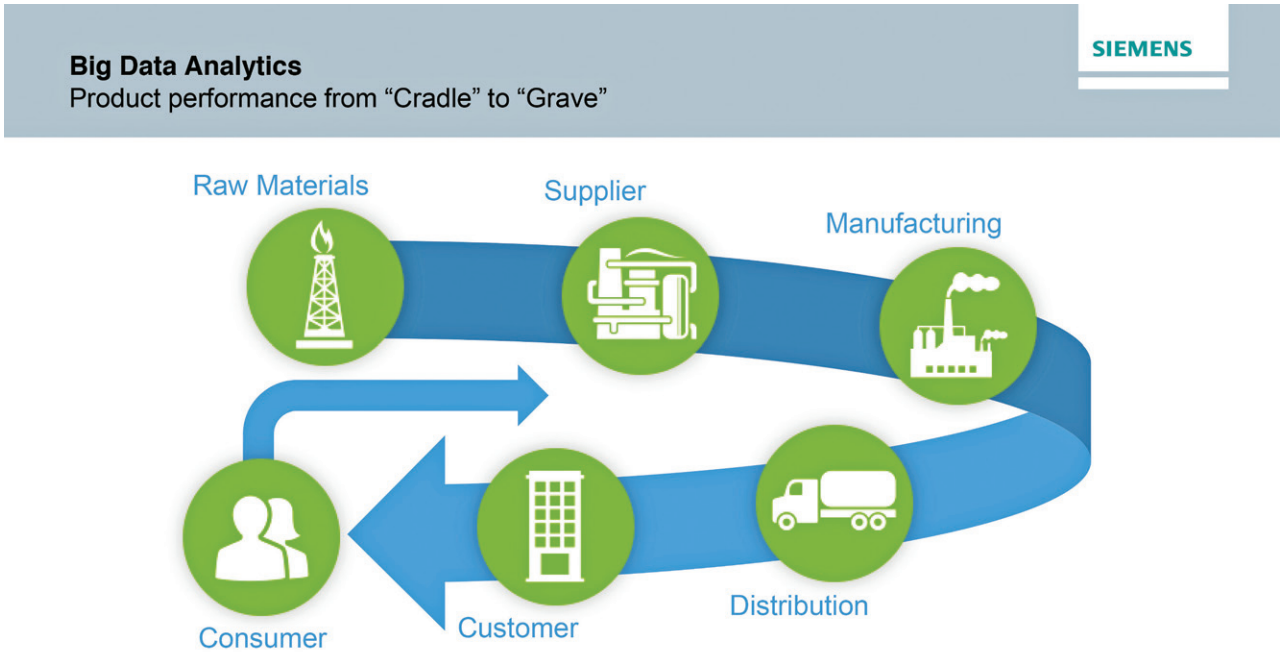
Whether it's simulation, visualization, or data bouncing back from the field, Big Data has entered the design process.

By Rob Spiegel, Senior Editor

Thanks to Big Data, design teams can now receive feedback about product problems — whether they occur on the factory production floor or during customer use. Much of this data has been around for years, though in the past it was less voluminous and harder to find. But now, data management has become part of the design engineer's job function.

The top companies of the world, naturally, are leading the way in Big Data analytics for design and manufacturing. At Dell, data coming in from the field revealed memory problems with one of its business server problems that had not come to light in the design or production process. Dell was able to identify the source of the problem quickly through the use of Siemens' Omneo data management system.

The system was used to diagnose the memory configuration problem, and it enabled Dell to get a replacement server out less than an hour after the customer reported a problem. "It would ordinarily take two weeks to identify the source of the problem and determine the fix, but they were able to get it done in two days," said Bill Boswell, senior director of marketing and business strategy for Cloud Services at Siemens PLM. "The old manual way of approaching this would have required three days just to gather the data."



Source: Siemens PLM

The closed-loop of product data allows designers to see what the customer experiences.

The ability to identify and solve the problem quickly had a two-pronged benefit. "In this example, the problem would have resulted in missing an order cutoff date to the plant in China," Boswell said. "The plant was shutting down for the holidays, so there would have been an additional delay of a week or more until the problem was solved. Dell realized the problem would impact more than just the one customer, so they pushed the solution to both the production and design stages.

Quality and efficiency are the reasons behind all the data collection. The whole point is to make better products while shortening time to market and reducing costs. The range of data that can help improve product quality can come from collecting information on product performance in the field as well as during the manufacturing process itself.

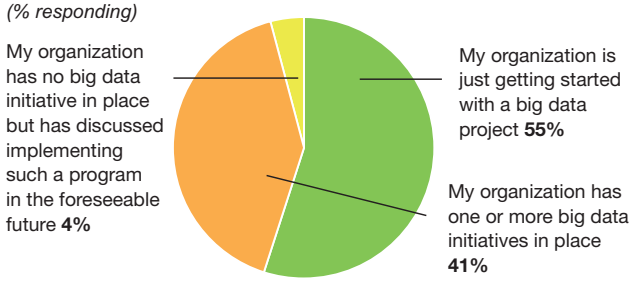
"The most important thing in Big Data for design is product quality," said Oleg Shilovitsky, a consultant who writes the blog BeyondPLM. "You are getting information about how the product is used by the customer. You can track how the product is performing, and that gives you a great opportunity to improve quality."

Big Data can help the manufacturer uncover the source of a problem. "You can get data from the exact moment of failure, you can bring that together with other elements of data," said Shilovitsky. "You discover what happened, and you find out if you may have a problem with a particular supplier or many suppliers. You can locate the problem's specific circumstances and improve the quality of the product."

FIGURE 1

Growing Adoption of Big Data

96 percent of respondents say they either already have one or more big data initiatives in place or are just getting started with one. (% responding)



Base: Survey of 300 executives at midsize organizations worldwide
Source: Competitive Edge Research Reports, November 2013 Big Data Survey

Source: Competitive Edge Research

Ninety-one percent of companies are either already using Big Data or are getting started.

The Challenge of Using Big Data in Design

Like most emerging technology, Big Data usage in product design is not yet widespread. It's a challenge to create the organizational and people structure to collect data, manage it, and put it to effective use. But the benefits are higher product quality, improved design efficiency, and quicker time to market.

Still, the early steps are not particularly efficient. "In my view, Big Data is not commonly used in design. Companies understand the opportunity, but it's very hard to make it happen on a standard basis," said Shilovitsky. "It's not something you can bring out of the box and tomorrow you have a Big Data solution. Manufacturers are all thinking

about how to do it, but they don't know how to make it happen, how to bring it to reality."

The data mounting up on the design desk is coming from a number of sources. Some is coming from the design process itself: 2D drawings, 3D CAD, simulation, visualization and 3D printing files are part of the whole product lifecycle management world. This is the home-grown material for the design team, so it's not in a foreign language, so to speak. But it's bigger than it used to be, so it presents its own challenges.

PLM vendors are aware of this and they have tools ready to help. "We've been talking for years about closing the loop between design and manufacturing. PLM wants to close the loop between the virtual world of design and the physical world of manufacturing," said Boswell. "With Big Data, the loop is just now getting closed. It's not tightly closed, but you can see all the trends in warranty data and see how the products are performing. That data used to be in silos. It didn't used to get back to design."

One of the reasons Big Data exists is because data is easier to collect, send, and process than in the past. Cheap sensors on the factory floor or on products out in the field are collecting tons of data and, thanks to cloud technology, sending it back in volume to manufacturers and companies — and eventually the design team. Data has become more interoperable, making it easier to manage, too.

"Two important things have changed with data," Shilovitsky said. "We now have very cheap sensors, and we can put them everywhere, so it becomes very easy to gather information, from cars and other products. The second thing that has changed is cloud technology that allows companies to collect data in volume."

Managing Copious Amounts of Data

While the design team increasingly has to manage greater amounts of data, data management is becoming less onerous. The design team doesn't need training in data center management to cope with the flow. PLM tools are equipped to support the fire-hose flow.

"You used to rely on your company's IT department to help with managing and analyzing data. Now you don't have to wait for the IT group to hire data scientists," said Boswell. "Now you have the technology and tools to use, yourself. You don't have to define all of the structures of the data to make use of it. You can create the contextualization of the data on the fly." **DN**

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Chip Makers Target Internet of Things Complexity

As issues of time and complexity increasingly dog embedded product developers, semiconductor makers are stepping in to help.

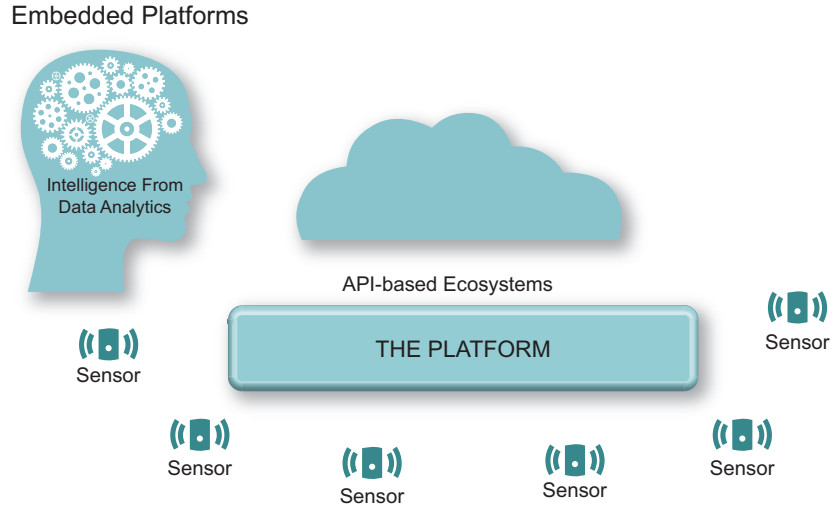
By Charles J. Murray, Senior Technical Editor, Electronics & Test

Embedded developers know the pain of software complexity. Missed deadlines, cost overruns, and lost sleep are the all-too-familiar outcomes.

Lately, though, semiconductor makers have grown more serious about wanting to help. More than ever, they're talking about tools, middleware, and software frameworks aimed at making the embedded development process easier. Their hope is that they can free up the developers, enabling them to focus less on integration issues and more on the differentiation of their end products.

"In the old days, engineers were expected to do the whole thing from top to bottom," said Jack Ganssle, embedded consultant and founder of The Ganssle Group. "Today, managers don't have the patience for that. They want their engineers to immediately start generating application-level code."

That's why manufacturers of embedded processors are stepping in. They want to take ownership of some of the technical issues, thereby removing the burden from time-strapped embedded developers. If their latest concepts are successful, embedded developers will have a pre-integrated foundation, onto which they can lay their application software.



Renesas' Synergy platform enables embedded developers to create a software foundation, onto which they lay their application software.

"The big challenge has always been the integration," said Vin D'Agostino, vice president of engineering and marketing at Renesas, which recently rolled out a platform known as Synergy to help developers with those issues. "We said, 'What would happen if we automated the ability for engineers to integrate all the little pieces they need to build up the base of their product?' That way, they could move forward and build their applications on top of that platform."

Synergy attacks the problem by incorporating those "little pieces"—some in silicon, some at board level, and a lot in the software code. It pre-integrates drivers, communication stacks, operating systems, and an application framework, all within an integrated development environment targeted at Renesas Synergy processors. Renesas engineers say that, unlike many industry predecessors, the platform is different in

Source: Renesas Electronics Corp.

that the 'little pieces" include software code that's pre-certified to work interoperatively.

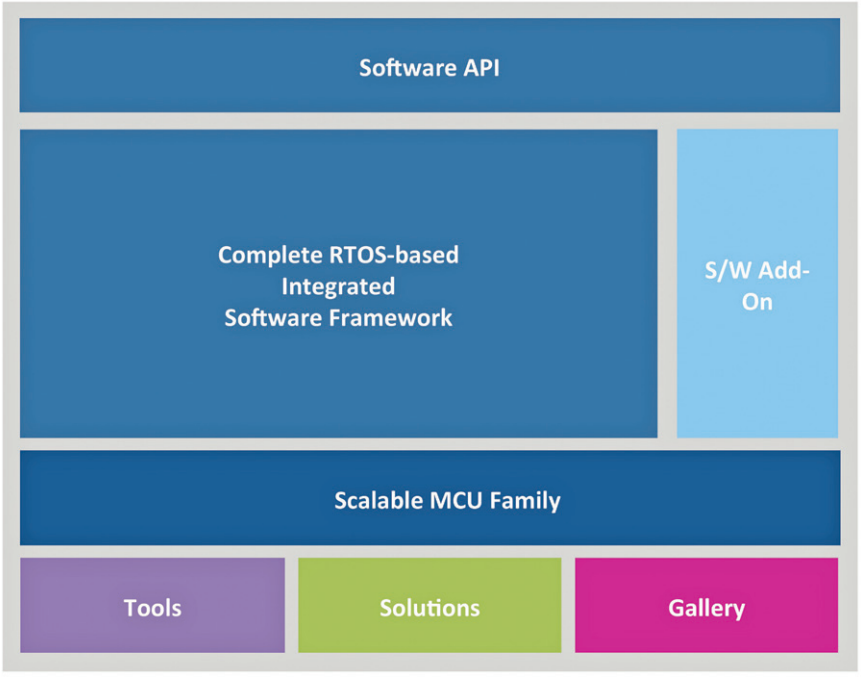
Similarly, Freescale recently announced that it is rolling out its Intelligent Sensing Framework (ISF) 2.1, which incorporates the Processor Expert tool to help engineers create sensor-based applications for its Kinetis MCUs. The platform is said to simplify the process of creating sensor-based applications for home, medical, consumer, and industrial products.

