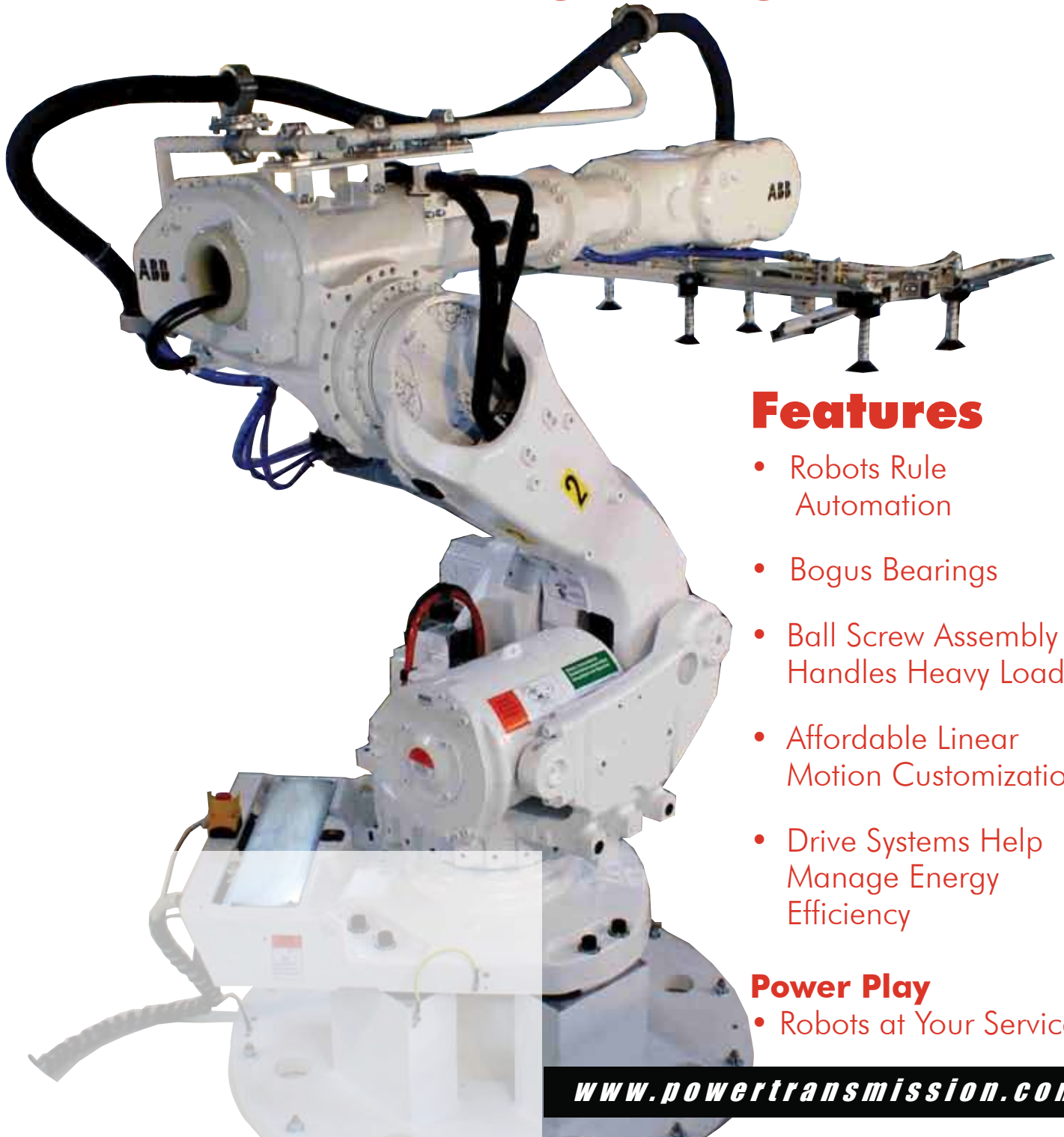


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VOL. 4, NO. 2

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User Friendly Buyers Guide

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And More Changes To Come...

The image is a screenshot of the website www.powertransmission.com. It shows a navigation menu at the top with categories like 'Gears', 'Belts', 'Motors', 'Gear Drives', 'Chain Drives', 'Belt Drives', 'Clutches', and 'Shafts'. Below the menu, there are several featured content areas: a 'User Friendly Buyers Guide' for gear drives, a 'Videos' section with a video player showing a man in a workshop, and an 'In-depth Feature Story' titled 'Start, Design and Market Your Engines' with a photo of a young boy working on a project. The website footer includes the 'start' logo and social media icons.

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SKF Bearings Assist Gearbox on the High Seas



The final drive/output pinion for the jacking gearbox provides the power needed to operate the platforms in harsh conditions (courtesy of SKF).

Jack-up platforms are designed to float to a location and then have the drilling platform “jacked up” off the surface of the sea for oil drilling operations. One piece of critical equipment is the jacking gearbox

that provides the power to lower the platform legs onto the sea floor and then lift the enormous weight of the drilling platform high enough above the water so there is no interference to drilling operations from wave motion, even in stormy conditions.

The Hyosung Corporation of Korea claims that their jacking gearboxes give the kind of reliability and power needed for working in such an environment. SKF has contributed 23 bearings in each of the latest designs of the gearbox, including the SKF CARB toroidal roller bearing, a bearing that delivers high carrying power in the smallest package of any bearing type.

Won-Cheol Hong, senior designer at Hyosung Industrial Machinery, began this project to design a smaller, lighter, more powerful jack-up gearbox for oil drilling platforms. The bearings that support the shafts and gears as they lift the enormous weight of the

platform at 1.5 feet per minute are a major component in the gearbox design. The weight of the platform and the demanding operating conditions mean that minor deflections of the shafts cannot be avoided.

To prevent premature bearing failure in gearbox applications, the bearings must be able to accommodate these deflections in all conditions throughout the life of the gearbox. Hong’s final selection included SKF tapered roller bearings, spherical roller bearings and CARB bearings for the very demanding load carrying in the planetary gears. This selection resulted from thorough advanced modeling of the gearbox together with sophisticated bearing life and load calculations, carried out by SKF.

Today, more than 500 sets have been delivered for offshore drilling applications and will be incorporated in new platforms being commissioned in the next few years. The first drilling platform equipped with these gearboxes started drilling off the coast of China in January 2009 and will stay there for three years. The oil rig, operated by a U.S. company, utilizes 54 Hyosung reducers to jack up the drilling platform with 18 gearboxes on each of its three support legs.

With the oil drilling platform expected to be active for 20 years, the operators want efficient and trouble-free operation during the anticipated 2,000 total hours of lifting and lowering of the platform once it is positioned, after the vessel is moved to various drilling sites. The first gearboxes produced have a lifting capacity of 440 kips (kilo-pounds) and a holding capacity of 700 kips in normal conditions, extending to 1,000 kips in severe storming conditions. Later models had a 550 kips carrying capacity with proportionally more holding and severe storming capacities.

“I am very happy with the technical



SKF CARB bearing



SKF CARB bearings allowed the Hyosung Corporation to downsize the gearbox for high sea operations (courtesy of SKF).

support I received from SKF in this project,” says Hong. “I was visited by European SKF engineers who had applied CARB bearings in other heavy industry applications such as steel mills, pulp and paper plants and wind turbines. They gave deep technical presentations to me and my staff that gave us the confidence to go further in the development. The use of CARB, and its self-aligning ability, allowed us to design low profile gears that are wider, stronger and give greater torque capacity than previous designs. This allowed us to downsize the gearbox. CARB’s ability to take up minor misalignments and heavy loads improves the gear meshing and improves the gearbox efficiency.”

SKF’s CARB bearings are self-aligning radial bearings with an inner ring that moves independently of the outer ring, enabling the shaft to move smoothly without inducing axial loads. It accommodates misalignment like a spherical roller bearing and axial displacement like a cylindrical roller bearing. Additionally, it carries extremely high loads due to relatively long and barrel shaped rollers. Because the rollers are barrel shaped, and the inner and outer rings are correspondingly concave and symmetrical, the bearings will always position themselves in the

raceway for optimum load carrying performance.

For more information:

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890 Forty Foot Rd, Box 332
Kulpsville, PA 19443
Phone: (267) 436-6723
skfusainfo@skf.com
www.skf.com

Pump Application Endplay Vibration Eliminated

A beveled retaining ring from Rotor Clip Co., Inc. is used to stop endplay vibration in a pump application.

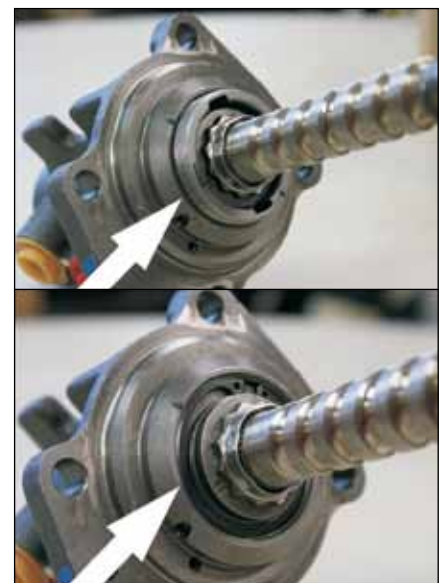
The bearing of an automobile power steering pump was being retained by a threaded nut to eliminate vibration caused by endplay. Extra labor was needed to machine complementary threads on the housing in order for the

nut to be installed. The nut also required a specific torque during installation for each unit, which increased labor and costs.

In order to resolve this problem, Rotor Clip Company, which manufactures retaining rings, hose clamps and other similar products, machined a simple groove into the application to allow the complementary angle of the beveled ring to assume the function of the more expensive and cumbersome nut. Once installed, the retaining ring eliminates the need for additional labor to torque the part or machine threads on the housing. Also, the cost of the beveled ring used is less than the original nut.

For more information:

Rotor Clip Company, Inc.
187 Davidson Avenue
Somerset, NJ 08873
Phone: (732) 469-7333 or
(800) 557-6867
Fax: (732) 805-6472
www.rotorclip.com



Top: The original application with the threaded nut installed. Bottom: The threaded nut has been replaced by a beveled retaining ring from Rotor Clip Co., Inc.