Freescale engineers say such solutions are critical for a broad swath of the embedded developer population. "There are more embedded programmers than there are people familiar with sensors," said Ian Chen, marketing manager for Freescale's Sensor Solutions Division. "So we're aiming this at someone who's doing something with sensors, but wants to reduce the adoption hurdles."

The emphasis on sensors make such platforms a good fit for the Internet of Things (IoT). From an engineering perspective, IoT applications may be almost indistinguishable from traditional embedded apps, but they are likely to be great in number and heavily sensor-based. And as those numbers grow, they could expose a widespread industry weakness — many embedded designers simply don't have the expertise needed to make those applications happen.

"You may be an expert on the vibration signature of your sump pump, but that doesn't mean you know anything about the gazillion or so IoT protocols that are coming out now," said Chen.

Indeed, the truth is that most developers have their hands full just marrying a few sensors to even the simplest microcontrollers. It's not unusual for such microcontrollers to be accompanied by data sheets that number in the thousands of pages, says Ganssle. "The real problem is that the MCUs can be hideously complicated," he said. "Some of the onboard peripherals can have hundreds of control registers and every bit has to be set properly. It takes an awful lot of time to do that."



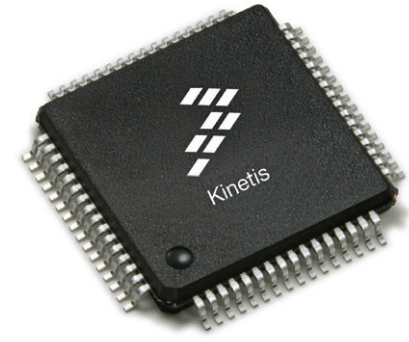
Source: Renesas Electronics Corp.

Synergy's software framework is aimed at a family of microcontrollers that ranges from ultra-low-power 32-bit devices to 300-MHz MCUs.

That's why Renesas says it packed Synergy with integrated solutions, including an operating system with a real-time kernel, and specialized software for TCP/IP, USB, color graphics, DSP, touch, security, and safety. The package also includes a hardware abstraction layer, application framework, and a load of software APIs.

From the vendor perspective, the goal is simple: Supply enough pre-installed plumbing so that engineers are further down the road when they launch their development cycle. "If you're not getting all those components from the same place, then you're going to spend your time downloading, configuring, and worrying about the way it all works," D'Agostino said. "There's a lot of stuff that can come back to bite you if you don't know what to look for."

The key, of course, is whether the new breed of embedded platforms works as expected. Development engineers who have been burned by inadequate reference designs are legion — and the true test will be whether they quickly gravitate toward platforms such as Freescale's Intelligent Sensing Frame work or Renesas' Synergy.



Source: Freescale Semiconductor

Freescale's ISF is targeted at the company's Kinetis microcontrollers.

If they do, it could be a huge win, not just for the MCU vendors, but also for the embedded development community. "We're taking the tedious work out of the development," D'Agostino said. "And in the process, we're enabling the engineers who are designing a product to do what they do best." **DN**

For More Information:

The Ganssle Group: **www.ganssle.com/**
Renesas: **http://am.renesas.com/**
Freescale: **www.freescale.com/**

The Future of HMIs Is Now

Mobile technology is putting its imprint on industrial operator interfaces, offering touch capabilities, new design approaches, and more sophisticated functionality.

By Al Presher, Contributing Writer

The Human-Machine Interface is the midst of an evolution and rejuvenation as the influence of touch-screen technology used in smartphones and tablets is spilling into the design of industrial operator interfaces. Add more powerful microprocessors and connectivity options into the mix, and there are new possibilities and advanced functionality that is helping to fulfill the vision of the HMI as a portal for machine communications.

While there is still a need for value-based HMI options and smaller, less expensive screens, the trends are clear including bigger screens, more resolution and colors, and solutions for harsh industrial environments. But the biggest changes come back to the influence of touch technology and a fundamental change in the ways operator screens are designed.

Impact of Mobile Technology

"The emergence of mobile devices, smartphones, and tablets is having a greater impact on HMI development," said Jen Vacendak, product support engineer and trainer for B&R Industrial Automation. "As new engineers enter the picture, they are accustomed to using those types of devices and we'll be seeing more of a merger between the two technologies."

She said this includes viewing machine status information on a tablet or smartphone, or the machine HMI itself starting to merge with the interface we would typically see on those devices. Operator terminals adopting multi-touch interface hardware is slowly gaining traction, although there are still significant benefits in using a traditional industrial panel. In applications such as pharmaceutical or food and beverage where equipment may be required to be hygienic or washdown-safe, industrial panels rated for those environments are still the primary choice.

"Mobile devices are more commonly used for remote monitoring, and less for control," Vacendak said. "E-stops still need to be hardwired, for example, and the result is that mobile devices aren't replacing HMIs but are being used to supplement them."

Packaging OEMs are often specifying larger, more sophisticated display solutions on their high-end machine offerings. These displays are more impressive visually and impart a high value to the machine.

Source: Omron

Focus on Remote Monitoring

"A key trend in HMIs is remote monitoring, and the ability to view screens on a mobile device such as an iPad, iPhone, or Android device," said Clark Kromenaker, product marketing manager for Omron. "Often the manufacturing supervisor wants to monitor production by viewing the HMI, and may also be getting email alerts when a certain machine

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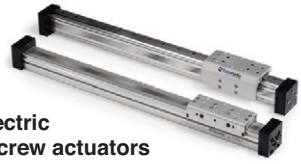

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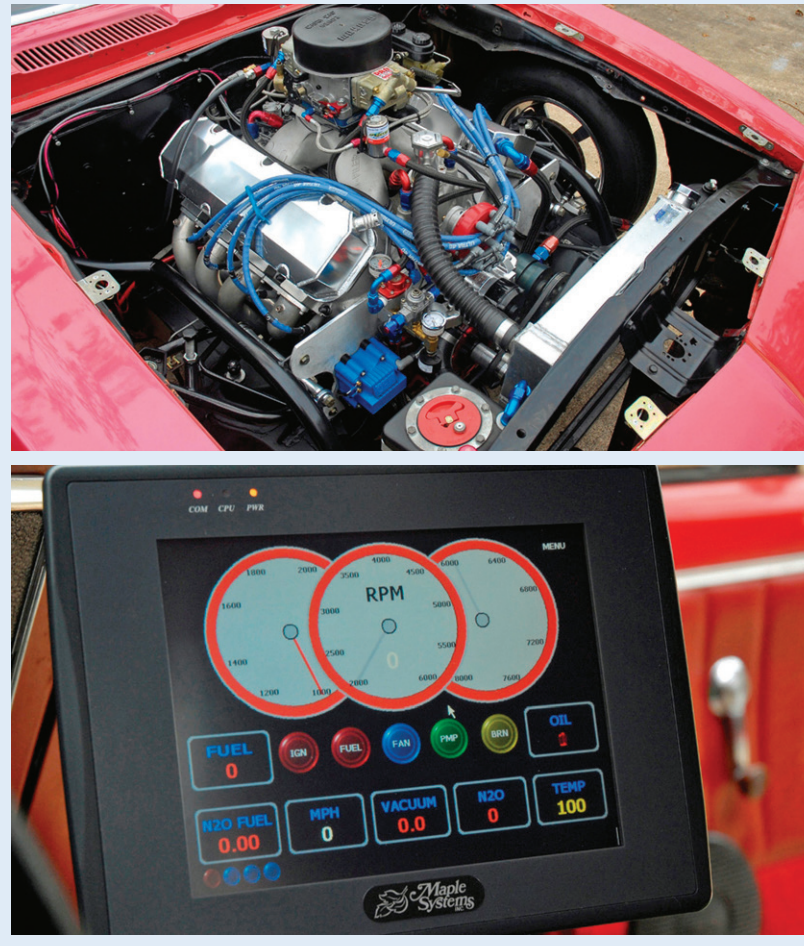
HMI/SCADA Gives Drag Racer Real-Time Edge

By Al Presher, Contributing Writer

The ability to tune an engine immediately before roaring down the track, backed by a carefully designed data acquisition system, has resulted in a world record for drag racer Trevor Stripling.

Stripling drives a 1967 Camaro with a 598 cubic-inch engine in 1/8 mile drag races. He has set a world record with a 5.11 second elapsed time at 143 mph. For quarter-mile drag racers, this is equivalent to a 7.80 E.T. at 180-plus mph. The engine uses nitrous (NOS) and generates 1,300 HP. Stripling lowered his record time to 5.0 seconds at 145 mph. He now holds a world record of 4.99 seconds at 143.86 mph.



A PLC captures data from multiple sensors and connects to a HMI with Windows CE, running Web Studio HMI/SCADA software.

Source: InduSoft, Wonderware by Schneider Electric

HMI/SCADA Software Solution

Stripling works with PLCs, HMIs, and data acquisition equipment in his job as a Control Systems Engineer at Contech Control Services, a provider of engineering procurement contractors (EPC) control services on the US Gulf Coast. He has considerable experience using Web Studio from InduSoft for control, monitoring, and data acquisition in refineries and process plants, so when he needed a data acquisition system for his racecar he called upon his knowledge and experience with industrial equipment.

A PLC (DirectLogic DL06) captures data from oil pressure, fuel pressure, engine vacuum, engine temperature, voltage, nitrous pressure, wideband O2, and engine and driveshaft RPM sensors during the five-second drag strip run. The PLC and HMI are powered by a 12V DC to 24V DC converter that runs off the car's electrical system. All real-time functions of the car, including ignition timing, are handled by the PLC, which connects directly to the MSD ignition and controls the timing. Stripling says the most important engine parameters are the wideband O2 sensors, which report how efficiently the nitrous tune is for given weather conditions. The second are the engine and driveshaft RPMs, and how the suspension settings are responding to engine power and track conditions.

The PLC connects to a HMI with Windows CE (Maple Systems Ivory Series), running the Web Studio HMI/SCADA software. The PLC and HMI connect via standard Ethernet. Stripling said one of the benefits of the HMI is that he was able to move most of the mathematical conversions for the analog sensors to Web Studio, decreasing the scan time in the PLC and allowing it to respond more quickly and make real-time control decisions.

In real time, the PLC acquires data and sends it to Web Studio where it is converted and sent back over the Ethernet connection. During the five-second race, the two systems exchange about 10,000 data values. The system is fast enough that the PLC can use the converted data to control the engine.

is down. Remote monitoring provides an ability to view the HMI screens and gain insight into any issues."

"One interesting development is that, since everyone is using smartphones and displays, customers are asking for the same type of functionality that you use on your cell phone," Kromenaker added. "The ability for the user to swipe through screens, multi-touch capabilities using two fingers on the screen, and other smartphone features are also being requested for use on the HMI. Instead of hitting a button to go from screen to screen, for example, the user can swipe the screen to go to the next control setting."

The popularity of mobile-type interfaces is also influencing the design and layout of operator interface screens. Usability has become a much larger issue and has become more

Source: B&R Automation

The emergence of mobile devices, smartphones, and tablets is influencing the types, sizes, and resolutions of panels available for industrial operator interfaces.

important as new operators and engineers enter the workforce. Younger people are accustomed to multi-touch including pinch to zoom features, and interacting with interfaces in a different way than what has been available with traditional industrial interface design.

There is an evolution in HMI interface hardware but the demands of the factory are limiting changes to the physical hardware at the machine itself. Safety and reliability of the hardware are key concerns, and consumer products are designed for a different purpose.

Kromenaker said one trend is customers asking for larger screen sizes. Typically, he said, Omron HMIs start at 3 inches for a low-end version, and go up to 15 inches. Now there are requests for 21- to 25-inch displays, which is an interesting trend as the HMI becomes a central focus of machine visualization. Design engineers have also been interested in transferring alarm or status display screens, for example, to large 70-inch monitors that might be above the factory floor for carrying messages to a larger audience.

Control & Visualization Options

New device options that illustrate the direction of HMIs include new C panels from B&R, which are available in portrait, landscape, and widescreen formats. The panels offer bezel color choices, and include a built-in PLC processor for control. An auxiliary T panel uses the main controller's IP address to display information. One option is to use a PLC with no screen and send visualization information to the auxiliary panel, or have a C panel on the machine and one or more auxiliary panels further down the line for viewing information, as well.

For high-performance applications, users commonly select a standalone industrial PC for control. But the integrated controller/panel offers an effective solution for less demanding needs for machine and motion control using the Powerlink network.

"We offer custom Mylar overlays that can be ordered in low quantity, and allow our customers to provide their own design. For automation panels that come in larger sizes, offering single and multi-touch displays, users have the ability to add stop-start buttons, a keypad, or an E-stop to be built into the panel," Vacendak said.

Source: B&R Automation

Integrating the controller with the operator panel creates a cost-effective solution for a wide range of machine control applications.

Advanced HMI Capabilities

Another clear trend is for the HMI to be providing additional functionality, leveraging more powerful processors, and connectivity within the plant. Most HMIs already participate in the Internet of Things (IoT), since most have a Mac ID and IP addresses.

"Our newest generation of advanced HMIs offers a Visual Basic.Net programming capability into the operator terminal itself," Kromenaker said. "VB.net offers a capability to conveniently connect with the operating system of the HMI to develop all kinds of advanced functionality."

Source: Omron

Operator interface screens are moving to using multi-touch and pinch-to-zoom features along with advanced graphics to enhance the presentation of information.

Users can create their own keypad, for example, that might have international symbols instead of letters and numbers, or customize objects within the toolbox to operate differently from standard operation. One example would be using VB-Script animate complex machine motion on the display. This programming option provides machine builders with the ability to be more creative and to create custom programming to enhance operation. That might include specific functionality that the HMI typically can't represent well visually, or the ability to link multiple tasks together.

For data collection applications, there's an ability to add an FTP server to the HMI. Data files can be collected on the HMI and uploaded to the control system. Omron controllers support a SQL client, and provide a mechanism for collecting machine or manufacturing performance information along with data from the HMI and transferring it to a SQL server, which may be in the IT infrastructure.

"The focus with this approach is adding sophistication to how the HMI operates and also the ability to offer connectivity within the factory," Kromenaker said. "The user has more flexibility to add more options that they couldn't before."

The processing power of newer Omron HMIs is using Intel Atom processors and the Windows Embedded Compact 7 (WEC7) operating system to enable use of VB.net on the HMIs.

Market Direction

Going into the future, Kromenaker said the direction of the HMI market will be moving in tandem with using the most popular screen technologies used on phones and televisions. There was a time when major control suppliers went to screen manufacturers to have their own displays built. The

trend now is to use the technology that is the volume market mover in terms of screen technologies to drive future HMI offerings.

Other interesting developments are the continuing miniaturization and improved power efficiency of electronics. We may see the HMI mounted on the surface of the enclosure or the machine with just small hole(s) in the panel for power and communications instead of having to cut a rectangular opening in a panel to mount the HMI device.

"If Power over Ethernet (PoE) continues to grow, there would only need to be one electrical connection to the HMI instead of the current two connections of power and communications. This would reduce heat buildup in the enclosure, make the HMI easier to install, and would also make it easier to meet hazardous location requirements, since cutouts into the enclosure would be minimized," Kromenaker added. "The next step beyond this may be an 'on machine' HMI, where the

There is an evolution in HMI interface hardware but the demands of the factory are limiting changes to the physical hardware at the machine itself. Safety and reliability of the hardware are key concerns, and consumer products are designed for a different purpose.

HMI no longer has an enclosure, is mounted directly to the machine wherever needed, and connects to a machine communications block nearby or perhaps operates wirelessly."

Upcoming features for industrial HMIs may also include more integration with diagnostics and media plus easy, on-screen accessibility to hardware manuals for troubleshooting. B&R's System Diagnostics Manager (SDM) is an example of a tool that can be accessed over the Web using the IP address of the controller to view diagnostics and error information for the machine.

A new Visual Components package for Automation Studio available from B&R later this year will extend the set of templates, tools, and visual elements used to design screens to help achieve the look and feel of modern interface solutions and incorporate newer technology, such as HTML5. **DN**

For More Information:

B&R Industrial Automation: **www.br-automation.com**
Omron: **www.omron.com**

Carbon Fibers Spearhead Automotive Lightweighting Effort

To meet looming fuel efficiency standards, automakers are using carbon fiber composites in hundreds of automotive components.

Charles J. Murray, Senior Technical Editor

More than at any time in its 125-year history, the auto industry wants to lose weight. And while engineers are willing to consider virtually any means of accomplishing that, carbon fiber composites are emerging as a major solution. These days, carbon fibers are turning up in wheels, deck lids, oil pans, seat frames, brake rotors, body panels, engine covers, passenger cells, and countless other vehicle components.

"Detroit is on a diet," said Matt Zaluzec, technical leader for materials and manufacturing at Ford Motor Co. "The entire automotive industry is trying to lose weight."

Indeed, the industry needs to lose weight if it plans to meet future US government standards, which call for a 54.5-mpg corporate average fuel economy (CAFE) by 2025. "The less mass you carry around, the less your powertrain has to work, and the less fuel you use," said Andrew Pontius, director of design and development at Faurecia Emissions Control Technologies. "In rough numbers, for every one percent you reduce your mass, you gain half a percent in fuel economy."

Ford's GT supercar uses carbon fiber composites on its body panels and inner rear deck.

That's why virtually everyone in the auto industry — automakers and suppliers alike — is designing low-mass components. Ford, in particular, has been leading the way in so-called "lightweighting," and carbon fiber is playing a huge role in its efforts. At its Research and Innovation Center in the Silicon Valley, the automaker recently demonstrated how the Ford GT supercar uses carbon fiber composites for its inner rear deck and body panels. The monolithic carbon fiber deck replaces a dozen or so individual pieces of metal on previous vehicles. The carbon fiber body panels, meanwhile, enable Ford to create "negative space" – that is, open spaces through the body of the car, so air can flow through it, rather than around it. The result, they said, is superior aerodynamics for the 600-HP GT.

"What the materials have brought to us as a design team is the flexibility to

Source: Ford Motor Co.

challenge the norm," said Chris Svenson, executive design director for the Ford in the Americas. "Materials like carbon fiber are great at producing light weight, but they're also great for creating new forms never seen before."

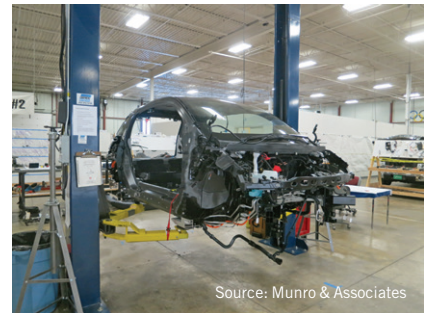
Still, those advancements pale in comparison to the material plans that Ford is hatching for the future. A concept car called the Fusion MMLV (multi-material lightweight vehicle) employs hundreds of carbon fiber parts that would normally be steel. The list of such parts is virtually endless: carbon fiber brake rotors that cut 6 lb apiece; carbon fiber seat frames that slash another couple of pounds. They're also using glass-epoxy front springs, carbon fiber wheels, and even special weather stripping around the doors — all for the purpose of cutting weight.

Similarly, BMW has made a notable effort by using a carbon composite for the entire passenger cell, or "Life Module," of its i3 electric car. The i3, recently called "the most significant vehicle since the Model T" by well-known industry consultant A. Sandy Munro, breaks ground not only by using composites, but by doing so in a way that's highly manufacturable. Each of the automated stations involved in the creation of the i3 Life Module has a six-minute cycle time, meaning that one complete carbon fiber-reinforced plastic body rolls off the assembly line every six minutes.

"Everyone will tell you that a six-minute cycle time is impossible," Munro said. "But they're doing it. It would take the aerospace industry at least three days to build something of this size."

Ford and BMW are just the tip of the carbon fiber iceberg, however. Many cars with high-performance reputations are also employing it. GM, for example, is using carbon ceramic matrix brake rotors, as well as a carbon fiber hood, rear spoiler, and rocker panels in the 2015 Corvette Z06. Supercar maker Hennessey has carbon composites in its Venom GT monocoque; Lamborghini is using it in the chassis of its Huracán LP610; and Koenigsegg put it in the wheels of its racy Agera S. To help boost fuel efficiency, Volkswagen also employs a carbon fiber-reinforced polymer (CFRP) monocoque on its 261-mpg XL1.

Suppliers are upping their investment in carbon fiber composites, too. At the North American International Auto Show in Detroit earlier this year, Faurecia showed off a carbon fiber roof, glove box, liftgates, and even a cross-car beam targeted at future vehicles. "If you have an electric vehicle and you want to show off its green personality, this can be a good choice," says Michael Twork, senior manager of research and innovation at Faurecia Interior Systems.



BMW's carbon-fiber-reinforced plastic Life Module rolls off the assembly line every six minutes, compared to three days for similarly sized parts in the aerospace industry.

The key question, of course, is how broadly such materials will be used in the future to replace more conventional choices, such as mild steel. The short answer is that they can be applied anywhere. If designers know the type and quantity of the resins used, as well as the orientation of the carbon fibers, they can design around the limitations of the material, engineers say.

For design engineers, tensile strength and modulus of elasticity are the key parameters. And there, the numbers match up well. The modulus of elasticity of anisotropic composites with aligned fibers, for example, varies from about 50-120 GPa (approximately 7,000-17,000 ksi), compared to about 210 GPa (30,000 ksi) for steel. Tensile strength is over 1,000 MPa (145 ksi), which is higher than that of conventional mild steels. By fully comprehending the differences, experts say, automotive designers can make the new materials work.

Ford's lightweight Fusion MMLV concept car employs composite carbon fiber wheels.

Source: Ford Motor Co.

"With composites, the choices are infinite," said Patrick Blanchard, technical leader of lightweight materials for Ford Motor Co. "You can tailor it to whatever your needs are."

Similarly, cost challenges aren't an issue in the right situations. Applications that reduce the number of parts (such as the Ford GT decklid that transforms a dozen parts into one) are the strongest candidates for carbon fiber use, according to Blanchard. "It's fair to say that any composite, whether it's glass or any type of polymer, is going to be more expensive than steel," he said. "So integration is the key to providing an effective business case."

The bottom line is that automotive engineers are still learning about which applications are best suited to carbon-fiber lightweighting. And even as they learn, fuel efficiency issues are pushing the number of those applications upward.

"We did a press release 10 years ago about lightweight materials and people said to us, 'Yeah, yeah, when are you going to put it in a high volume vehicle?'" notes Zaluzec of Ford. "Well, here it is." **DN**

For More Information:

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Macro Sensors
www.macrosensors.com

Powerbox New Medical 30W Power Supply

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Powerbox, one of Europe's largest power supply companies and for more than three decades a leading force in medical power supplies, introduces the EXM30 series of 30W external wall plug adaptors.

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Powerbox USA, Inc.
www.prbx.com

Supercritical Fluid Technologies SFT-10 High Pressure Carbon Dioxide Pump

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The SFT-10 pump can deliver carbon dioxide at pressures up to 10,000 psi (69 MPa) at flow rates from 0.01 to 24.0 ml/min. These characteristics

make the SFT-10 an ideal pump for use in supercritical fluid extraction, and a variety of other high pressure applications, including supercritical fluid reaction chemistry and chromatography.

The SFT-10 utilizes reliable, dual sapphire syringe pump technology to achieve high pressures rapidly. The Peltier chiller has superior cooling capability. It maintains the temperature at the pump heads low enough to ensure the carbon dioxide remains liquid.

The standard operating mode is "constant pressure" where the pump will maintain a pressure set point. An optional constant flow mode, from 0.01 to 24.0 ml/min., is available.

The SFT-10 may be acquired as a stand alone CO2 pump or used as part of Supercritical Fluid Technologies' SFT-110 / SFT-110XW Supercritical Fluid Extractors.

Supercritical Fluid Technologies
www.supercriticalfluids.com

Banner Engineering Wireless Vibration and Temperature Sensor

Sensor provides wireless machine monitoring

Banner Engineering introduces its wireless vibration and temperature sensor. Designed to effectively monitor machines for increases in vibration and temperature, the sensor measures RMS velocity in inches per second or...