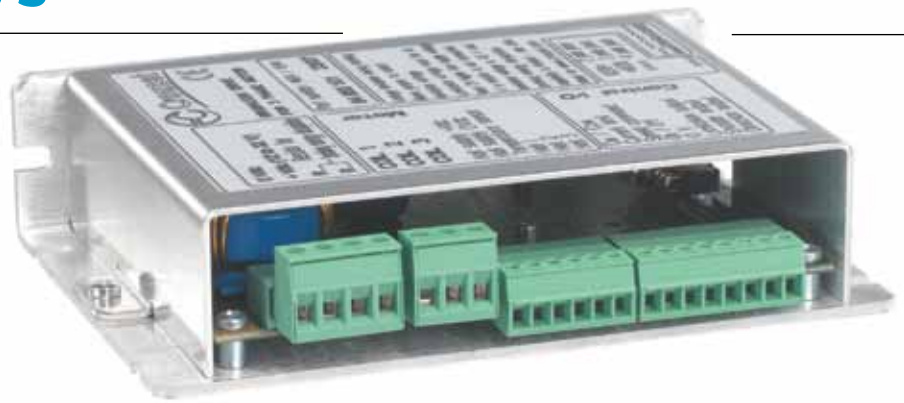
Crouzet

EXPANDS BLDC POWER RANGE

A line of high-performance, geared BLDC motors is available with a complete tool kit of selectable gearboxes, controllers, brakes and smart drives from Crouzet North America, a company of Custom Sensors and Technologies. The motor's concept allows different configurations to be assembled quickly for fast prototyping while providing a complete automated solution tailored for individual customer needs.

The motor line provides more options for Crouzet's motor offerings. "Crouzet has expanded the continuous power range of the BLDC motors it offers from 30–100 watts to 17–205 watts," says Jim McNamara, Crouzet application engineer. "The gearboxes used in this product are designed for a longer service life than other Crouzet models."

The low-cost BLDC motors feature a wide selection range for power, speed, torque and size. The motors include continuous power up to 400 watts, speeds between 1,500 and 6,100 rpm and motor constants up to 15 ounces per square root watt (103 mNm per square root watt). Maximum torque constants feature up to 198 ounce-inches/amp (1,400 mNm/amp). The six new models



The BDE40 Controller can be used with most three-phase brushless Hall effect motors in a range of motion control applications.

include two round and four square designs with lengths ranging from 41 millimeters to 114 millimeters. Motors can be ordered with a factory-mounted optical or magnetic encoder and can be fitted with electromechanical fail safe power-off brakes.

"The power range of 17 to 205 watts is best for small, but not micro applications," McNamara says.

Compatible gearboxes feature spur, planetary and worm styles with torques from 0.4 Nm to 120 Nm. The BDE30 and BDE40 external drives are offered in 6A or 14A max respectively. Internal drives are available on BLDC motors that feature power ranges from 40 to 100 watts. "Accessories include right angle and planetary gearboxes, brakes and encoders, and external drives," McNamara says.

The motor control solution is appropriate for a range of applications in the medical and industrial markets. Uses include automation for endoscopy,

x-ray and dental equipment, robotic pool equipment, peristaltic pumps, access control, printing and bill boards. "One customer uses our 80 watt BLDC motor with an integrated controller in a solar powered pump application," McNamara says. "Another customer uses a BLDC motor with a controller for automatic subway doors that provides high acceleration and dynamic braking."

The motor line was in development by Crouzet for about two years. "Crouzet's goal in developing this new product was to satisfy premium application performance requirements beyond Crouzet's previous offerings," McNamara says. "This product line offers increased performance with expanded power range and service life over other Crouzet products."

Crouzet typically adapts products for specific customer requests. "Our new 'tool kit' approach of interchangeable motors, gearboxes, controllers, brakes and smart drives allows us to provide fast, automated solutions at an excellent value."

Crouzet also recently released the BDE40 Controller as a complement to its line of standard and custom Brushless DC motors. The BDE40 can be used with most three-phase brushless Hall effect motors in a range of motion control applications, and it includes four-quadrant functionality and load resistor protection.

The device features a four-quadrant design for applications that require standard forward and reverse motor control as well as closed-loop speed control for motor slowing and stopping.



Crouzet's low-cost BLDC motors feature a range of power, speed, torque and size selections.

Typical applications include control for production conveyor belts, production robot trolley wheels, medical, food mixing machines, cutting and packaging machines and other applications with 12 or 24 volt power supplies that need powerful motors.

The BDE40 delivers up to 360 watts with 11 to 36 VDC, 10 amps nominal and a maximum continuous current of 14 amps. Resistors protect against over-current, polarity inversion and short circuiting. Other performance features include an absorbed current of 0.1 amps, temperature rise of 50 degrees Celsius, ambient operating temperature of 20–40 degrees Celsius and storage temperature of 40–90 degrees Celsius.

The BDE40 can be used as a stand-alone controller, connected to a PLC or driven by potentiometers. The unit comes standard with guide, braking resistor, protection diodes and connectors.

“The new controller was introduced to provide a convenient new solution for our customers,” McNamara says. “Brushless DC motors always require a driver, and by offering a universal-type controller solution, our customers don’t need to go elsewhere to complete the package.”

For more information:

Crouzet North America
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 Phone: (760) 597-6322
www.crouzet-usa.com

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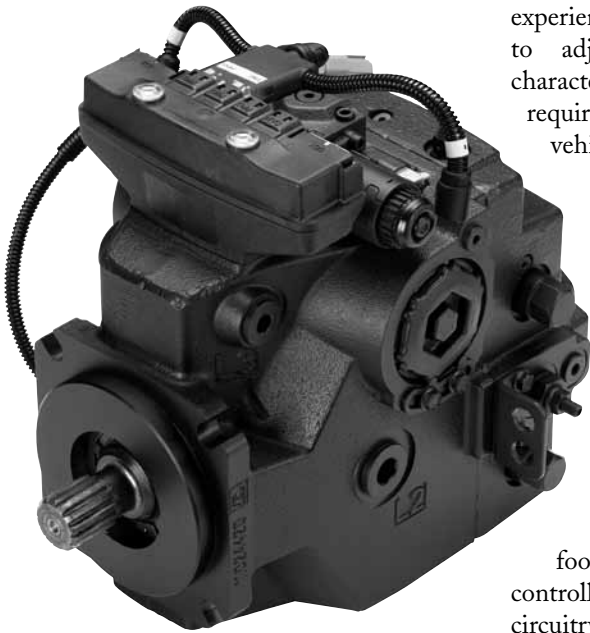
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experience that allows operators to adjust hydrostatic transmission characteristics to suit specific operating requirements. It helps increase vehicle performance and overall efficiency with improvements in productivity and comfort.

The H1 embedded controller (H1 AC) features electronics mounted directly to the pump. The electrical connections are designed to provide simple OEM vehicle installation and complete semi-automatic sensor calibration for Plus+1 Compliant drive and inching foot pedals, as examples. The controller also has added “watch dog” circuitry, which provides real-time fault monitoring of the electronic hardware. Optional software monitors redundant HMI input channels while H1AC provides single fault tolerance for AC vehicle transmission systems. This is useful for vehicle manufacturers trying to meet European Machinery Directive 2006/42/EC and related safety standards (ISO 13849-1:2006), and it also reduces OEM cost and time needed for system qualification and vehicle certification.

“Our H1 Automotive Control is the first solution on the market to offer the

precision and consistent performance of intelligent electronics, combined with complete drive system functionality, system qualification and SIL 2 certification,” says Joseph P. Maher, system portfolio manager. “OEMs will be able to reduce time to market for new vehicles and model variants while still customizing vehicle behavior and providing differentiation for their products.”

The H1AC software is also designed to SIL 2 IEC 61508 standard. Other features include engine anti-stall and protection against engine over-speed, extreme high and low hydraulic oil temperature conditions and hydraulic motor over-speed. Variations in hydraulic oil viscosity affecting control performance are compensated for automatically, so the vehicle’s operating temperature performs predictably.

The system is customizable via the Plus+1 Service Tool between four operator system modes that are programmed according to three main propel methods or mode types: automotive, non-automotive and creep-automotive mode. Other features include the ability to further customize hydraulic pump and motor displacement control profile and ramp times, provide constant speed drive functionality, interface to vehicle systems via CAN simple diagnostics.

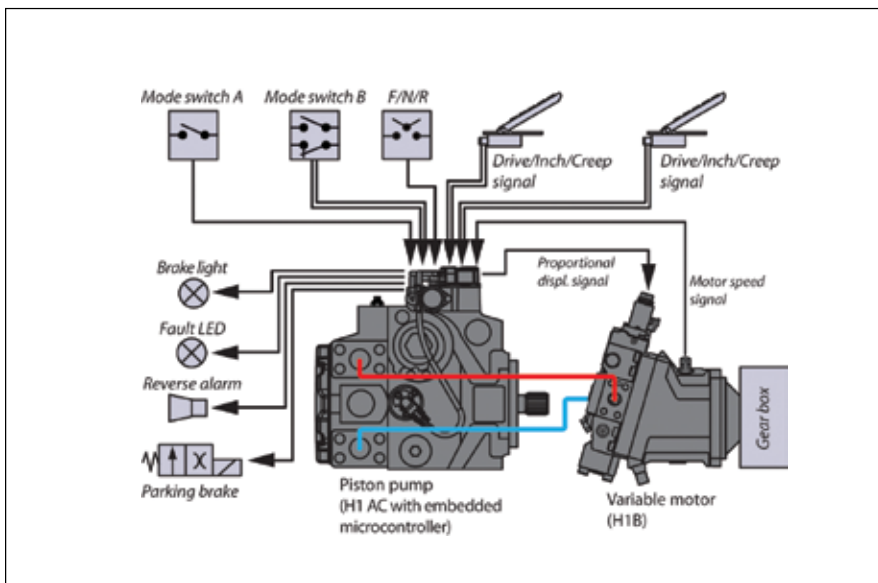
The OEM can configure up to four different system modes with varying vehicle drive behaviors to meet various application requirements by using the Plus+1 Service Tool AC software service screens. The system modes are chosen through vehicle switch settings, so OEMs can create working and driving modes, design driving behavior to suit specific working conditions or operator skill level. This makes the same hardware appropriate for a range of vehicles with different software settings.

For more information:

www.sauer-danfoss.com/acsolutions

transmission system that significantly reduces OEM vehicle development, qualification expenses and new product time to market.

The Plus+1 compliant system features an H1 variable piston pump with embedded electronic control, H1 bent axis variable piston motor, sensors and associated human machine interface (HMI). The AC combines with software to provide an automotive style automatic transmission driving



Torque Sensor

FAST TRACKS UAV FOR TAKEOFF

Development of a vertical take-off and landing unmanned aerial vehicle (UAV) is near completion with the help of a non-contact digital torque sensor, TorqSense, which proved the most viable option for use on the test rig. The search and surveillance UAV is intended for military, homeland security, policing and environmental monitoring. It is rugged, immediately deployable and can be launched from the ground, ship or even moving vehicles. The vectored-thrust UAV platform is used for any situation requiring safe aerial viewing or sensor measurement. It is being developed by Selex Sensors and Airborne Systems (S&AS), a Finmeccanica company.

"The TorqSense technology has been one of the key enablers for the development and implementation of the novel propulsion system on the Damselyf UAV," says Mark Agnew, Selex's chief engineer for UAV systems.

The project is led by Selex's Ashley Bryant, who at first wanted to build a flyable scale model replica of the vertical take off Harrier jump jet, but there was apparent opportunity for a professional UAV. Bryant ruled out using a jet engine, deciding a cold fan solution was the only reasonable option.