Banner Engineering introduces its wireless vibration and temperature sensor. Designed to effectively monitor machines for increases in vibration and temperature, the sensor measures RMS velocity in inches per second or millimeters per second, and temperature. This enables the sensor to identify machine problems before they become too severe and cause additional damage or result in unplanned down time.

The sensor is optimized to work with 1-wire serial radio devices, such as Banner's wireless Q45VT Node, the P6 Performance Node and the MultiHop M-H6 radio. Operators can easily set vibration thresholds based on the ISO 10816 standard. When a threshold has been exceeded, the wireless node can provide local indication, send the signal to a central location, and send the vibration and temperature data to the gateway for collection and trending.

The wireless vibration and temperature sensor is ideal for a variety of machine monitoring applications, including motors, pumps, blowers and many other types of machines throughout a facility.

Banner Engineering Corp.
www.bannerengineering.com

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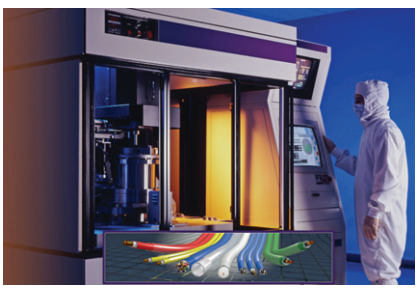
Rated for Class 1 Clean Rooms utilized in Semiconductor Wafer Fabs, Cicoil's Flexible Flat Cables are ideal for operational critical applications that require absolute reliability. The crystal-clear designs are free of halogens & contaminants, and are an excellent alternative to PVC, Polyurethane and Teflon cables, especially in continuous motion and long-term flexing operations.

Cicoil's One-of-a-Kind extrusion process allows multiple power conductors, shielded signal pairs, Fiber Optics, Ethernet, Coax, Thermocouple Wires and flexible tubing for air, wire placement or fluid transfer, and other design elements like Cicoil's patented StripMount™ fastening strip to be placed in a single flat cable, precisely controlling the Inner component spacing, jacket thickness and the overall cable shape.



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Materials & Assembly

Standard Knapp Model 333 Vanguard Wrap-Around Packer

Compact, fast and reliable solution for corrugated, full wrap-around packing

Standard-Knapp, a worldwide leader in the manufacture of innovative packaging machinery, announces the Model 333 Vanguard Wrap-Around Packer, which produces a tight, square, cost-saving wrap-around tray or full case shipper. Depending upon the product and the case, the Vanguard of-

fers speeds of up to 30 cycles per minute. With its robust construction, Vanguard offers high reliability for 24/7 operation and a compact design that fits into any shop floor. Snap-in parts and quick-handle adjustments provide reliable, repeatable changeover. Vanguard can handle a wide product packaging range, including cans, cartons, and bottles (glass or plastic), as well as multi-packs, tubs, and aseptic packs.

Standard-Knapp
www.standard-knapp.com

New TPE Compounds from Teknor Apex

A new family of thermoplastic elastomers (TPEs) for consumer products

A new family of thermoplastic elastomers (TPEs) for consumer products provides vivid color, tactile appeal, and soft-grip ergonomics while spanning a broad range of physical properties and exhibiting excellent moldability, it was announced today by Teknor Apex Company, which will introduce the compounds at Fakuma 2015 (Stand B5-5315).

Monprene® CP Series compounds are standard products available in identical formulations to customers in North America, Europe, and Asia. Two series are available: Monprene CP-10100 low-density compounds, with specific gravity of 0.89; and Monprene CP-11100 high-density compounds, with specific gravity of 1.15. Initially each series is comprised of six grades with Shore A hardness ranging from 40 to 90.

Teknor Apex Company
www.teknorapex.com/

igus New Chainflex M Line Cables

igus has announced the release of their Chainflex M line of lower-cost cables

Tested, safe, yet low in price – this is the promise from igus with their newest line of Chainflex cables. From control, servo motor, and measuring system cables, to data, power, and bus cables, Chainflex M offers a full cable range, all designed specifically for continuous-flexing applications; at about 40% lower cost than traditional Chainflex cables.

The standard line of Chainflex cables is tested and guaranteed for high speeds, high cycles, and demanding environments, yet many applications do not require such high standards of their cables. Now, with Chainflex M, manufacturers have the option of having the flexible reliability of Chainflex, but with a lower cost. Guaranteed for up to 5 million cycles, Chainflex M cables are in the same price range as cables for non-flexing applications.

igus Inc.
www.igus.com

Software & Hardware

Nanonics Connectors from TE Connectivity

New addition to Nanonics line qualified to military specification MIL-DTL-32139

TE Connectivity (TE), a world leader in connectivity, announces its new two-row nanominiature rectangular connectors as the latest addition to its line of nanonics connectors. The ultra-compact and weight-saving connectors have been qualified to MIL-DTL-32139 specifications by the Defense Logistics Agency (DLA)

Land and Maritime, and are designed to meet the rugged needs for applications within aerospace and defense, test and measurement, marine, and commercial air.

Keyed housings also ease installation by virtually eliminating mismatch and stubbing during the mating process, and corrosion-resistant plating helps withstand harsh environments. In addition, the contacts are made of gold-plated copper alloy to withstand voltage from 250V at sea level, and 100V at 70,000 feet.

The new connectors consist of wired products with seven sizes from

9 to 51 positions. They are interchangeable and intermatable with most nanonics connectors including non-TE brands.

TE Connectivity
www.te.com

ICP DAS USA Introduces Multifunctional Remote I/O

M-7024U multifunctional remote I/O module has analog output, digital input and digital output

ICP DAS USA introduces M-7024U, a multifunctional remote I/O module that has 4-channel analog output, 4-channel digital input and digital output. It provides programmable output range on all current and voltage analog output channels including 0 ~ 5 V, +/-5 V, 0 ~ 10 V, +/-10 V, +4 ~ +20 mA and 0 ~ +20 mA. Each analog output channel can be configured for an individual range. The M-7024U module also features per-channel open-wire detection for +4 ~ +20 mA outputs, as well as 8 kV ESD Protection and 2500 VDC intra-module

isolation. Thus it provides a very safe and flexible solution for industrial systems. Options for configuring power-on and safe values are also included.

The M-7024U multifunctional remote I/O module communicates over Modbus RTU and DCON protocols via RS-485. Like most of our other M-7000 series Modbus RTU based remote I/O modules, it also supports a wide operating temperature range of -25 to +75°C (-13F ~ 167F). A free EZ Data Logger software is also provided with the M-7024U data acquisition module for PC based data logging and control systems, which can help users easily monitor the system, view the trend and generate reports. The M-7024U can be used in various automation and control applications where the system needs to take digital input signals and send out analog output and digital output signals.

ICP DAS USA, Inc.
www.icpdas-usa.com

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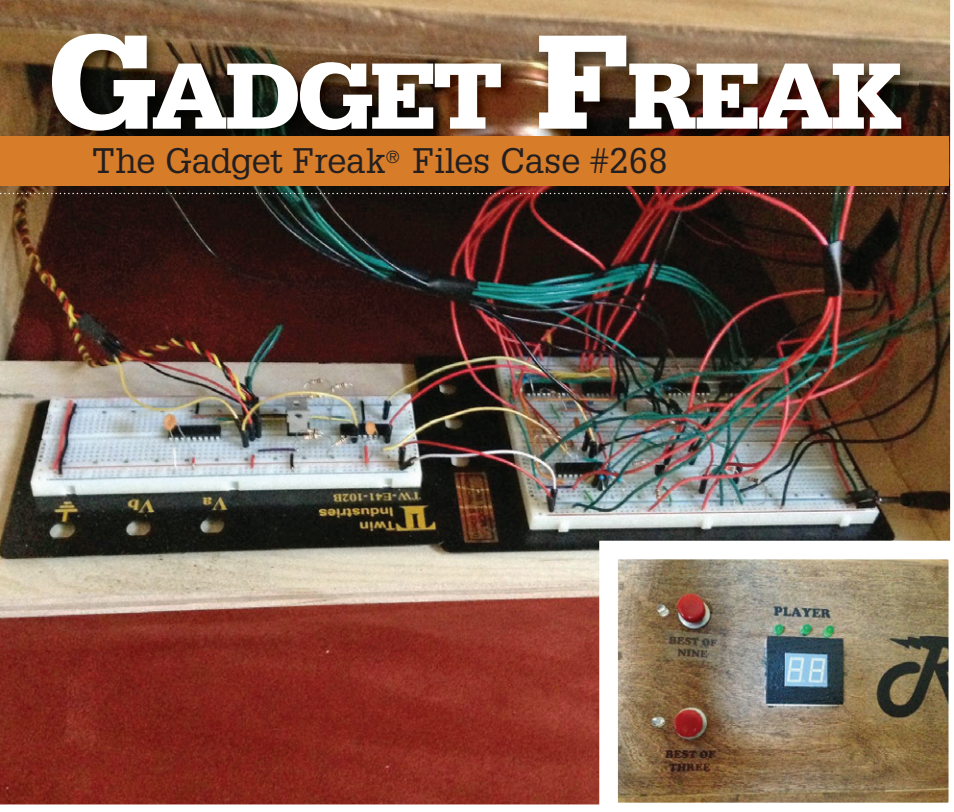

The Handy Rival Challenges You to Rock, Paper, Scissors

THE HANDY RIVAL is an arcade game, created by Colorado State students Jacob Dahlke, Kyle Hartson, RJ Miller, Melissa Wills, that allows an individual to play rock, paper, scissors against a robotic hand. When the user puts on the glove, movement is detected and the displays turn on. Blinking LED lights prompt the user to select either the "Best of Three Rounds" or the "Best of Nine Rounds" button. After a button is pushed, the LEDs stop blinking and the game begins.

There are four beeps to synchronize the user with the timing of the "rock… paper… scissors… shoot." On the fourth beep or the "shoot," the user and the robotic hand show their selection by use of the familiar rock, paper, or scissors hand signal. If the user wins, the victory sound plays and one point is added to the "Player" score on a 7-segment display. If the user loses, the defeat sound plays and a point is added to the "Rival" score on a separate 7-segment display. In the event of a tie, a neutral beep sounds, no points are awarded, and the round is replayed. DN

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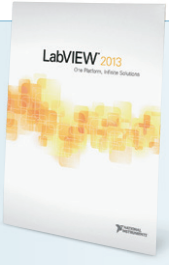

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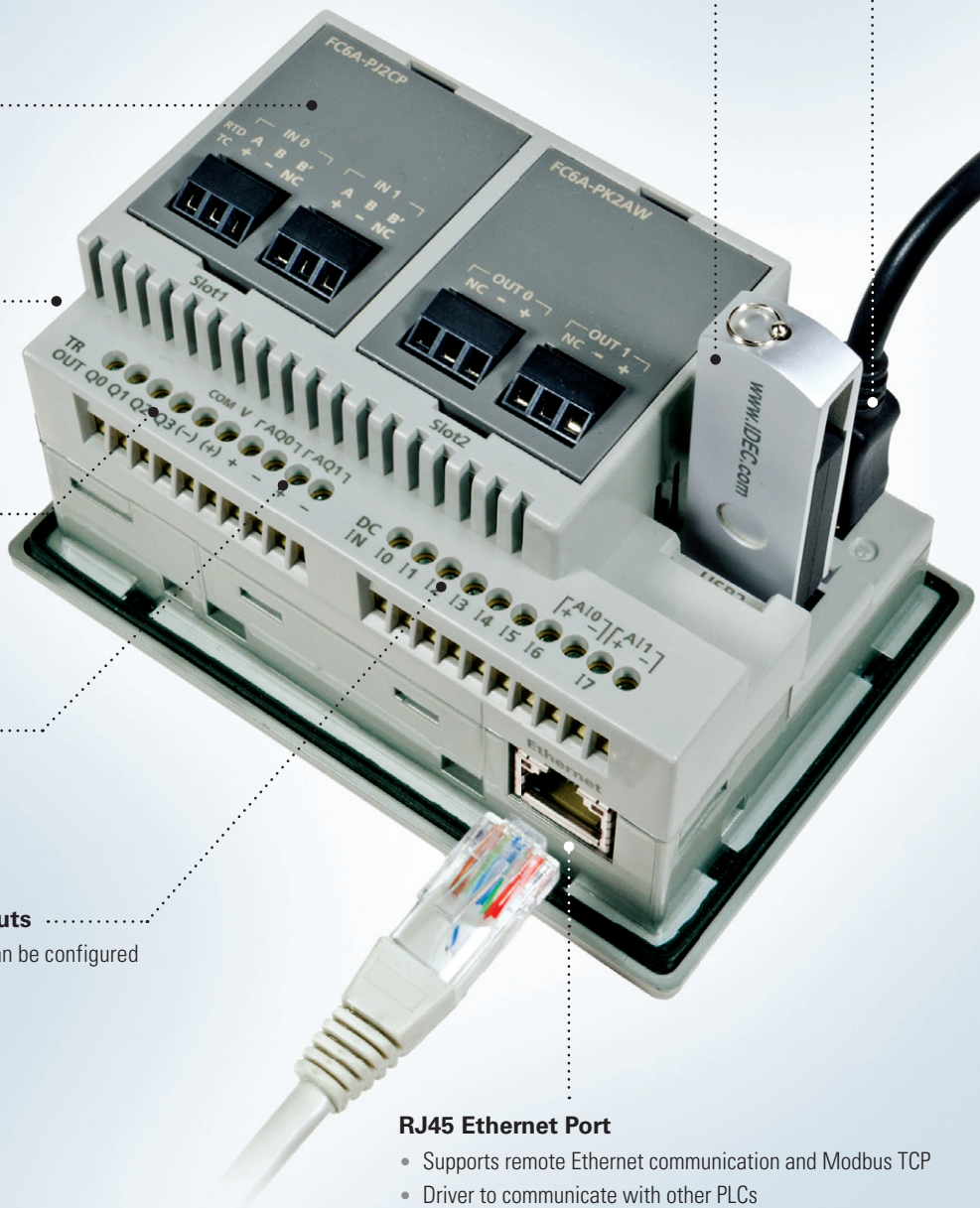

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Many-Core Processors for Control

The latest Intel processors are powering many-core industrial servers for control applications, and extending the impact of Moore's Law into the future.

BY AL PRESHER, CONTRIBUTING WRITER

The hallmark of PC control has always been the benefits it can pass on to machine control applications through increases in PC performance, along with steadily falling component costs. In recent years, higher performance has been achieved using multi-core processors.

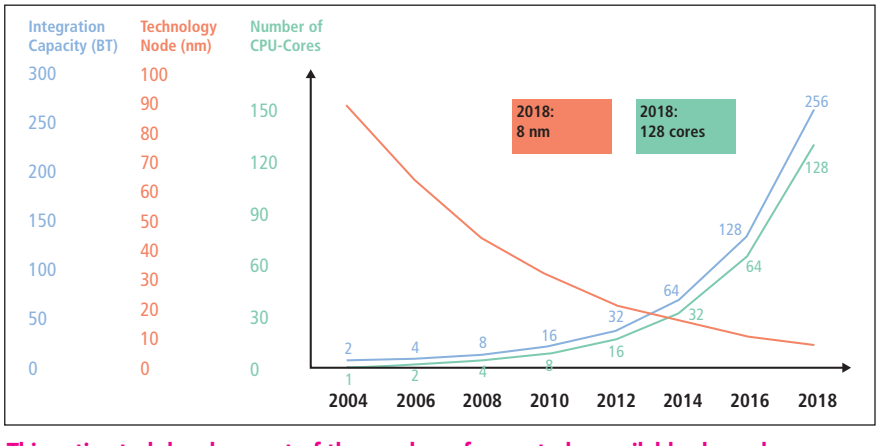
But now, as a next step in the development of technology, a new type of many-core industrial servers are offering both a higher number of processors and at the same time more cores on a board. Current configurations for the industrial control market are available with up to 24 cores, and also provide both a much larger cache and higher clock rates.

"With continued increases in machine complexity, a trend has emerged that signals greater demand by machine builders for control systems with much higher performance and connectivity. Machines and lines that previously may have required multiple controllers for different tasks can now be operated with one centralized Industrial PC (IPC) by utilizing the latest Intel processors," said Reid Beilke, industrial PC product specialist for Beckhoff Automation.

A key is that many-core industrial servers can provide the compute power to implement centralized control system architectures that are capable of controlling complex machinery and equipment from a central location. Enhanced performance may also create an opportunity to run more processor-intensive tasks such as scientific automation and simulation, for example, in addition to machine control tasks.

SOURCE: BECKHOFF AUTOMATION

The new C6670 industrial server from Beckhoff offers options for two Intel Xeon processors each with 6, 12, or 18 cores on one motherboard.



SOURCE: BECKHOFF AUTOMATION

This estimated development of the number of cores to be available shows how multi-core technology will continue to evolve over the next three years.

PROGRESSION TO MANY-CORE CONTROL

The technological progression of PC control has offered controllers with multi-core processors for many years already (in cabinet, arm/pole, and DIN rail-mounted formats). But now Beckhoff is offering a new "many-core" industrial server hardware (C6670) and TwinCAT 3 software which is able to maximize the performance of many-core PC-based hardware, all the way up to 256 processor cores when available in the future. Currently, two Intel Xeon processors are available each with six, 12 or 18 cores integrated on a single motherboard.

A wide variety of modular and scalable IPCs and industrial servers are targeting integration into the most demanding applications today, including Industry 4.0 concepts. These new industrial servers, for example, would enable customers to implement a server-based methodology for machine control by using up to 36 CPU cores and 2 TB of onboard RAM. The target is to use this solution as a centralized controller on multiple highly complex machines, or as part of an overall system architecture that extends data acquisition and analysis functionality to an entire plant floor.

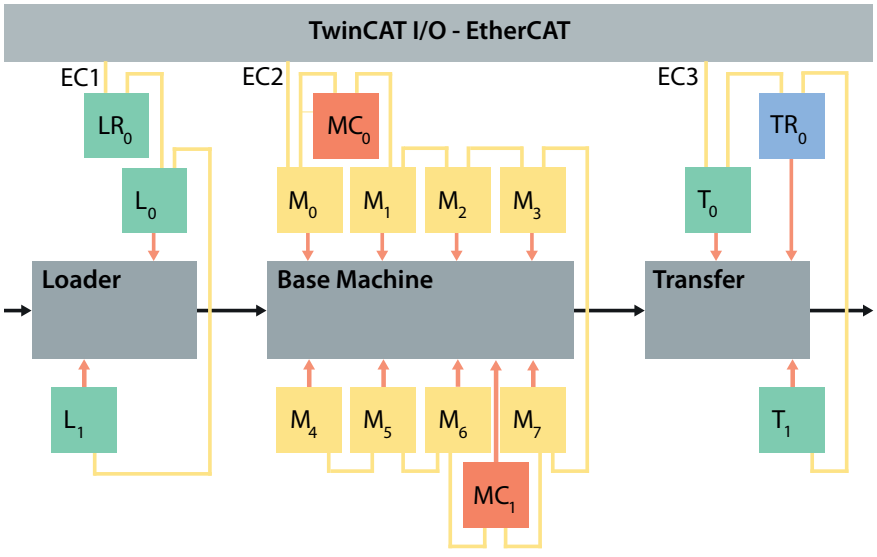
"This data can then be distributed throughout company ERP systems and the cloud via a secure, encrypted communication protocol such as OPC UA, providing a real-time, up-to-the-minute look into plant production details. Of course, numerous other CPU-intensive tasks can be added to one industrial server beyond the control and data acquisition for multiple machines, including the addition of robot control, safety technology, vision systems, condition monitoring, and much more," Beilke said.

Using the multi-core optimized TwinCAT 3 software, each specific task can be allocated to a separate core. In the case of the C6670 industrial server, Beilke said that up to as many as 36 different CPU cores can be "isolated" for dedicated tasks on a single PC-based device. With the ability to distribute the workload over several CPU cores, machine builders and manufacturers can increase the overall efficiency and throughput of the system. This streamlines the hardware architecture and increases performance, while giving the system room to grow for the implementation of additional functionality as production needs dictate.

APPLICATIONS FOR MANY-CORE INDUSTRIAL SERVERS

One application area where this new technology may be used is machines with multiple complex machine modules. An example would be a machine with a loader module that loads parts to be processed into a machine. Various modules might control a loading robot, along with functions for processing parts. Finished components are then made available in a transfer unit for further processing.

One approach to this application would be a system architecture that distributes



SOURCE: BECKHOFF AUTOMATION

Many-core industrial servers are targeting centralized control system architectures where the goal is to control complex machinery. Machines that consist of different functional modules can map individual control programs and run them in parallel.

processing for the multiple machine modules required in this system to many Industrial PCs. But this would result in more communication overhead between the processors. In addition, diagnostics would become more difficult because distributed data would have to be collected first. The software that runs on the different processors has to be managed, and interfaces have to be agreed.

According to Beilke, using a many-core server would provide a powerful PC to realize centralized control by distributing the different machine modules to the individual cores of the many-core CPU, for example. In this way, the modularity is maintained, while the benefits of a central controller can also be used. With this control philosophy it is possible — today and in the future — to implement each of the different modular machine parts on a central PC-based controller.

The high-performance CPU could also handle visualization. And since many-core CPUs can be equipped with high-performance graphics cards, they can also be used

to execute advanced and ergonomic 3D or multi-touch applications.

FUNCTIONALITY INCREASES WITH COMPUTING POWER

By running one or more PLCs in IEC 61131 with object-oriented extensions, motion control with point-to-point axes (PTP) is also integrated. A CNC or a robot could also be added to the process along with applications such as image processing and condition monitoring that require large amounts of memory area and execute complex processor-intensive algorithms. By integrating MATLAB/Simulink into TwinCAT 3, there is a capability to use simulations in more automation control applications.

The key to this approach from a technology perspective is its ability to accommodate dramatically increased functionality on a single central computer. This potentially offers a path to continuous overall performance increases and also allows task cycle times to be reduced.

Beckhoff's perspective is that conventional PLCs have cycle times of 5 ms to 10 ms, while PC-based controllers with cycle times of 1ms or less have already been available for some time. With high-performance many-core computers and TwinCAT 3 software, cycle times are expected to fall to a level of 100 µs or less. In addition to software that supports short cycle times, a high-performance fieldbus such as EtherCAT is required to get data into the central PC deterministically and with precise timing even with high clock rates.

The resulting system architecture would consist of a powerful PC, an EtherCAT fieldbus, fast I/O modules and software solutions for PLC, motion and specialized applications such as scientific automation. High-speed I/O enables higher sampling rates for control loops, which normally leads to better control results. In conventional applications such as control of a pneumatic cylinder, which occurs dozens of times on machines, these faster response times can also enhance overall machine performance.

CONTROLLING MULTIPLE COMPLEX SYSTEMS

"A new age of machine control and connectivity is upon us. With the growing demand for big data systems, PC-based controllers provide ever-increasing value to deliver this functionality to the industrial market," said Beilke.

"Consolidation of multiple complex systems provides companies with the power to run leaner and operate more efficiently. With the advent of many-core systems for machine control and automation, this increased productivity comes with a long-term positive outlook for intellectual property growth, as the many-core concept enables companies to adeptly position themselves for peak competitiveness — today and far into the future," he said.

Smart Actuator Propels Hydraulic 'Beast of Burden'

A smart hydraulic actuator is enabling a powerful four-legged robot to negotiate harsh terrain without the aid of multiple cables, remote computers, or external devices.

BY CHARLES J. MURRAY, SENIOR TECHNICAL EDITOR

Known as the Integrated Servo Actuator, the custom-designed component incorporates a two-stage servo control valve, position and pressure sensors, and onboard electronics. By doing so, it creates a simpler package for the legs that propel the robot.

"It dramatically simplifies the architecture of the quadruped," said Gonzalo Rey, director of research and technology for Moog Inc. "By integrating all those functions into one piece of metal, it doesn't need any additional transducers, cables, or remote computers telling it what to do."