"A jet engine combusts fuel to turn its turbine and create thrust," Bryant says. "Our cold fan is driven, via a drive shaft, by a minuscule but powerful two-stroke engine. Developing this technology required us to build a unique test rig, with an in-line torque sensor, so that there were no out of balance forces coming into play."

The TorqSense system from Sensor Technology met all his needs. Other requirements included ease of mounting, so the drive system could come on and off the rig often, and a need to interface with a PC so that real-time performance data could be logged



and analyzed.

TorqSense's digital measurement system has two tiny ceramic piezoelectric quartz combs that resonate at fixed frequencies and are fixed to the system's shaft. While the shaft rotates and torque is applied, the combs distort and the resonant frequencies change proportionally to the applied torque. Frequency changes are monitored digitally by the TorqSense electronics in a non-contact manner using an RF couple, and a several outputs are available.

"Our development program was speeded up because of the ease with which we could lift the drive on and off the test rig, and the fact that we could automate the data capture and analysis," Bryant says. "If it weren't for TorqSense, we could not have kept to our development schedule and would have suffered consequential budget stresses too.

Bryant is considering adapting the TorqSense as a permanent feature of the UAV. "We would use the quartz combs in the usual way, but would integrate the electronic functions with the existing on-board controllers, so the weight gain would be tiny. We would then be able to monitor the drive conditions

in flight through our existing remote control system, improving reliability and controllability."

For more information:

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Phone: (919) 954-1004
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Kollmorgen Drive

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The Advanced Kollmorgen Drive (AKD) is Ethernet-based and delivers high performance with flexibility, scalability and power range for most application requirements, including basic torque and velocity applications, indexing, multi-axis programmable motion via the company's complete machine automation solution: Kollmorgen Automation Suite.

AKD allows machine builders to standardize on a single drive family with a common graphical user interface across the power range for high machine performance, throughput and accuracy across applications, all while minimizing engineering time and costs associated with stocking, understanding and programming multiple types of drives.

"AKD is specifically designed with the versatility, communications and power that OEMs need to expand machine performance and increase integration speeds," says Josh Inman, product manager for Kollmorgen North America. "The AKD facilitates true plug-and-play operation with standard Kollmorgen servomotors and linear positioners to get an optimized, high performance system up and running quickly, in less space and time and for less cost than lower performing options. Multiple Ethernet connectivity options available from the base hardware

support a variety of open and closed protocols, without the need for separate option cards. And a broad power range in a smaller, compact design enables machine builders to use these robust drives with a single interface."

The AKD is available for 120/240 VAC or 480 VAC operation with a power range of 3 to 24 Arms continuous current, 9 to 48 Arms peak. Coming later in 2010 is a power range up to 96 Arms continuous and 192 Arms peak.

The AKD is capable of supporting various feedback devices and Ethernet Motion buses from the base hardware without separate option cards, including Smart Feedback Devices, Endat, BiSS, Analog Sine/Cos encoders, incremental encoders, HIPERFACE and resolvers. Supported Ethernet Motion buses include EtherCAT CANopen and Modbus/TCP.

Patented Autotuning algorithms automatically adjust all gains, including patent-pending observers. This functionality also brings immediate, adaptive responses to dynamic loads with precise control. Autotuning can also help overcome imperfect mechanical designs to help machine builders solve difficult scenarios by compensating for compliant transmissions and couplings

that typically take away from a machine's intended performance.

The GUI features a six-channel real-time software oscilloscope for quick commissioning and diagnosis. A multi-function Bode plot helps users evaluate performance while Auto-complete functionality of programmable commands saves looking up parameter names. Machine performance data is sent immediately by one-click capture and sharing of program plots and parameter settings.

According to Inman, "Because AKD makes it so easy to monitor system performance and share system information, there is virtually no effort required to get a Kollmorgen motor and drive system up and running—and the user friendly interface across the power range makes commissioning and general interactions a truly intuitive process."

For more information:

Kollmorgen
203A West Rock Road
Radford, VA 24141
Phone: (540) 633-3545
contactus@kollmorgen.com
www.kollmorgen.com

Crown Gear Drives

DESIGNED FOR FULL RANGE OF APPLICATIONS

Zero-Max Crown Gear drives provide directional motion change in all types of power transmission systems. They are right-angle gear drives that operate quietly, are compact and sealed from contaminants. High class 10 spiral

bevel gears and non-magnetic stainless steel shafts are features.

The Crown Gear drives were designed to cover the full spectrum of machine applications from packaging systems to food processing and material

handling systems. They are suitable for a wide range of horsepower, torque and shaft speed requirements. Zero-Max offers the drives in standard two- and three-way models with 1:1 and 2:1 speed ratios, shaft diameter combinations of 3/8, 1/2 and 5/8 and 3/4 inch.

The hardened class 10 spiral bevel gears are permanently mounted to the shafts with locking pins. The result is a durable connection for use in heavy load applications without maintenance.

Long-life, precision hardened and ground ball bearings provide quiet operation at speeds up to 2,000 rpm in most environments. The drives are pre-lubricated and completely enclosed in heavy-duty cast aluminum housings. The design ensures that internal gears remain permanently aligned, lubricated and free from outside debris contaminants.

Optional features include different shaft configurations, housing modifications for special mounting requirements and special finishes that include squared, splined, extended, shortened, stepped and combinations. Housing modifications include machin-



ing of special mounting flanges and mounting holes.

“Crown drives have been increasingly popular for use in automation systems because of their high quality, robust design and minimal backlash operation,” says Robert Mainz, Zero-Max sales manager. “They easily handle reciprocating motion in most automated packaging machinery, paper converting, food processing and similar applications.”

For more information:

Zero-Max
13200 Sixth Avenue North
Plymouth, MN 55441
Phone: (800) 533-1731
Fax: (763) 546-8260
zero-max@zero-max.com
www.zero-max.com

Digital Servo Drives

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product news

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Haydon Kerk Motion Solutions, Inc. offers the LRS Linear Rail System in several configurations, both motorized and non-motorized. These linear rail systems consist of a stationary base and a load bearing carriage that travel along a rigid extruded aluminum rail.

The LRS Linear Rail Systems come with several in-line motor options, including a single stack or double stack size 17 stepper motor, a stepper motor with an integral chopper drive or the IDEA programmable linear actuator, which consists of the stepper motor, drive and controller programmed through a graphic user interface. The LRS is also available without a motor, so designers can integrate with a variety of motor types and belt and pulley configurations.

The carriage design controls slide bearing play with a patent-pending, self-adjusting linear bearing. "T"



Slots that provide the capability to mount limit switches and sensors are integrated along the length of the rail system. The lead screw is made from 303 stainless steel and can be configured with optional Black Ice TFE coating for permanent lubrication. The LRS Linear Rail system comes standard with a general purpose lead screw nut, but in cases of extreme control, the system can be configured with a Kerk CMP or WDG precision anti-backlash nut.

For more information:

Haydon Kerk Motion Solutions, Inc.
info@haydonkerk.com
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Extreme Encoder

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The Extreme 1000 series from Leine & Linde offers encoders for severe work environments. Available in North America through Heidenhain Corporation, the measurement and function range on this encoder is especially designed to meet the requirements of the steel, crane and mining machinery industries. The encoders stand up to extreme mechanical stress, vibrations and shock, as well as dusty environments with high temperatures.

The sturdy bearings and enclosure allow the 1000 series to achieve high durability across applications. The

enclosure is rated IP67 and protects the encoder's internal components from dust and liquids. A stainless steel housing is available as a special option.

Different incremental and absolute versions are available, and a combination of the various encoder types can be integrated in the same 1000 series product. Absolute pulse encoders with PROFIBUS interface are now capable of enduring tough industrial environments for the first time using the 1000 series encoder.

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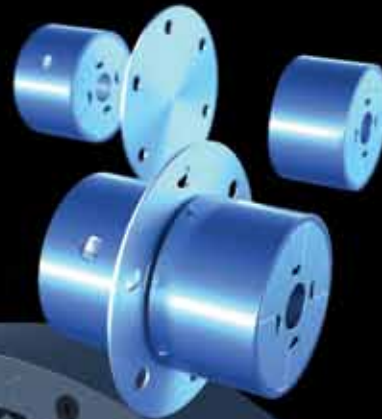
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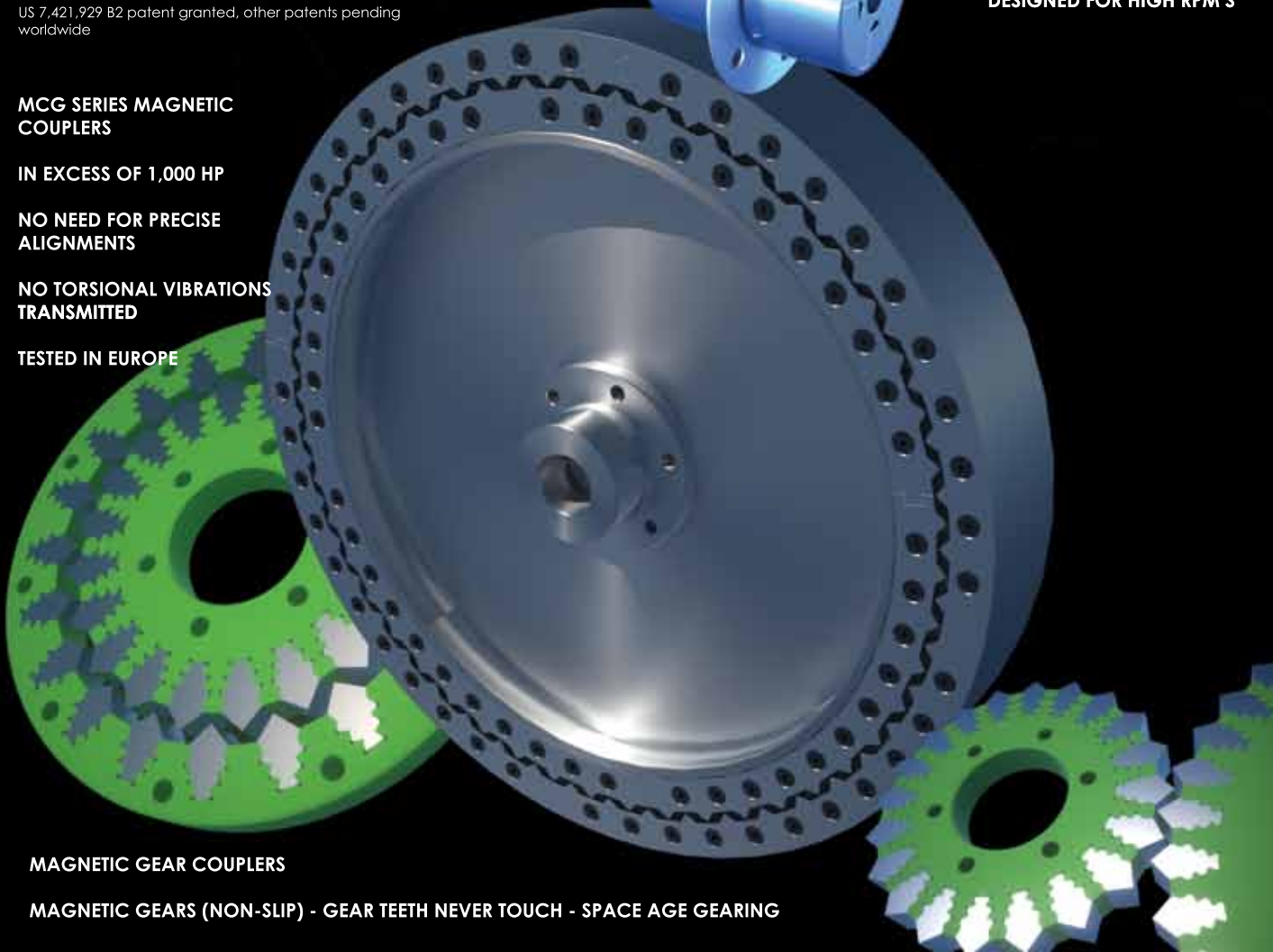
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Helping Hands

HOW ROBOTIC AUTOMATION CAN HELP MANUFACTURING'S RESURGENCE

Matthew Jaster, Associate Editor

Before Mike Cicco was involved on the engineering side, he used to sell robotic systems to manufacturers. Most of his sales pitches were met with hesitation and skepticism as he tried to explain the “benefits” of replacing employees on the shop floor with an automated system. “Many times they would kick you right out the door for even suggesting such a thing,” says Cicco, director of material handling at FANUC Robotics America, Inc. “The perception through the years has changed, however, as companies began to realize that rising U.S. labor costs were too high and they needed to automate in order to compete overseas.”

The working relationship between man and machine has had many supporters and detractors in the manufacturing sector. Some companies strongly oppose the idea while others embrace it as an opportunity to keep the workforce in place that currently exists. It's a slippery slope, especially when downsizing or layoffs come into play. As U.S. manufacturing continues to bite and scratch its way out of recession, there's an argument being made that integrating more robotic systems will actually help the current state of manufacturing.

“Now more than ever it's a matter of necessity to cut costs wherever you can,” says Charlie Miller, vice president key account sales at ABB Robotics. “Labor costs, health care costs and everything else that directly involves employment. Companies have specific employee target numbers in mind and they need to strictly follow these.”

Dean Elkins, senior general manager/eastern region at Motoman and chairman of the Robotic Industries Association (RIA), sums robotics up like this, “They fill important gaps in the labor force; the tedious tasks that shouldn't be handled by human workers for safety and health reasons. Robotics began with the hot, heavy and hazardous jobs, but they've become an important tool in augmenting most manufacturing processes.”

Robotic automation has always been viewed as some-

thing that would take jobs away from human employees. Today, there are so many other problems in manufacturing that many business leaders are embracing automated alternatives. The RIA estimates that 194,000 robots are now used in the United States, placing the United States second only to Japan in overall robot use. It's estimated that more than one million robots are being used worldwide.

In a press release promoting the National Robotics Week initiative (April 10–18) RIA president Jeffrey Burnstein said, “The future success of our nation depends upon our ability to take advantage of critical technologies such as robotics, and we're looking forward to reaching more manufacturing and non-manufacturing companies alike with the message that robots can help them become stronger global competitors.”

Productivity Versus Perception

It's this competitive edge that continuously haunts executives trying to accomplish more with less in manufacturing. Robotic automation may very well solve many productivity and sustainability issues, but at what cost? The operators and assembly line workers that have been replaced by machines over the years might not share such enthusiasm.

“There have been plenty of layoffs for operators in the past,” Cicco says. “The norm today, however, is that the people that are tending the machines get relocated or they get trained to run the system that is being put in place.”

Perception seems to be changing thanks to training programs and the willingness of workers to become more skilled at their positions and accept new responsibilities.

“These systems increase quality and throughput, drive down costs and they're easier to use today from a control perspective,” Elkins says. “Robots are working side by side with humans on a more frequent basis. They're helping humans keep their jobs.”

Joseph Ellert, welding/applications engineer at Nachi Robotics, says robotic automation almost always creates better



ABB Robotics gripper design enables a robot to handle the complete cutting process in solar modules (courtesy of ABB).

job opportunities for skilled individuals today. “When a customer purchases new robotic automation they must also have the personnel to support and maintain production. This leads to new job creation for engineers, programmers and maintenance personnel.”

Miller at ABB believes it’s more an issue of quality than anything else.

“Hopefully manufacturers see it as creating better jobs for existing employees. You’re creating more rewarding and skilled positions by educating the current workforce on these new control systems. Employees become motivated, and they see themselves as more valuable to the company when they’re educated on new equipment.”

“Many companies are worried more about keeping the workers they have at this point in time,” Cicco says. “High technology jobs often lead to better opportunities, more responsibilities and higher paying positions. The game has changed dramatically since robots first reached the manufacturing floor.”

Elkins at Motoman believes the increase of robotic systems is going to play a large role in creating more U.S. manufacturing jobs. “This industry is creating a whole new class of assemblers, engineers and programmers. It’s an engineering culture that’s great for job stimulation.”

Improved working conditions and higher paying jobs are just a few of the added benefits to robotic implementation. Companies like Nachi Robotics, ABB, Motoman and FANUC support these systems by offering standard and custom training courses to meet the needs of each individual customer.

In addition to employee benefits, manufacturing costs are greatly reduced through technology upgrades.

“A single robot can move a part, weld the part and inspect the part in a single work cell, replacing at least three pieces of dedicated equipment,” Ellert says. “The newest generation of robots at Nachi is designed to minimize valuable floor space required to build a robotic work cell. This ergonomic design fits very well into lean manufacturing initiatives.”

Industrial robotics falls into four general categories including processing, inspection, assembly and material handling (moving stuff around). As robotic systems become more intelligent through increased vision and force sensing capabilities, manufacturers will be able to broaden the areas where these systems can be applied.

“Let’s face it, these machines were fairly modest in the 1980s,” Cicco says. “They moved from here to there, and that was the extent of it. Today, we have definitely broadened the applications we can automate because the robots are much smarter. They have a sense of sight and a sense of touch. The technology continues to grow each day.”

Ellert says Nachi’s machines are faster, consume less energy and have an effective design that fits very well into lean and green manufacturing. “Conserving both space and energy are important aspects for this movement, and robotic companies are always looking for ways to improve.”

While no one can predict the future of manufacturing, robotics assuredly will be involved. The more is less philosophy will be a major talking point as further robotic technology is

continued



An M-101A robotic unit demonstrates material handling for the food and consumer goods industry (courtesy of FANUC).



The M1iA is a lightweight and compact high speed assembly robot (courtesy of FANUC).

developed. Advancements in robotics will include:

- Increasing robot payload capacities to accommodate heavier parts;
- Improving servo technology to produce faster robots with better accuracy;
- Vision and sensor technology will be critical in more applications;
- New materials will be developed to provide lighter robots with higher speeds;
- Robots will be able to perform more complicated tasks and gain capability from advancements in computing speeds and other computer technologies.

Robotic companies will continue to create more flexible automated units and software development that will undoubtedly open new areas of business. "If we continue to drive down manufacturing costs with robotics, the U.S. market will continue to improve," Miller says.

A Growing Number of Resources

In the beginning, there was the automotive industry. Robotic automation's rise to fame in the 70s and 80s primarily involved automotive assembly lines. Unfortunately, the last couple of years haven't exactly been kind to anyone involved in automotive. Thanks to fuel efficient options and higher quality standards, however, there are signs of life once again on automotive assembly lines across the country.

"Things are starting to move in the right direction in the U.S. automotive industry, and that's huge for us," Cicco says. "GM and Ford are building new plants, and we're starting to see general industry picking up. The automotive industry fuels the rest of the manufacturing sector. As the Rust Belt gets going again, the rest of the country will follow suit."

Elkins at Motoman agrees. "We are seeing some positive signs, and I think by 2011 the automotive industry will be back in a big way. We saw a major slowdown of request-for-quotes last year, but they're starting to pick up across the board."

It's another case of that old, reliable trickle-down effect. Build better cars; get better results and the Tier 1, Tier 2 and Tier 3 automotive suppliers start getting more work.

"Due to the quantity of vehicles produced by a given manufacturer and the need for world class quality, the auto industry has historically been the largest user of robotics," Ellert says. "However, 2009 represented a major turning point for the robotics industry. In 2009, non-automotive related purchases rivaled automotive purchases, according to the RIA."

Automotive will always be important to robot manufacturers simply because people will always buy cars, and robots will always be needed to manufacture them. As a result of the slowdown, however, companies are diversifying sales strategies to provide automation to new industries," Ellert says.

And industry, in general, is buying into robotics at an exceptional rate. Miller has recently been encouraged by rising robotic orders in the life science, pharmaceutical, biomedical, alternative energy and food and consumer goods industries.

"Food and consumer goods have been a real pleasant surprise for us. This has been an area for many years where manufacturers were reluctant to adopt automation, but that's now changing."



This Nachi MV06-L Robot is horizontally mounted on a traversing servo driven slide unit (courtesy of Nachi Robotics).

FANUC has also seen a large increase in this area and Cicco believes the latest recession played a role to a certain extent.

“When times are tough, people head to the grocery stores. It’s just the way it is. We’ve done automation for Hot Pockets and french fries a lot lately. Food and consumer goods is becoming an area of exceptional growth and opportunity.”

The alternative energy industry continues to hold promise as well. Solar and wind energy applications will be growth areas in robotics as long as incentives and initiatives on the federal and state levels are passed.

“We’re hopeful solar applications, in particular, will start picking up here like they have in Europe and Asia,” Miller says. “We’re not there yet; there’s plenty of room to improve. When you look at alternative energy applications, robotics is a perfect fit. Vision tools and force sense technology are much needed upgrades when dealing with the equipment found in solar.”

“Our customer base is shifting toward solar and wind and we’re working with companies that are going to make these products in the Midwest, so it’s an exciting time for the alternative energy market,” Elkins adds.

People were terrified of robots in the 1980s, according to Cicco. FANUC began partnering with companies in a variety of industrial markets to present automation tools and solutions for areas like welding, aerospace, automotive and medical devices. “We wanted to find industries that don’t ever go off-shore for their specific needs, industries that supported U.S. manufacturing.”

Cicco adds that a sure sign of the staying power of robotic automation is the amount of companies that no longer use integrators like FANUC today.

“Several companies have their own in-house robotic operations and no longer need outside assistance. This is one ex-

ample of how the market has changed, but the industry itself continues to grow,” Cicco says.

To Educate and Instruct

Marketing has always been an interesting dilemma in robotic automation. Sales teams are instructed to come up with a variety of strategies to get the message out on the benefits of automation. This is accomplished with education programs and involvement in U.S. manufacturing initiatives.