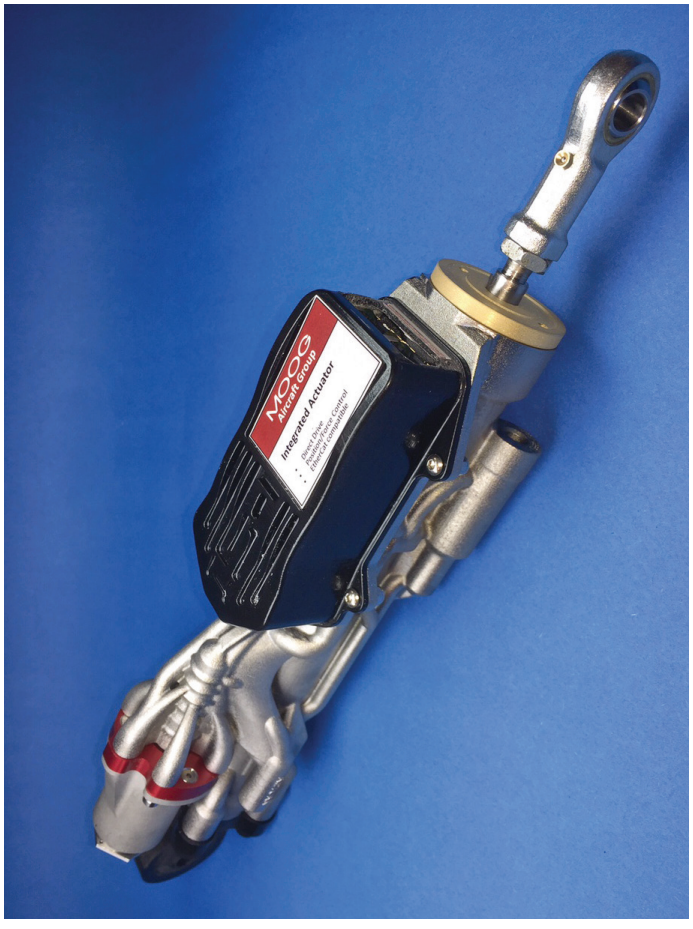
The HyQ (hydraulically powered quadruped) robot, created by researchers at the Italian Institute of Technology, was developed as a platform for the study of dynamic robotic motions, such as running and jumping, over rough terrain. From the outset, researchers hoped it could be applied to a variety of applications — such as defense, rescue, and construction trades — where it could be used to haul equipment and supply power.

"We look at it as a power tool, a mechanical beast of burden that can negotiate rough terrain and deliver payloads and power when it gets there," Rey said.

To accomplish that, however, the 200-lb robot needed to control the torque of 12 of its leg joints. Torque control is key to the robot's ability to maintain balance over uneven surfaces, Moog engineers said. Using position control without it, they said, would likely cause the robot to topple when it encountered unexpected obstacles.

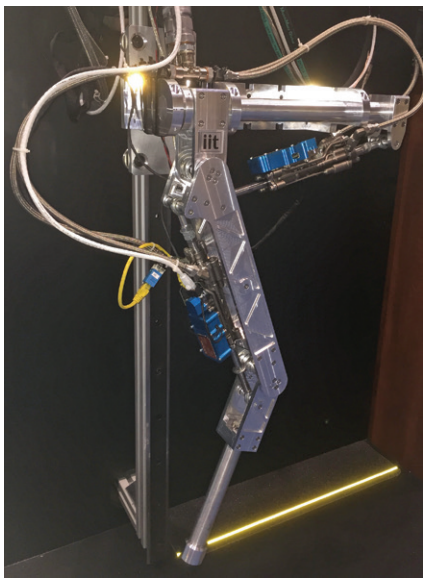
"Torque control allows the designers to stabilize the robot, even in less structured environments," noted George Small, principal engineer for Moog. "Position control alone is just not robust enough for those kinds of applications."

To solve the problem, Moog engineers endowed the hydraulic actuator with a two-stage hydraulic servo valve



SOURCE: MOOG INC.

Moog's Integrated Servo Actuator packs a two-stage hydraulic servo valve, along with sensors and electronics, into a custom-designed, printed titanium body made by additive manufacturing.



SOURCE: MOOG INC.

Using position and torque control, Moog's actuator enables the four-legged HyQ robot to balance itself on uneven surfaces.

accompanied by pressure sensing, position sensing, and closed-loop control via the unit's onboard electronics. All of the components are incorporated into a custom-designed, printed titanium actuator body made by additive manufacturing. During operation, the actuator's hydraulics typically operate at 2,300 psi, although they are capable of pressures in excess of 3,000 psi, Small said.

Moog engineers said the key to achieving torque control is the bandwidth of the hydraulic valve. The HyQ's valves operate between 150-300 Hz, enabling the system to control joint-level torque in the range of 40 Hz. Such speed is critical, engineers say, because the robot must be able to quickly react when its "foot" strikes an uneven surface.

"With each step, it stays on the ground for only a fraction of a second," Rey said. "And in that fraction of a second, you have to control the torque and generate a force to balance it."

Robots have long been able to accomplish such feats, but the Integrated Servo Actuator enables designers to do it in a compact way. "Traditionally, you would have scattered all the various functions into individual components," Small said. "Here, it's easier to use because we've put all those elements into a single package."

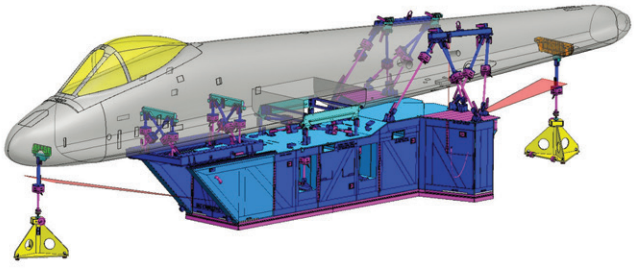
"TORQUE CONTROL ALLOWS THE DESIGNERS TO STABILIZE THE ROBOT, EVEN IN LESS STRUCTURED ENVIRONMENTS."

— George Small, principal engineer for Moog

Pneumatic Support Keeps the Air Force's Warthog in the Skies

To carry out the program, Boeing built five custom carriages using a custom, upgraded pneumatic rod lock system developed by Advanced Machine & Engineering Co.

BY PAT TOENSMEIER, CONTRIBUTING WRITER



Custom-designed pneumatic rod locks secure the A-10's fuselage without external loading and consequent damage during the aircraft's refurbishment operations.

The A-10 Warthog has been flying with the US Air Force for almost 40 years. Its offensive capabilities — ground attack and close air support — are so formidable that it has been called the "sledgehammer of the skies."

The A-10 will fly for at least one more year, after funding for continued operations was approved by Congress on April 30. That means the refurbishment and maintenance work on the aircraft will go on, as well.

To carry out the program, Boeing built five custom carriages using a custom, upgraded pneumatic rod lock system developed by Advanced Machine & Engineering Co. (AME).

The system is based on AME's fourth-generation AMLOK line, according to the company's sales manager, Shane Hatfield, but is customized for the five specially made Boeing fixtures, which allow the A-10's heavy fuselage to be mounted for structural repair operations without deforming the airframe. (The A-10's empty weight is 29,000 lb.) Each fixture has 28 rod locks, with each able to support 5,000 lb with little backlash.

The rod lock is a "power-off" unit, which means it only engages locking points on a cylinder rod when pneumatic power is shut off. "Release pressure and holding force go hand-in-hand," Hatfield said.

Commercial AMLOK versions use 60 psi of pneumatic power from shop air to keep the clamping mechanism open. The A-10 lock requires 90 to 95 psi. Once the lock is positioned on a rod, pneumatic pressure is shut off, activating the spring-loaded clamping mechanism. Using pneumatic pressure to deactivate the locks improves worker safety and prevents mishaps caused by accidental loss of air. Only when pressure is restored can the load be released.

The Air Force contacted Boeing, and conceived the design of the fixtures and subcontracted their manufacture out to area firms, and that's when AME joined the project.

Hatfield does not disclose details of the rod lock's interior design, saying only that it is a "complicated mechanism" with a "piston and collet configuration" and "a lot of technology." Features include a static wipe rod that cleans the grooves in the rod cylinders where the lock attaches.

Supporting 5,000 lb, each A-10 rod lock handles almost double the load of a conventional lock and maintains its position with maximum axial backlash of 0.002 to 0.003 inches. Hatfield says some level of "float" is needed in lock attachments because components would drag on each other and affect locking integrity. Axial backlash measurements were tracked by laser during prototype testing of the fixtures and locks.

Boeing manufactured five fixtures for the refurbishment program. Each has 28 holding points for locks. Rod locks are positioned at seven points on both sides of the fuselage — 28 points in all. This means that AME supplied at least 140 locks for the fixtures.

Hatfield says the company's commercial locks are tested for 2.5 to 7 million cycles and warranted for one year and 1 million cycles. The comparatively low number of A-10 refurbishments (the entire fleet is about 265 aircraft) means each lock may only experience 200 cycles per year.

But this was a case where the size and weight of the aircraft required a custom system that was beyond standard catalog rod locks.

Regional & Tech Trends Propel the Global Food Packaging Market

Frequently changing consumer trends ensure there will always be markets and thus new machinery demand in those regions.

BY TRACEY SCHELMETIC, CONTRIBUTING WRITER

The global packaged food market is still rising, thanks to constantly changing consumer preferences and growing demand in the Asia Pacific (APAC) region, and the global food packaging machinery market is continuing to ride its fortunes. With the packaged food industry worth between $4 and $5 trillion in 2014, analyst group TechNavio valued the global food packaging machinery market at $14 billion last year. It expects the market will reach $19 billion by 2019, representing a compound annual growth rate (CAGR) of more than 6%.

In the US alone, the packaged food industry was valued at $2.15 billion in 2014 and is expected to reach $3.21 billion by 2019 — a CAGR of 8.31%. While new customers of the food packaging equipment are more likely to be in Asia today, most of the industry's largest manufacturers remain in the US.

TechNavio's report found that demand for food packaging machinery is being driven by trends toward smaller packages with less content as well as diverse, eye-catching container formats. This has raised sales for packaging machines that can work on a smaller scale and those that are flexible for use in different specifications of size and structure.

While the consumption of packaged food in North America and Europe has certainly reached market saturation points, frequently changing consumer trends ensure there will always be markets and thus new machinery demand in those regions.

In terms of rising demand for packaged food, however, the APAC region is the area to watch, as it represented 39.9% of global market share in 2014, with a majority of the business in China and Asia. Europe, Middle East, and Africa (EMEA) represented 34.6% of the world market, and the Americas took 25.4%. According to TechNavio Senior Analyst Sharan Raj, the growth in APAC is due to the increasing migration of rural populations to urban areas coupled with increases in disposable income and the growth of organized retailing.

"The market in the APAC region is one of the fastest-growing because of the high number of food packaging firms catering to a huge population," said Raj. "Most of the packaging equipment vendors in the APAC region operate on a small scale."

In Europe and North America, there is a need for advanced packaging technologies and new equipment. These advanced technologies help fulfill the use of more innovative packaging materials that will extend the shelf life of products. Some even use biological and chemical sensors to monitor changes in temperature and moisture content. In addition, more advanced food packaging technologies are meeting supply chain and inventory technology by allowing packagers to build RFID tags into packaging films.

Motion Control in Packaging: 11 Tips For Improvement

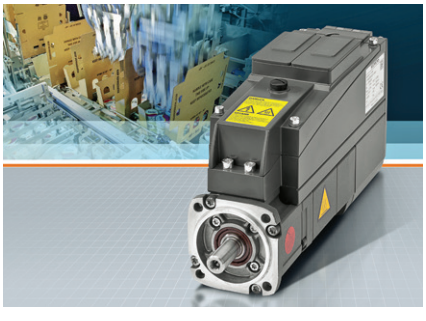
Automation combined with trained personnel will provide faster, more efficient and cost-effective production. With automation products and software becoming so much more reliable and affordable, the days of the purely mechanical system are numbered, if not already spent.

BY AJAY S. RANA, SIEMENS INDUSTRY INC.

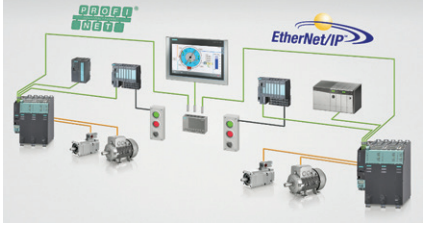
Packaging lines, whether being designed for Greenfield installs or Brownfield expansions, can take advantage of the many technical innovations being made in the areas of motion control, software communications platform integration, safety, remote connectivity, washdown rating, or international standards compliance and modularity. The burgeoning market for American-built equipment in the emerging and traditional offshore markets, plus a continued strong domestic business climate, are driving the development of more advanced technologies and flexibility in design of such equipment and systems.

In this article, the author details some recent technology developments in packaging machine and line motion control, offering 11 areas for both end user line improvements and expanded capabilities for the machine OEM, as follows:

1 A new decentralized drive technology offered today consists of a drive mounted directly over the motor. This technology significantly reduces the amount of cabling required, plus conserves control cabinet space, cooling costs, and related energy efficiencies. Quick connects and a common DC bus further enhance the effectiveness and field performance of this decentralized drive concept. Also, since there is just one cable per motor, it also eliminates the need for a separate communication cable. This is just an integral part of "Hybrid Cable technology" now on the market.



2 The incorporation of EtherNet I/P interface into the drive to permit online communication with other brands of equipment. This development has significant advantages in a Brownfield line expansion/upgrade with legacy controls or when new equipment that utilizes various brands of motion control components is being incorporated by an end user or system integrator. Through a regular Ethernet/IP cable connection, other communication languages can be routed to the drive system components and motion controller, thereby providing huge capital savings and time savings. In short, it gives the end user and OEM a flexibility to choose the best control components. From the software perspective, the heterogeneous automation environment of the past was a significant engineering challenge and financial roadblock, but not anymore.