FANUC, for example, is involved in a website dedicated to bringing business back to the United States (www.save-ourfactory.com). Members include ATI Industrial Automation, Motion Control Robotics, Schunk USA and the Society of Manufacturing Engineers (SME). The website serves as an online resource for articles and videos involving quality, efficiency, off-shore pitfalls and viability topics targeted at U.S. manufacturing.

“This is one of our biggest marketing tools and a way to reach out to industry leaders to increase manufacturing opportunities here in the United States,” Cicco says.

Technology Days at ABB Robotics take place April 21–22 at a training facility in Auburn Hills, MI. Onsite events like these allow ABB employees to host robotic demonstrations and in-depth technology seminars for current and prospective customers. An open house on the final day welcomes anyone interested in robotics to see the demonstrations, including youth organizations and students.

Nachi Robotics offers facility tours to local colleges and supplies robotic equipment to colleges and universities in order to support engineering curricula. The company has also been involved in the FIRST (For Inspiration and Recognition of Science and Technology) robotics competition (www.usfirst.org) for ten years.

continued

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"I get calls from local high schools all the time because students are interested in coming in and seeing some of our robotics at Motoman," Elkins says. "For career planning, the robotic industry embraces so many different engineering disciplines that it's really appealing to college and high school students."

These resources are a great way to show off the robotic systems and give people an idea where the manufacturing industry is heading in the future. And surprisingly, most companies are now embracing the technology, and the stigma of job loss is no longer the focus. In fact, with all the growth and new market opportunities, the real threat to robotic automation is more robotic automation. These companies continue to release new equipment and technology efforts in an effort to increase business.

"The industry has become very cost competitive," Ellert says. "Being attuned to the needs of customers and developing products to suit those needs is the road map to success. Humans and robots cooperating in manufacturing tasks will be commonplace in the future."

"And we haven't even begun to touch upon the huge labor shortage that's coming," Cicco adds. "People forget that many of the baby boomers that planned to retire recently had a change of heart when the recession hit. There's going to be a significant loss of manufacturing jobs in the next ten years when they finally decide to call it quits. Lots of empty positions will need to be filled."

Robotic automation is ready and willing to pick up the slack. 

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www.robotics.org

Bogus Bearings

BEAT PRICE AND LEAD TIME, BUT AT WHAT COST?

Jack McGuinn, Senior Editor



Printed boxes waiting to be filled with domestic Chinese counterfeit bearings. Photo taken during police raid in China (all photos courtesy of SKF).

In a classic example of life imitating art—or is it the other way around?—while researching the issue at hand I was reminded of *All My Sons*, Arthur Miller’s 1947 play (based on true events) dissecting the ramifications of a businessman/family man supplying defective cylinder heads for WWII fighter planes, resulting in the death of 21 pilots.

Fast-forward sixty-some years and what do we have? Counterfeit bearings. Counterfeit bearings showing up in everything from elevators to aerospace components. When your \$100 “Rolex” falls apart on your wrist, well, what did you expect? But when bogus bearings find their way into safety-sensitive applications, lives are at stake.

How big is the problem? The Glen Ellyn, IL-based Bearing Specialists Association estimates that counterfeit bearings transactions are a “\$600 billion a year problem which costs U.S. businesses \$200-\$250 billion annually, and is directly responsible for the loss of more than 750,000 American jobs.”

The jobs loss issue alone should command the attention of

state and federal government, affected industries and manufacturing in general.

To provide just a snapshot of how this typically goes down, a news item from the U.S. Customs and Border Protection (CBP) website reveals: “(Phoenix, AR-based) U. S. Customs and Border Protection import specialists seized counterfeit bearings with a domestic value of \$14,652 and an estimated manufacturer’s suggested retail price of nearly \$130,000 had they been genuine product.”

It should come then as no surprise that the counterfeiters don’t discriminate—any type of bearing is fair game—ball bearings, taper roller bearings, you name it. Indeed, bogus bearings have leached into the high-end, OEM precision bearing market, and are now ending up in wind turbine gearboxes or worse.

All of which is prologue for the following Q&A conducted recently with Stefan Lundin, SKF communications

continued

manager, group brand protection.

What distinguishes a counterfeit bearing?

The typical counterfeit bearing is a low-cost, no-name bearing that is marked with that of a premium brand to look like a premium bearing. The bearing is then packed in boxes that are copied from the original products, giving the impression of being genuine.

Another type of infringement is an old genuine bearing that is polished to look like a new bearing. This means that anything that is not what it looks like is a counterfeit.

How long has this problem been going on in the industry?

The modern bearing products have been subject to counterfeiting for quite some time on a smaller scale. The problem



Unmarked bearings waiting to be branded. Photo taken during police raid in China.



Counterfeit SKF and domestic Chinese counterfeit boxes waiting to be filled with counterfeit bearings. Photo taken during police raid in China.

has been escalating more rapidly over the last decade and really boomed in the last couple of years.

What is important to note is that counterfeiting is a criminal activity that does not lend itself to long time or detailed official records. This means that statistics involving counterfeit trade are estimates based on police, customs and other information. The official statistics are therefore only showing the tip of the iceberg, while the actual size of the problem only can be estimated.

Is price “enabling” this problem? What makes counterfeit bearings attractive to buyers?

It is important to understand that the end-users buy counterfeit bearings unknowingly and in most cases at retail prices, or just below. As in many other trades, it is the middlemen who profit from the trade. The counterfeit traders buy cheap counterfeit bearings and then sell them at a premium price.

Are the extremely long lead times for bearings another factor in the use of counterfeit bearings?

Definitely. Especially in the last few years before the economic downturn when demand far outstripped supply for a lot of bearing types and sizes. When lead times from premium manufacturers and their authorized distributors are long, time-pressed buyers scan the market for the products they need. Counterfeit bearings can be found for all the major bearing types and in many sizes. They can even be “made to order,” which makes it easy for counterfeiters to “produce”—i.e., whichever bearing of the right dimensions they manage to get their hands on, and which they can “brand” to what the customer is asking for. And it is one of the major factors in counterfeits finding their way to the open market.

In the absence of international bearing standards, what can be done to identify counterfeit bearings?

The main obstacle that we see is that the anti-counterfeiting solutions offered on the market are without a common standard. There are as many solutions as there are companies offering them. The major bearing manufacturers have their own systems for detecting counterfeit products, which for obvious reasons are kept secret as to avoid counterfeiters copying the identification method. As a customer it is impossible to tell the fakes apart from the genuine article, and the safest way to avoid counterfeit products is to source the products from known and authorized sources.

Are the bulk of counterfeit bearings coming from bearing retailers/agents?

Yes, and this is what makes it easy for the fakers. The manufacturers of the low-cost bearings used as the base in the fakes are doing nothing illegal. It’s the middlemen who then set up their operations with only the need of re-labeling material and counterfeit packaging. This can be done in any kind of small warehouse and can be easily moved around to avoid detection. There are also bearing traders who are completely Internet-based and can set up their operations virtually anywhere and anytime. One also need to be aware of the fact that there are authorized distributors and there are non-authorized dealers.

What are bearings associations like the Bearing Specialists Association (BSA), American Bearing Manufacturers Association (ABMA) and The Power Transmission Distributors Association (PTDA) doing to assist their members regarding this issue?

The WBA (World Bearing Association), where ABMA is one of the member organizations, is actively addressing the problem through the development of education and information campaigns. WBA also promotes legislative and administrative measures as well as engaging other key entities such as customs and other governmental authorities.

It is believed China is the major source of the counterfeit bearings. If so, why?

First of all, it must be said that the Chinese legislation and enforcement on IP (intellectual property) is good, in our opinion. SKF is also pleased with the way Chinese authorities handle counterfeit cases in general. If there are buyers, Chinese companies will come up with the products to sell. It is therefore not only a question of where the counterfeit bearings originate from, but also to where they are shipped and by whom. The answer to where the counterfeit bearings end up is—in most countries over the world.

As of this moment, China is the most prominent country of origin in all counterfeit cases we have dealt with so far. There are also counterfeit suppliers in India, and local “suppliers” are common in parts of Eastern Europe too. Estimates from official sources claim that Chinese counterfeit goods make up roughly 70% of the total counterfeit market worldwide. We have seen no reason to doubt these figures so far. As for the US market, nearly all seized counterfeits has been traced to Chinese suppliers.

What are some of the major problems that can result from counterfeit bearings?

Counterfeit bearings wear and tear like genuine bearings, only a lot more unexpectedly, and a lot faster. The counterfeit bearings originate from numerous different manufacturing sites and are of varying quality when they leave the factories. After being handled, or manhandled, during the branding process, the best that can be said about them is that they have unpredictable performance. This means that the amount of unexpected downtime will be a lot higher with counterfeit bearings. In some cases the performance of the bearings can be so bad it can cause damages to the applications they are in, and in worst case to the operators or members of the public as well.


Given the sometimes long production chain from bearing manufacturer to end user, how is it possible to track down the origin of counterfeit bearings that find their way into products?

It is really no problem as customers who have been cheated by counterfeiters are very keen on reporting the suppliers to law enforcement. In most cases, the name of the original supplier is given to the police when interrogating the suspects, or found during the police investigations.

Are bogus bearings showing up in high-precision applications such as wind turbines?

The counterfeiters make no distinction between what types of bearings they fake.

We have seen fake bearings of just about every dimension and type, and as one example the police have confiscated bearings that are typically used in the propeller shafts of oil tankers. Another even more horrific example is the occurrence of fake bearings found in tail rotors of Bell Helicopters, as informed by the FAA. (https://www.faa.gov/files/notifications/2007/Jan/UPN_2006-00097__1-18-07.pdf)

Recently we have also seen fakes of types typically used in elevators and construction cranes. 



Shipment of counterfeit bearings from China seized by US customs, John F. Kennedy International Airport.

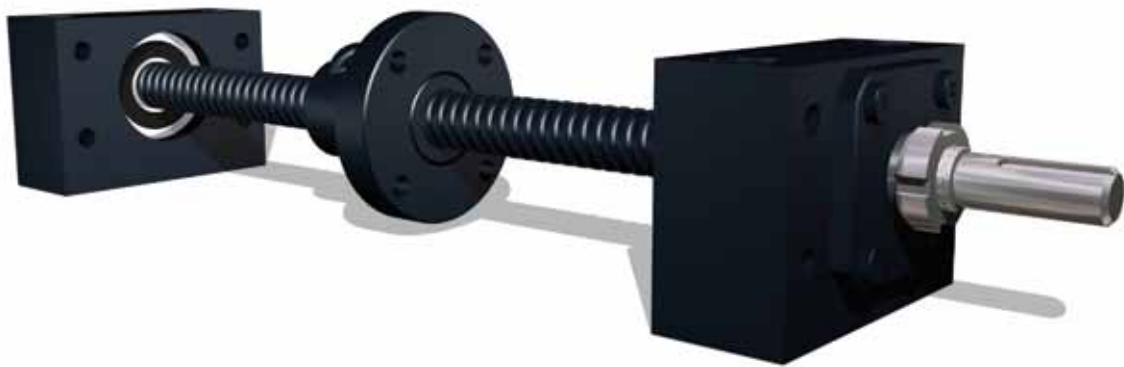


Spanish national police inspecting counterfeit SKF bearings during a police raid.

Oscillation Welding Protects Pipelines

BALL SCREW ASSEMBLIES KEY TO PATENT-PENDING PETROLEUM CORROSION TECHNOLOGY

Lindsey Snyder, Assistant Editor



(Photos courtesy Method Media).

The 21st century has presented a technological shift in oilfield drilling, as most easily accessible oil is tapped and well producers are forced to drill deeper in order to procure highly corrosive sour crude oil. Sour crude oil is a sulfurous mixture that corrodes the iron in the carbon steel pipe that extracts it. The petroleum industry has determined to develop drilling technology that can overcome these harsh, corrosive effects.

Robotic equipment manufacturer ARC Specialties, Inc., of Houston, has developed a cladding technology that controls this corrosion, so it can safely extract and process sour crude. This provides protection from pipeline failure and allows for more oil production in new deep water sour oil fields. The KLADARC TriPulse Hot Wire Gas Tungsten Arc Welding (GTWA) system leverages oscillation welding to deposit a metallurgical-lined, two-layer, corrosion-resistant alloy (CRA or Alloy 625) overlay on clad pipe up to 20 feet



The dual-torch oscillation simultaneously overlays two layers of corrosion-resistant alloy on a pipe's inner surface and provides a molten "puddle," with longer residence time to bond and eliminate common problems of overlay welding.

in length and inside diameters up to 30 inches. The CRA has a nominal thickness of 3.5 millimeters and 3.0 millimeters minimum thickness. The patent-pending technology reduces oxide inclusions and iron dilution in the cladding process, ultimately mitigating the corrosive effects of the sour crude.

An important feature of this five-axis cladding machine's advancement is its ability to oscillate the arc inside the pipe. The oscillation element in this process is driven by ball screws manufactured by Nook Industries' Precision Screw Group as part of its Power-Trac line of ball screw assemblies. The Nook ball screws feature a double bearing EZZE-MOUNT support and provide a durable and efficient means of converting rotary motion to linear motion on the dual-torch oscillation axis of the machine. "Oscillation of the boom is the largest load on the machine," says Dan Allford, president of ARC Specialties. "Accelerating, decelerating and reversing the mass of the arm loads the ball screw over a very small length. Any wear in the screw would result in inaccurate torch motion and weld defects."

The dual-torch oscillation ultimately overlays two layers of CRA onto the pipe's inner surface simultaneously and provides a molten "puddle" with longer residence time to bond and eliminate common problems of overlay welding, such as leaving holes that penetrate through the overlay layer and thereby expose the outer steel pipe to corrosive sour crude. "The puddle is the welding term for the molten portion of the weld. The weld metal, in this case nickel based alloy, solidifies just behind the torch," Allford says.

The oscillation process involves feeding CRA wire into a 20-foot-long torch that welds it circumferentially along the inner wall of the steel pipe. Nook's ball screws create this circumferential weld by wiggling the torch into the pipe back and forth at approximately one inch per second. This occurs while motorized pipe rollers steadily turn the pipe. The first 20 feet of pipe is coated, flipped 180 degrees, and then the torch is put back to coat the other half of the pipes' inside diameter.

Each oscillation places a heavy load on the ball screw with the 20-foot torch decelerated, stopped and reversed 120 times a minute, with loads running just under 1,000 pounds

continued



Arc welding with oscillation creates a pipe overlay of wider stringer beads.


during acceleration. The accelerate/decelerate rate is a harsh, rapid speed/load oscillation of 0.8 inches at around one hertz per second. The oscillation also moves the weld puddle side-by-side, which generates approximately two times the weld yield. Also, this single-pass circumferential weld ensures that the CRA overlay is seamless and also allows the pipe to undergo long-radius bending after the overlay process. "The oscillation process is a harsh application since it runs and repeats without stopping for hours at a time," Allford says. "Therefore, the reliability and performance of Nook's ball screws is vital and a key basis for our patent-pending process."

Nook customized the precision-rolled ball screws to meet ARC's unique application specifications. The ball screw assemblies from Nook come in a range of materials including alloy, stainless steel, titanium and other exotic metals. Nook uses a precision rolled manufacturing process instead of grinding its ball screws, which makes them more efficient and cost effective.

This collaboration between Nook and ARC has resulted in several completed pipelines reporting positive results,

Allford says. The two manufacturers will likely continue to partner on future projects. "ARC and Nook have been working together for over eight years," Allford says. "We have over 200 machines operating with Nook ball screws around the world. So when we needed a ball screw for pipe cladding, Nook was a proven product for us."

Many forces contribute to the continued need for developing advanced technology to combat sour crude petroleum pipeline corrosion, including demand, environmental concerns, energy independence and aging infrastructure. Many of the sour crude oil reserves in the Gulf of Mexico reside at very deep subsea locations with volatile conditions such as high pressures, which increase the oil's corrosiveness. Advanced corrosion technology is crucial to oil production, and it provides safety and protection from environmental catastrophes that result from corroded pipelines.

"Oscillation welding really sets apart our clad quality from the traditional methods of cladding. It produces a long-life coating that prevents pipeline failure," Allford says. "KLADARC's cladding technology controls the hydrogen sulfide corrosion, and trust in Nook's product to coat the pipe is directly related to this crucial feature, which allows us to meet stringent quality assurance requirements for the petroleum industry." 

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The dual-torch oscillation process involves feeding corrosion-resistant alloy wire into a 20-foot long torch that welds it along the inner wall of the steel pipe.



The KLADARC machine employs technology that reduces oxide inclusions and iron dilution in the cladding process to mitigate the corrosive effects sour crude oil has on steel pipes.

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Linear Motion Q&A

CUSTOMIZED MACHINERY BUILT WITH OFF-THE-SHELF COMPONENTS

(Courtesy Thomson Systems)

Introduction

Machine builders strive to achieve the right balance of functionality, performance, price, durability, energy consumption and other attributes that will enable their products to excel against the competition. In the past, OEMs designed their machines around readily available standard components or had to add the cost and development time needed to obtain custom components designed especially for the application.

The growing breadth of standard offerings via the methodical evolution of electromechanical linear actuators, linear motion bearings, clutches and brakes, and linear slides now enable machine builders the benefit of a precisely matched “custom” solution while using cost-effective “standard” motion components.

Linear Slides and Stages

James Marek, business unit manager

What linear slides and stages are the most innovative in the marketplace? Why?

Linear slides that meet the technical and commercial demands of customer needs are the most innovative in the marketplace. The demands that I constantly hear are enhancements to performance, the ability to perform in adverse environments and a quick “selection-to-delivery” cycle. Enhancements in performance include increased footprint-to-load capacity ratio and longer system lengths, along with improvement in positioning accuracies and repeatability. Linear slides are being deployed in adverse environments, and customers expect them to survive with

little or no maintenance. Particularly challenging are environments where there are airborne contaminants that have a tendency to migrate into the linear guide system and ball screw. There are some novel sealing strategies that protect the internal components of the system. Engineering resources within organizations are leaner than ever. Web-based tools that allow them to do their job more efficiently are also in demand. There are tools that support not only the sizing of all components within the system but also output smart part numbers and CAD models.

How has linear slide and stage technology advanced in the past five years?

There are a number of relatively new technologies that address the challenges

associated with deploying a linear system in an application. These technologies address the mounting orientation, loading conditions, move profile and environmental conditions associated with customer applications. Extrusion technologies and post-processing of the extrusion have enabled systems of over 12 meters in length to be developed from a single piece of extrusion. In the case of a ball screw-driven system with long lengths, the system is often limited by the critical speed of the screw. A solution to this problem was to design screw supports that are dynamically transferred within the system at pre-defined locations. This has enabled 12 meter-long systems to rotate at input speeds of 3,000 rpm without hitting the critical speed of the screw. A number of unique sealing strategies have been developed to minimize particles and fluids from penetrating the interior components of a system. These seals allow linear systems to perform in paper and pulp, woodworking and painting applications.

A motor mounting system that is designed to mount to a wide array of motor interface dimensions—yet be flexible enough to produce the interface in 24 hours—has addressed this need. Lastly, there are software tools that have been developed to take the input



The Thomson RediMount System provides mounting to virtually any customer-specified motor. It eliminates the need for a custom motor adapter, greatly reducing cost and delivery time (all photos courtesy Thomson Systems).

parameters for a specific application and to process this data against the performance characteristics of all systems in the database. Safety factors are displayed for each system that satisfy the application, and solid models for these systems are dynamically created and available for download to the user.

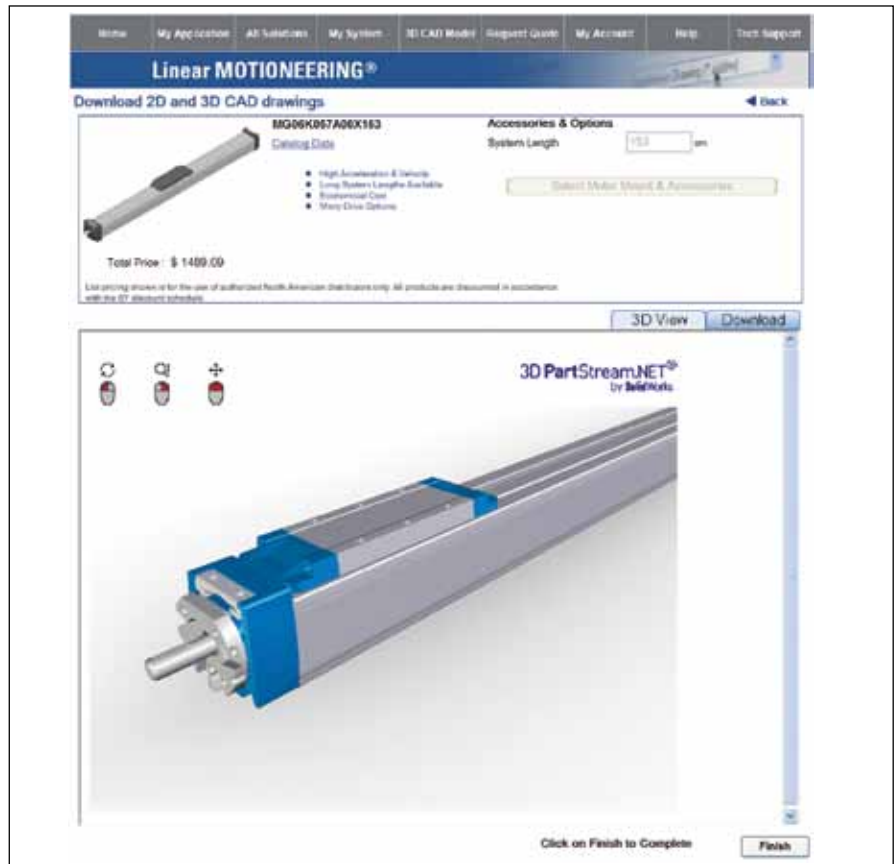
How has the marketplace benefited from these technological advances?