3 Advancements in the "safety wall" for packaging machine builders, whereby a safety PLC, hardware and software, plus features such as safety integrated into the drives, provide an effective double safety scenario. The days of the mandatory keyswitch lockouts and intense engineering of the line safety have given way to the fail-safe controller, with safety functions integrated on the drive, while closed-loop position control of the drive remains

fully active. This means faster restart of the line, as setup functions can be performed with the protective covers and guards open, so you get shorter downtimes, less wasted product, and a resulting higher level of productivity, all in a totally safe environment that protects operators and machinery alike.

4 New motion controller technology, ranging from 1-128 axis capacity, with just two form factors, that is, motion control and a PLC functionality in one hardware package, is getting accepted widely in the industry. Having a single software platform and the same programmability to configure from one axis to 128 axes adds an extra advantage both on cost saving and engineering time. This development is emerging in tandem with enhanced communication protocols from machine-to-machine or up to a full Manufacturing Execution System (MES) network. The result is faster construction, commissioning, and line integration. Also, having an integrated web server inside the controller helps troubleshooting, which can be anywhere from basic to advanced. Operator control, maintenance, and diagnostics data are standardized, while the data links to the master mainframe or IT system are simplified.

5 Motor advancements, including field replaceable encoders plus plug-and-play technology and quick-connect technology, have changed the landscape in both machine building and line maintenance. As an example, high-performance, energy-efficient

AC servo motors, coupled with a drive component, are being offered as a package and manufacturers are today making more software tools available for motor size selection, drives pairing, and communications hardware options. Likewise, servo, torque, and linear motors are all available with a quick identification device to make line integration a one-click operation.

6 Gearmotor packages are generally used for specific heavier-duty conveyor applications. Use of advanced helical bevel technology that allows lower HP motor usage, smoother starts, high torque control, operating efficiency, and less energy consumption are some of the features that should be considered when specifying gearmotors. As a side note, most manufacturers today provide downloadable CAD files for easier design integration by the builder and end user communities, to facilitate both in-plant and engineering system documentation. In addition,

all mechanical data are usually available online for the mounting of gearmotors, a real plus for the installer.

7 On the horizon, we see new washdown motor technology for the food and beverage production plus food packaging sectors that features a complete stainless-steel enclosure. Hygienic design gets special consideration in certain sectors of the packaging and processing industries, whenever machine components are in direct contact with food, beverage, cosmetics, etc. Having a washdown motor with totally hygienic design adds value to the overall machine for the builders and keeps the downtime to a minimum for the end users. Currently, IP69K is a standard getting considerable attention in this huge market segment. IP69K is the standard used for all applications where high-pressure and high-temperature washdown are used to sanitize equipment. This new standard will become the norm for food processing in the near future, as it represents a decided improvement over the older IP ratings.

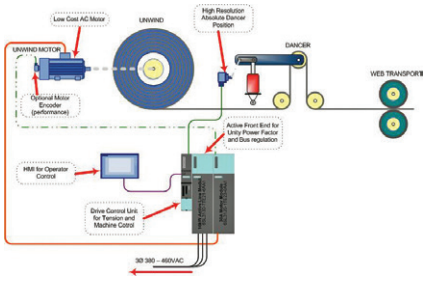
8 Modular solution technology, whereby a single large machine with multiple sections of motion control or a full production packaging line can be run without the need for multiple CPU's. With modularity comes flexibility and one can then engineer the solution to provide a seamless transition from a machine with all options to a machine with fewer but job-specific options. The economic advantages here are self-evident and the key driver to this development is the enhanced open architecture of the motion controller and drive systems.

9 Remote connectivity through an integrated web server with a maintenance person having a password that will allow complete condition monitoring and onsite troubleshooting on a packaging line. The end user can also access a full library of "fixes" online. This web server can be customized to suit the user's needs. In a more complex arrangement, the machine builder and end user can also extract performance data to track machine uptime, component wear, maintenance strategies, and other considerations in an overall equipment effectiveness (OEE) paradigm. Functionally on the floor, of course, the key advantage is the maintenance engineer's ability to

quickly and accurately isolate an issue in the line, do the diagnostic analysis, get a part ordered, or obtain onsite service in the most efficient and cost-effective means possible. The price of a single hour of downtime on a major packaging line lobbies for such remote connectivity plant wide.

10 With more domestic (North American) machinery and equipment builders selling overseas, the importance of global standards compliance. Supplier presence worldwide is essential to make it easier for the machine builders to get parts and competent service quickly. The remote connectivity detailed above is also a factor here, but the need for standards-compliant machine components that can be integrated into an existing design for foreign sale is critical. To be competitive on the world market, builders must be cognizant of their vendors' international capabilities. For the multi-national end user, as well, this norm is consequential in achieving efficient compliance approval from the local standards organizations.

11 Finally, sustainability and the flexibility of energy conservation afforded both builders and end users by the emergence of regenerative drives technology in the packaging world. Excess energy can be used to drive other machine components or returned to the grid in a measurable manner. This "active front end" technology on the drive, coupled with more energy efficiency on the motors used, yields a definable best practice accomplishment in energy cost savings for the builder and end user alike.



In the overall evaluation, automation is the watchword for a modern packaging line and the equipment or machinery builder who supplies it. Automation combined with trained personnel will provide faster, more efficient, and cost-effective production. With automation products and software becoming so much more reliable and affordable, the days of the purely mechanical system are numbered, if not already spent. Having a high degree of automation in your line or on your machine means faster product changeover, faster recipe adjustments, homing of new line components after an install, enhanced troubleshooting capabilities, and more.

Ajay S. Rana is industry business development manager, packaging, for Siemens Industry Inc.

IN THE MARKETPLACE

ABB AUTOMATION ENGINEERING SOFTWARE SUITE

The speed and efficiency of industrial control and machinery automation projects is enhanced significantly with a major new release of ABB's integrated development toolsuite.

Automation Builder 1.1 provides an integrated development environment for solutions using the spectrum of automation components - including PLCs and safety PLCs, motion controllers, drives, robots and HMIs - substantially reducing software complexity and cutting time to market and cost of ownership.

Among many new features, the latest release of ABB's software extends the data exchange capabilities with electrical planning and engineering software, with a new bi-directional interface to the widely-used EPLAN Electric P8. Electrical automation and PLC design data may be imported, modified and transferred back to the electrical CAD environment - eliminating any need to manually enter data and thereby ensuring synchronization of signal identification between the two software environments.

ABB Inc.
www.abb.com

ALPHA WIRE ECOFLEX PUR

The new EcoFlex® PUR continuous flex cables from Alpha Wire feature reduced size and weight and zero halogen construction in a rugged, oil-resistant cable for continuous flex applications. As an addition to our EcoGen™ portfolio of compact, lightweight, zero halogen wire and cable, EcoFlex PUR cables use mPPE insulation and a tough, abrasion-resistant polyurethane jacket that enables reliable 600 V performance in cable that's 40% smaller and 44% lighter than typical continuous flex cables.

The zero halogen PUR jacket offers exceptional abrasion resistance, resists oils and UV radiation, and remains flexible at temperatures down to -40°C. Its mPPE insulation contributes to size and weight savings, and enables the cables to meet RoHS and REACH requirements for the elimination of hazardous substances and recyclability. EcoFlex PUR cables are currently available in over 120 standard shielded and unshielded configurations, and up to 36 conductors.

Alpha Wire
www.alphawire.com

AUTOMATIONDIRECT OFFERS ADDITIONAL FULL-FEATURED SOFT STARTERS

Designed to withstand up to 477 FLA (at 200-480 VAC), SR55 full-featured solid-state soft starters are available in three frame sizes and provide many advantages over electromechanical contactors. SR55 soft starters are fully digital, provide full motor overload protection, and use thyristors in all three motor phases for controlled, reduced voltage motor starting and stopping.

SR55 soft starters are used in general purpose soft start motor control applications where traditional across-the-line starting or wye-delta starting would typically be appropriate and are ideal in applications requiring lower inrush currents. SR55s also have a built-in internal bypass and patented iERS (intelligent Energy Recovery System) that reduces energy costs when used on lightly loaded and oversized motors.

The SR55 series features 24VDC, 110 or 230 VAC selectable control voltage, as well as easily and separately adjustable motor start and stop times. These fully programmable units are equipped with a touchscreen with an easy-to-navigate menu structure, a quick Automatic Application Setup feature, built-in SCR failure protection, and full data logging (fault records, motor current, operational status, etc.) SR55 soft starters also feature integrated Modbus RTU, or optional Modbus TCP or Ethernet/IP communication, as well as programmable analog I/O, digital inputs and relay outputs for remote control.

AutomationDirect
www.automationdirect.com

BEI KIMCO MAGNETICS DII15-60-200A BRUSHLESS DC MOTOR

BEI Kimco Magnetics introduces a new, rugged brushless DC (BLDC) motor that was developed specifically to withstand the harshest conditions found in the Oil Exploration Industry. The robust design also makes it suitable for other applications found in severe environments where failure is not an option. As the extraction of oil reaches greater depths, drilling equipment must continue to operate reliably in increasing temperatures and pressures, while also enduring

extreme shock and vibration. In an industry where one hour of downtime can cost upwards of $100,000, having durable products that have been tested and proven to last is crucial. In some cases, replacing a motor in drilling applications can take up to ten hours or more. BEI Kimco Magnetics understands this need and has designed a motor that can stand up to the challenge, and has the testing results to prove it.

The new 1.5" diameter DII15-60-200A High Pressure High Temperature (HPHT) brushless DC motor provides the ideal solution for severe down-hole applications such as mud pulser valves, caliper deployment and sensor positioning. The motor has been successfully tested to operate under continuous duty in temperatures up to 205°C and pressures up to 30,000 psi.

BEI Kimco Magnetics
www.beikimco.com

EATON E2VAC VACCUM CIRCUIT BREAKER

Power management company Eaton has announced the new E2VAC Mining Circuit Breaker, a low-voltage, vacuum-based breaker solution with advanced monitoring and optional integral remote racking. Designed to improve reliability,

productivity and worker safety in power-centers and other panel applications in underground mining and metals operations, the E2VAC's vacuum contactor technology significantly reduces the risk of energy released during an arc event.

The new breaker is available as a fixed drawer assembly or with integral remote racking capability that allows the breaker to be racked in and out from service at a safe distance. The breaker also features the EDR-5000 relay with advanced monitoring capabilities, which improve on basic monitoring tools to help maximize power quality. By improving diagnostic and communications options, the breaker is designed to indicate symptoms before failure occurs, expanding safety and reliability for workers and the surrounding equipment.

Eaton
www.eaton.com

STANDARD-KNAPP 598 TRITIUM SHRINKWRAPPER

Standard-Knapp, a worldwide leader in the manufacture of innovative packaging machinery, announces its 598 Tritium™ Shrink Wrapper. The 598 Tritium™ Shrink Wrapper is a continuous motion shrink wrapper capable of handling applications in the food, beverage and personal care industries.

With single, double and three lane configurations, the 598 Tritium™ Shrink Wrapper swiftly arranges products into compact pack patterns and wraps the configurations in film, thereby eliminating the need for trays and pads. The 598 Tritium™ Shrink Wrapper also features both an innovative Robo-Wand™ wrapping section and precise servo-driven film cutting system. These features allow for wide product range capabilities, reliability, as well as increased speed of up to 120 trays per minute.

The modular construction of the 598 Tritium™ Shrink Wrapper allows for precise assembly with no adjustments. The 598 also features an ergonomically designed side film stand which makes it easier for employees to reload film rolls. In addition, its slide-out film feed and increased visibility make maintenance simpler.

Standard-Knapp
www.standardknapp.com

HELUKABEL INDUSTRIAL PLUG CONNECTOR WITH PROFINET FAST CONNECTION TECHNOLOGY

Helukabel, one of the world's leading cable manufacturers, presents its new PROFINET plug connector, the HELUKAT RJ45 Cat5 IP20, which has built-in fast connection technology. The Fieldbus-

compatible plug comes in a linear and angled design. It is therefore well-suited for industrial use in tight installation spaces.

HELUKAT has colored contact elements which prevents the installer from committing connection errors. The clear labeling matches the wire sequence of the PROFINET standard whose four single wires can be quickly connected. The metal housing enables it to be used in industrial applications. Transmission rates are up to 100 MHz Cat 5. The shielded plug connector comes in a linear, 180° version and an angled, 90° version. Designed to protection grade IP 20, it can withstand operating temperatures of -4 F to 158 F (-20 C to +70 C). The HELUKAT RJ45 Cat5 IP20 is compatible with AWG 22 and AWG 24 cables, and designed to be used with both bunched and solid wire conductor types.