The benefits of commercial innovation are speed to market and reduction in product development costs. Engineers are quickly able to optimize their solutions and obtain solid models that can be dropped into their machine models. The benefits related to technology advancements are the same, although not as obvious. Take the improved sealing technology as an example. Prior to having such a robust seal design for linear slides, the engineer would have had to make provisions for protecting the linear slide. This could have been providing external shrouds or bellows or locating the slide adjacent to its optimal position to avoid direct contact with the contaminants. Cost and development time are compromised when the designer is required to fortify the design to protect the linear slide.

How, if at all, will linear slide and stage technology continue to advance in the next five years? Who stands at the foreground of this potential innovation? Why?

Customers will determine the advancements as the leading manufacturers will react to their needs. My sense is that companies that are flexible to modify their standard products to the specific needs of the customer will lead the way in the innovation of new technology. This technology will be in both the product and service spectrum. Companies that are “easy to do business with” by providing exactly what the customer needs, rather than giving them 80 percent of the solution and forcing them to engineer the last 20 percent will not only survive but grow in the challenging economic times that we are facing.

Has linear slide and stage technology become outdated/obsolete by other solutions in the market? If so, how?



Linear Motioneering from Thomson is a web-based sizing and selection tool that reduces the time required to utilize economical and proven standard components to meet the vast majority of linear motion requirements.

No, if anything, the motor-driven slide table is replacing existing applications that are based on hydraulic or pneumatic technology. Servo motor and position feedback technology are at a more competitive cost point. They offer benefits of better control, safety and environmental friendliness.

Clutches and Brakes

John Pieri, product line manager

What are the best (or most common) brakes and clutches on the market today?

This depends entirely on the application and market, but in general, electromagnetic friction and wrap spring clutches and brakes are the two most common. There is a trend to provide electric actuation over fluids and pneumatics. As electric motors have become smaller, energy efficient, more powerful and lightweight, so has grown the demand for electromagnetic clutches and brakes.

Examples of growing markets include medical, aerospace and defense, robotics and electric vehicles (includes hybrid automotive, electric lifts and

other mobile off-highway).

How have brakes and clutches changed in terms of functionality and performance to fit harsh environments?

When there is a need for operation in harsh environments, special coatings for corrosion resistance have been developed. Also, with the use of magnetic FEA, special alloys with built-in corrosion resistance are being used. There have also been innovative solutions on sealing/covering the moving parts.

An example of harsh environments would be in the aerospace and defense market segment. There have been many advances in materials used in clutches and brakes in these applications.

How have brakes and clutches changed in the past five years?

There has been an increase in the demand for brakes, mainly power-off, spring-set, while clutch usage has been flat. In some cases the use of clutches and clutch couplings is now threatened by the use of low-cost motor/drive technologies.

continued



Deltran high-performance solution in OEM or after-market applications. Their higher torque rating enables users to install a smaller, less expensive unit than would otherwise be possible with competitive options.

How will they continue to change in the next five years?

I believe there will be a continuation in the drop of clutch and clutch coupling usage and an increase in the use of spring-set, power-off brakes.

What is the future of regenerative braking?

Regenerative braking utilizes AC motor/drive technology to generate electricity (like a generator), only the energy source comes from back-driving those motors (like slowing down a vehicle going down a hill). Regenerative braking increases the use time of a vehicle's battery and is an alternate solution for dynamic stopping. Clutches and brakes are partnered with this technology (spring-set brakes are used in tandem as the parking or emergency brake) and are gaining momentum in these emerging markets.

How will energy-harvesting technology change brake and clutch market demand?

Power-off, spring-set brakes will participate in this expanding market segment for parking and safety.



The two major types of linear guides are round rail bushing bearings and profile rail bearings. Round rail ball bushing bearing systems accommodate torsional misalignment caused by inaccuracies in carriage or base machining or machine deflection with little increase in stress to the bearing components. Profile or square rail systems offer higher accuracy, higher rigidity, higher load-life capacity and are also very compact.

Bearings

**Alison Ng, director, engineering—
rails, guides and components**

What are the best (or most common) bearings on the market today? What do they feature?

The most prevalent linear motion bearings on the market today are split between linear ball bearings that run on round rails, and profile rail bearings that run on ground guide-ways, with a bias toward the profile rail bearings. The balance of the linear bearing market is taken up with specialty bearings that vary from non-contact to limited stroke, to cam followers, to plain contact, etc. One type of bearing will have various advantages over another type of bearing, but the overall benefits and suitability are dependent on the application needs and requirements.

Both of the most popular linear bearings are rolling contact bearings, but each has some design differences that provide certain advantages for certain conditions—quality, function and perception all play a factor in the application preferences for bearing types

and manufacturers. Both bearing types consist of inner and outer races with re-circulating rolling elements that run between them, configured such that they can effectively support very high loads while enabling extremely high-precision and repeatable, anti-friction linear motion.

Re-circulating rolling contact bearings provide the best overall performance, reliability, precision, accuracy, repeatability, speed, low friction, predictability and value for the linear motion market.

How, if at all, do bearings change in terms of functionality and performance to fit harsh environments?

Adaptive bearings that transform to better handle changes to the conditions are not typical, although there has been quite a bit of work done to provide compliant structures that enable bearings to handle high loads or slight installation or surface preparation errors or imperfections. Rather, linear motion bearings are selected or accessorized specifically to be able to function and perform in the design environment. Certain types of bearings are better capable of handling extreme temperatures, like bearings with all-steel construction, or special high temperature range materials. Material selection is a key aspect to a bearing's ability to survive in environments that are exposed to chemicals or radiation. Proper bearing type selection is required for survival in harsh physical operating conditions, such as high impact or vibration. Proper accessorizing of the linear bearing is necessary to address poor maintenance and lubrication practices, such as incorporating lubrication options and seals or incorporating bellows and scrapers to protect against physical contaminants.

There have been changes in the value aspect of linear bearings, rather than the design aspects of the linear bearings. Lower-cost but sometimes also lower-quality bearings have been introduced to the linear bearing market, causing a focus on the actual installed and end user value as being a significant parameter, rather than just performance and functionality.

On a longer time scale, as mentioned before, compliant designs and structures have been introduced to help



Thomson RoundWay Linear Roller Bearings boast a dynamic load capacity of up to 70,000 lbf (310,800 N)—more than 20 times the load capacity of a conventional linear ball bearing, even at extreme operating temperatures (up to 500 degrees Fahrenheit; 260 degrees Celsius) and speeds (up to 100 ft/s; 31 m/s).

improve bearing performance and ability to function at an optimum level with imperfections in installation or set-up. Rolling element separator elements have been introduced to attenuate bearing noise. Segmented and modularized designs help the manufacturer tailor solutions better.

How, if at all, will they continue to change in the next five years?

With the global economy and manufacturing in its current state, the changes to linear bearings will continue to be on the value-focused side and will tend to be very incremental, or special-application oriented. This does not mean the linear motion systems designers will only look at price, but rather at the overall installed end user cost. This will mean demands for improved reliability, ease of installation, ease of maintenance, low operating cost and low power consumption, without a reduction in performance. This will in turn drive the desire for better sealing and lubrication accessories, better quality products that are more consistent, downsizing bearings, alternative materials for demanding environments and perhaps even hybrid bearings.

Is there such a thing as a “conventional”

bearing, or have they become customized to fit each unique application?

In the linear bearing industry, there is definitely a move to make “conventional” bearings. Several standards exist for the linear bearing products, ranging from several ISO metric, to JIS metric, and inch standards. These are used as guidelines for the bearings that are the building blocks for the linear motion system designer to create a unique, tailored solution. For any given opportunity, however, the development of unique linear bearing solutions is always available.

What quality/performance specifications do you look for in bearings when putting together your BOM (bill of materials)?

While there has been a move to standardize bearing performance for “conventional” bearings, this has been less than completely consistent, as the bearing designs and methods are highly subject to the level of the bearing house creating the product. Many bearings cannot be considered “conventional.” The quality bearing manufacturers will produce bearings that perform better. The innovative bearing designers will design bearings that perform better. Sometimes, two bearing companies can

continued



Electromechanical linear actuators, such as the Electrak Pro Series from Thomson, are those that are derived from flexible platforms customized to meet the needs of specific OEM customers.

claim the same performance numbers per the same standard, but the two bearings will not have equal performance. Ultimately, it is the degree of trust you have in the linear bearing manufacturer, because not all linear bearings are created equal.

Actuators

Al Wroblaski, product manager,
industrial linear actuators

When it comes to linear, hydraulic, electrohydraulic and piezoelectric actuators, has one particular type of actuator come to stand out in front of the others? If so, why?

Electromechanical linear actuators currently offer the widest range of performance and most direct compatibility with machine microprocessors, or PLCs.

Electromechanical linear actuators that achieve the highest success are those that are derived from flexible platforms that are easily and cost-effectively customized to meet the needs of specific OEM customers.

What actuators are the most innovative in the marketplace? Why?

In each major market segment where actuators play a predominant role, there is typically one key manufacturer who develops a platform that addresses the specific needs of the marketplace. Usually, shortly thereafter, “clones” of this product arrive on the scene, typically competing on price.

The leading actuator companies

have resident, dedicated engineering design capability and core manufacturing competency (e.g., lead screws, flexible assembly, motors, etc.), coupled with aggressive marketing programs to identify the future needs of customers.

Innovation is currently defined by offering significantly increased functionality while reducing envelope or footprint, and maintaining or reducing cost of ownership. Similar to the model of the “personal computer,” where the same money spent five years ago buys a product with a dramatic increase in capability.

How has functionality been enhanced in linear, hydraulic, electrohydraulic and/or piezoelectric actuator technology in the past five years?

By increased compatibility with the low-power microprocessors being used to control “machine functions” on equipment, and integrated, on-board electronics that enhance the controllability of electromechanical linear actuators.

How has the marketplace benefited from these technological advances?

The ability to provide “low-level” power switching has facilitated the use of microprocessors controlling actuators to perform manual devices, or manually operated hydraulic cylinders. This has led to automation and optimization of machine functions, which in the past had to be operator-monitored and controlled. It has also reduced the cost of hardware and wiring systems, as lower-current handling components can be used.

Onboard, electronic functionality-integrated internally to electro mechanical linear actuators:


- Internal feedback devices such as potentiometers, encoders, or Hall effect sensors reduce performance issues by removing them from the external environment, and reduce labor costs of assembling external feedback devices, and accompanying hardware.
- Onboard, internal microprocessors allow actuators to replace external electromechanical devices to provide electronic, clutching and end travel limits.