The PROFINET plug connector can be easily and quickly installed without the need for tools. The single wires must be arranged in accordance with the color coding of the RJ45 plug and, in the folded-up guide element, inserted into the contact points up to the stop. To achieve a full connection, the user presses the guide element downward to the stop, closes the housing cover, and fixes the front screw cap with a quarter rotation. The development of a 145°-angled version as well as an 8-pin variant is currently in the planning process and will expand the product range once successfully completed.

Helukabel USA
www.helukabel.com

ICP DAS USA PASSIVE INFRARED (PIR) 360° MOTION AND TEMPERATURE SENSOR

ICP DAS USA releases PIR-130-DC, a 1-channel passive infrared (PIR) sensor module that detects human-body generated infrared waves within a range of approximately 8 meters (315 inches) in diameter with a 360 degrees coverage area. The PIR-130-DC is for indoor motion detection and can be configured to automatically switch on a light if motion is detected. It also includes a 1-channel temperature sensor that can measure room temperature or be configured

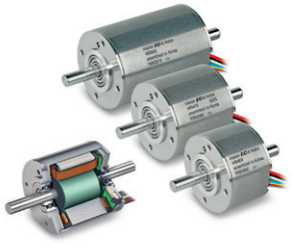
to trigger a fire alarm. The PIR-130-DC supports 10~30 VDC power supply while there is another version, PIR-130-AC that supports 110 ~ 220 VAC.

The device communicates over RS-485 interface and supports Modbus RTU and DCON protocols. Time-delay, Lux Control Level and Sensitivity levels are adjustable to meet different expectations of users. There is also a photo sensor inside for smart switch-on control. Relay Output can be used to control the light via the PIR/temperature sensor. It can be easily mounted on the ceiling to monitor the room. This PIR-130-DC sensor can be widely used in buildings, homes, and stores to automatically turn on lights if motion is detected. For example, it can be used in storage stores where the lights will be automatically turned off when customers come to drop off their boxes. In this way, the sensor helps you save your energy costs and modernize your room.

ICP DAS USA, Inc.
www.icpdas-usa.com

MAXON EC-I 40 HIGH TORQUE DC MOTORS

When it comes to powerful movements, maxon delivers with its EC-i 40 High Torque series of DC motors. The Swiss drive specialist presents three powerful iron-core internal rotor drives. The drives have a diameter of 40 mm and are equipped with an innovative rotor.



They feature high dynamics, a low cogging torque, and extremely high output torque. The strongest motor in this series offers a maximum nominal torque of 234 mNm and is 56 millimeters in length. It exceeds the performance of its precursor model by up to 70 percent.

The three new brushless DC motors are cost-effective and ideally suited for applications in robotics, prosthetics, and industrial automation. The compact design offers a great solution in applications with extreme space constraints. When needed, the EC-i 40 High Torque motors can be combined with maxon gearheads, servo controllers, or position controllers. The EC-i 40 series is easily configured and available in our online shop.

maxon precision motors, inc.
www.maxonmotor.com

OESAT10-120 MOTORIZED VERTICAL STAGE

The AT10-120 Motorized Vertical Stage from Optimal Engineering Systems, Inc. (OES) is a high resolution, low profile, high load vertical lift stage that can be easily integrated into almost any application. The large 220 mm x 140 mm (8.7 in. 5.5 in.) drilled and tapped platform has a vertical travel of 110 mm (4.3 In.). The twin lead (right and left hand thread) precision ground screw and six guide rails provides smooth, flat (parallel to

mounting surface), vertical motion, and high resolution to 5 µ (non-microstepping) and 0.50 µ (10 Microstep Driver), and repeatability is 10 µ at travel speeds of 5 mm/sec. Applications for the AT10-120 vertical lift stage include: Testing, inspection, assembly, sampling, laser drilling and machining in a broad range of industrial, medical, semiconductor, and research facili-ties.

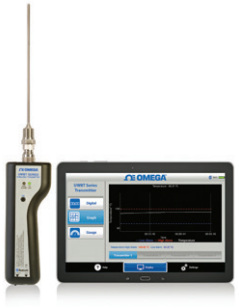
The AT10-120 low profile 90mm (3.54 in.) vertical stage is constructed of black-anodized aluminum alloy and weighs just

6 kg (13.23 lbs). The powerful 2-phase NEMA 23 Stepper and inclined plane and scissor lift concept offers higher load capacity to 15 kg (33 lbs) com-pared to vertically mounted stages, and without the concern for cantilevered effects (loss of parallelism), additionally, the moving platform has access from all four sides, and the base plate has easy to access holes for mounting.

Optimal Engineering Systems, Inc.
www.oesincorp.com

OMEGA INTRODUCES HANDHELD WIRELESS BLUETOOTH TRANSMITTER

The UWBT Series of Bluetooth® transmitters combine the accuracy of an industrial sensor/transmitter with the convenience of smartphones and tablets. It measures different sensor inputs such as thermocouple, RTD, relative humidity, and pH and transmits the data to your smart phone or tablet via wireless Bluetooth communication from the free



UWBT app running on an iOS or Android™ smart phone/tablet. The free app has many features including the ability to be configured in 9 different languages, can be paired with multiple transmitters simultaneously, monitors and logs sensor data on your smart phone or tablet, and displays sensor data in digital, graph, or gauge format. This CE compliant product has the capability to download logged data to your smart phone or tablet and email the data to an email address or to the Cloud, the UWBT logs up to 10 samples per second and logs data to the handheld transmitter with date/time stamping or directly to your smartphone/tablet and works with mobile devices and computers with USB communications.

Omega Engineering, Inc.
www.omega.com

ORIENTAL MOTOR BXII SERIES BRUSHLESS MOTOR AND DRIVER PACKAGE

Oriental Motor USA is pleased to announce the BXII Series Brushless Motor and Driver Package. The BXII replaces our popular BX Series and now offers an all new driver incorporating a built-in controller with all the features

necessary for speed control, position and torque control.

The BXII Series now provides the highest level of speed control, up to 4,000 r/min with a speed regulation of +0.05% and is available from 30 W up to 400 W, in round shaft, parallel shaft gearheads or the hollow shaft flat gearhead and electromagnetic brake options. The new driver features a digital setting directly on the face of the drive to utilize the built-in speed control, positioning or torque limiting functions with no additional control module required.

The new driver can also work in conjunction with our popular MEXE02 software (free download) or if remote programming is required, our standard OPX-2A control module (sold separately) can be utilized. The BXII Series comes standard with a 3m (9.8 ft) cable included.

Oriental Motor USA Corp.
www.orientalmotor.com

ORIENTAL AZ SERIES 0.36° MOTOR AND DRIVER PACKAGE

Oriental Motor USA is pleased to introduce its latest technology for advanced positioning applications, the AZ Series 0.36° Battery-Free, Absolute Sensor Equipped Motor and Driver package.

The AZ Series offers closed loop control, substantially reduces heat generation from the motor and incorporates a newly developed Absolute Sensor for absolute-type positioning. The new Absolute Sensor operates autonomously, without additional battery back-up or external sensors to buy. The AZ Series driver offers advanced and powerful operational programing and function control through our MEXE02 software (available as a free download). With no additional sensors, high speed return-to-home or restart without homing is possible and even common repeat move functions can be programed into the driver, saving wiring, lowering costs, increasing throughput and saving controller command functions.

The AZ Series is offered with built-in controller or pulse input type with single-phase 100-120 VAC, single-phase/three-phase 200-240 VAC or 24/48 VDC input. Round shaft motor only type or four different geared types are available as standard product, including our newest Harmonic Planetary gear (HPG) with a center shaft or flange mount. All cables are included.

Oriental Motor USA Corp.
www.orientalmotor.com

SIGNALFIRE REMOTE SENSING SYSTEM

SignalFire Telemetry has expanded the interface capabilities within the open architecture of its Remote Sensing System to support a wider array of sensors in the remote management of assets in challenging outdoor environments such as oil fields, water systems and mining.

At the heart of every Signal Fire Remote Sensing System (SFRSS) are remote transceiver "Sentinel" nodes that

interface with sensors, extract data and send a powerful, long-range transmission of data in the unlicensed ISM bands that sustains signal strength through terrain, structures, or weather.

Signal Fire introduces three new Sentinel nodes to its existing range of analog, digital, Modbus and HART modules to provide users with greater options in their monitoring and control applications.

All Sentinel nodes are rated to Class 1 Division 1 standards, intrinsically safe, rugged oil field proven and can be power either from internal batteries or Signal Fire's C1D1 Solar System. The addition of the three wireless Sentinel nodes to the SFRSS enables users to build a full wireless network using the best sensors for an application.

SignalFire Wireless Telemetry
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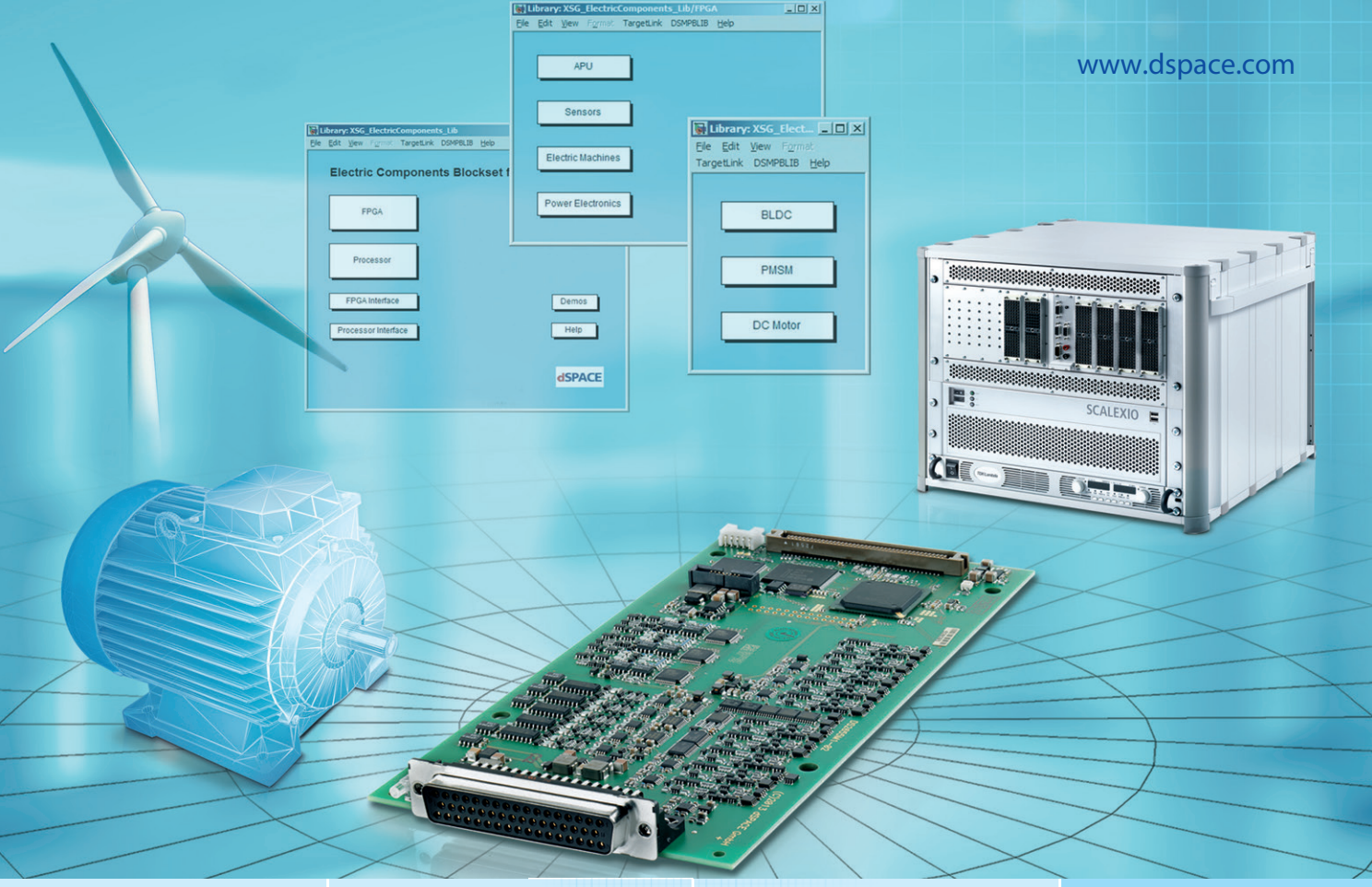

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