- The ability to provide outputs to external devices for facilitating interlocks can be programmed into actuator “chips.”
- This internal integration reduces overall “system” size, cost and performance issues.

How, if at all, will actuators continue to advance in the next five years? Who stands at the forefront of this potential innovation? Why?

The “winning” actuator companies in the next five years will be those that partner closely with OEMs, who themselves are technology innovators who will exhibit high growth during the period. Prerequisites will be strong engineering and global manufacturing operations, highly robust design proven by thousands of applications in harsh environments, as well as customization capability allowing for design optimization.

The key advancements will come in the following areas:

- Increased onboard, electronic functionality reducing the amount of control the primary machine PLCs need to provide.
- Increased thrust, speed and duty cycle will allow electromechanical actuators to address the environmental concerns in many applications where the risk of contamination from fluid power alternatives is becoming unacceptable.
- Increased product platforms ranging from small to large will allow equipment designers to put an increased number of machine functions under automated control, reducing operator interaction. 

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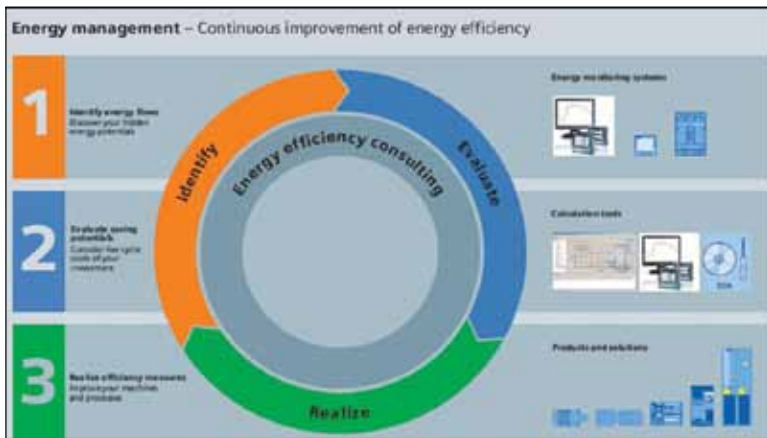
Michael Perlman, Siemens Industry Inc., motion control marketing manager

While it is valid to state that energy efficiency is defined as the same level of production being achieved at an overall lower energy cost, it is equally important for today's machine builders and automation engineers alike to remember that an energy-efficient system can actually translate into higher productivity. This is achievable through a comprehensive approach to energy management.

Energy management is a process, rather than a product or series of products installed on a machine, or inline, to achieve a basic

energy saving of kW hour consumption. This process must be ongoing and perpetual, meaning that any defined goal should be viewed as a momentary metric of achievement, rather than a final end. While any vendor can supply the right products and support services to hit a target mark of energy savings, the mindset of the customer is key in keeping the process recurrent. This ensures a continual increase in the productivity levels achieved, defined as a factor of the energy consumed. In many ways, it can be viewed in the same manner as an ongoing

continued



Optimum energy monitoring and management are not products; they're a process, as outlined in this flow chart.



Any vendor can supply the right products and support services to hit an energy savings target, but a customer's mindset is crucial to maintaining the process (courtesy of Siemens Industry Inc.).

ing, effective but constantly evolving quality management system at your company.

Three essential elements are the basis of such a process.

First, energy monitoring systems must be in place to effectively determine the current consumption. These can include, but are certainly not limited to, energy consumption displays, infeed/supply monitoring devices, power factor meters and more. Second, the proper calculation tools are needed to properly evaluate the life cycle costs of any investment. These tools can be as simple as a motor sizing chart or the software programs used to parameterize drives. However, a more formal mechatronics protocol may be beneficial to your operation. In this scenario, a thorough evaluation of both mechanical and electrical/electronic influences on your system, be it a machine or a process line, is conducted. The results can often open the eyes of machine designers, process engineers and system integrators alike. Third, to realize the benefits of this analysis the proper products and system solutions must be implemented.

This is where a competent supplier can be an effective partner for your operation. For example, the solution you need might involve a vector drive that utilizes an energy optimization function to enhance the efficiency of the motor during partial-load operations. In a system with multiple motors, energy savings might be realized to a substantial degree by the use of a drive unit with a common DC bus. The designer can also select the most appropriate infeed solution for the machine, pump or process operation, given the particulars of performance and required output. This may include an appropriately sized infeed unit with regenerative capability, or the ability to put unused or braking energy back on the incoming power line.


Some applications may allow the use of high efficiency standard induction motors and, in the process, realize a potential savings of 1–3 percent. The use of frequency converters (VFD) for speed control might raise this to an 8–10 percent savings.

Optimizing your entire system through mechatronic analysis of the machine or process design can result in a potential savings of 15–20 percent by the avoidance of over dimensioning of motors, plus partial load optimization by means of energy-related flow control. This analysis may also point to the ability to use controlled energy infeed and recovery.

In order to determine the true efficiency of any drive system, it is necessary to demonstrate the amount of energy required by its power components and a corresponding examina-

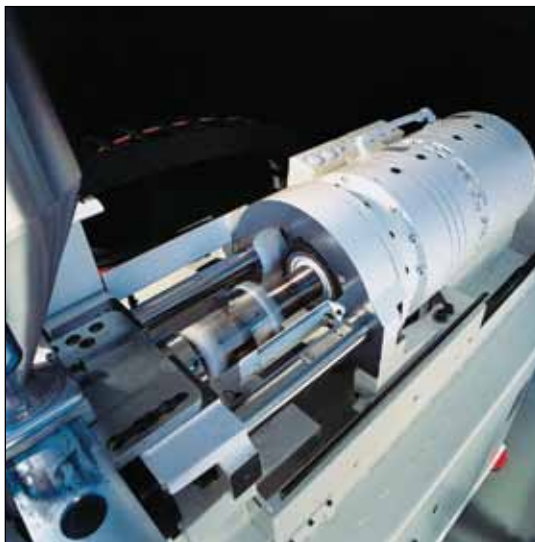
tion of how the system uses energy. Different drive concepts used on the same system under identical power load must also be considered. This latter exercise might look into partial load efficiencies with various motor and drive combinations, straight comparisons between synchronous servo versus asynchronous induction motors or direct drive versus motor/gearbox combinations, drives with braking components versus regenerative drive technology, as well as solutions with single versus multi-drive, common DC bus solutions.

A corollary to this discussion should also include a review of potential hydraulic/pneumatic component change-outs in certain applications where replacement with an integrated package of motion control and PLC technology might better resolve closed-loop pressure control of axes, for example. Fewer components and their related power consumption can lead to overall system productivity improvements, as well as ongoing enhanced energy efficiencies. Reduced programming, diagnostic and commissioning times can also flow from such an approach, providing even more opportunities for overall machine or process improvements. Tracking the energy efficiency of such a system may seem problematic at first, but here again today's sophisticated mechatronic and virtual production protocols can be utilized to validate the real-world performance characteristics of such designs, far in advance of their implementation.

As the emergence of new technology has impacted many of the products used in energy-efficient systems, it is equally important to take a more holistic look at operational sequences and the overall integration scheme when designing, retrofitting or rebuilding for improved energy utilization. 

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Optimizing an entire system through mechatronic analysis of the machine or process design can potentially save 15 to 20 percent of energy by avoiding over dimensioning of motors, in addition to partial load optimization by energy-related flow control.



Michael Perlman is the marketing programs manager for the Motion Control business of Siemens Industry, Inc. In this role, he oversees the technical marketing for products including SINAMICS intelligent drives and SIMOTION motion controllers. Perlman has over 20 years of experience in plant and corporate automation engineering at a number of Fortune 100 manufacturers, including Kraft Foods, General Mills and Masterfoods (Mars). He received a bachelor's of electrical engineering from the Georgia Institute of Technology and a master's of business administration from the State University of New York Buffalo.

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SMMA Spring Management Conference

NAVIGATES RECOVERY

The SMMA – Motor and Motion Association is ditching the slickers and galoshes for this year’s Spring Management Conference, themed “After the Storm: Navigating in the New World.”

Conference chair Matt French, vice president/general manager of AMETEK Inc.’s technical and industrial products division, crafted the nautical inspired theme for last year’s recession-focused conference, “Charting a Course through Uncertain Times.” French and the conference planning team opted to continue with maritime terminology to retain continuity between 2009 and 2010. “The chair last year and this year has been very much involved in putting the program together,” Bill Chambers, SMMA operations director, says of French.

For the first time, the spring conference is being held in Fort Myers, FL. “We typically go west one year and east another,” Chambers says. “We try to select one coast or the other; although, we have also gone to Arizona.”

The event kicks off on a Tuesday evening with the chairman’s welcoming reception followed by a casual dinner. Members of the Permanent Magnet Division arrive earlier in the day to attend their scheduled meeting in the afternoon. The conference sessions begin Wednesday morning and wrap up Thursday at noon. “This used to be a Wednesday-Thursday-Friday affair. This past fall we started with a Tuesday-Wednesday-Thursday format,” Chambers says. “A lot of people don’t like to travel late on Friday.”

The springtime conference focuses on specific management issues, as compared to the technical focus of the annual fall conference. Presentation topics include preparing for recovery, an update on the Electric Motor Education and Research Foundation (EMERF)—a pre-competitive motor research consortium—supply chain management, an investor’s view of the industry, the impact of mergers and acquisitions on the industry, taking advantage of the U.S. Commercial Services export resources and an economic forecast.

Two Wednesday afternoon breakout sessions correspond to the presentations: preparing for recovery and supply chain



(Courtesy Sanibel Harbour Marriott Resort and Spa).

management. “The presentation is usually 45 minutes to an hour, normally PowerPoint followed by a few questions and answers,” Chambers says. “Breakouts are longer, more informal and include more speaker-attendee dialogue.”

“It’s an opportunity for the people particularly interested in that topic to get into more detail with that presenter.”

There are several pre-conference options on Tuesday, including golf tee times and an SMMA Motor and Motion College, “Basic Motor Theory, Operation and Application.” The course is instructed by William H. Yeadon, PE, president of Yeadon Energy Systems Inc. There is a separate fee for the half-day course, which includes instruction, a course manual and afternoon refreshments. Chambers says the SMMA Motor and Motion College is an important part of the organization’s mission, which is to be a voice for the motor and motion industry while providing a forum for education, communication, research and networking.

SMMA has more than 120 member companies that include electric motor and motion control manufacturers, suppliers, users, consultants and universities. Chambers estimates 75 to 100 members will attend the conference; although, “it’s hard to tell because of the economy. Last year the attendance was way down.”

One other feature of the conference is table top exhibits. There may be 10 to 15 exhibitors, which is about half of what is typical for the fall technical conference. “It’s important to note that this is not a trade show. They are table top exhibits,” Chambers stresses. “It is unlike a trade show because the only times exhibits are on display are during the coffee breaks and continental breakfasts. The exhibits are not on display during the conference session.”

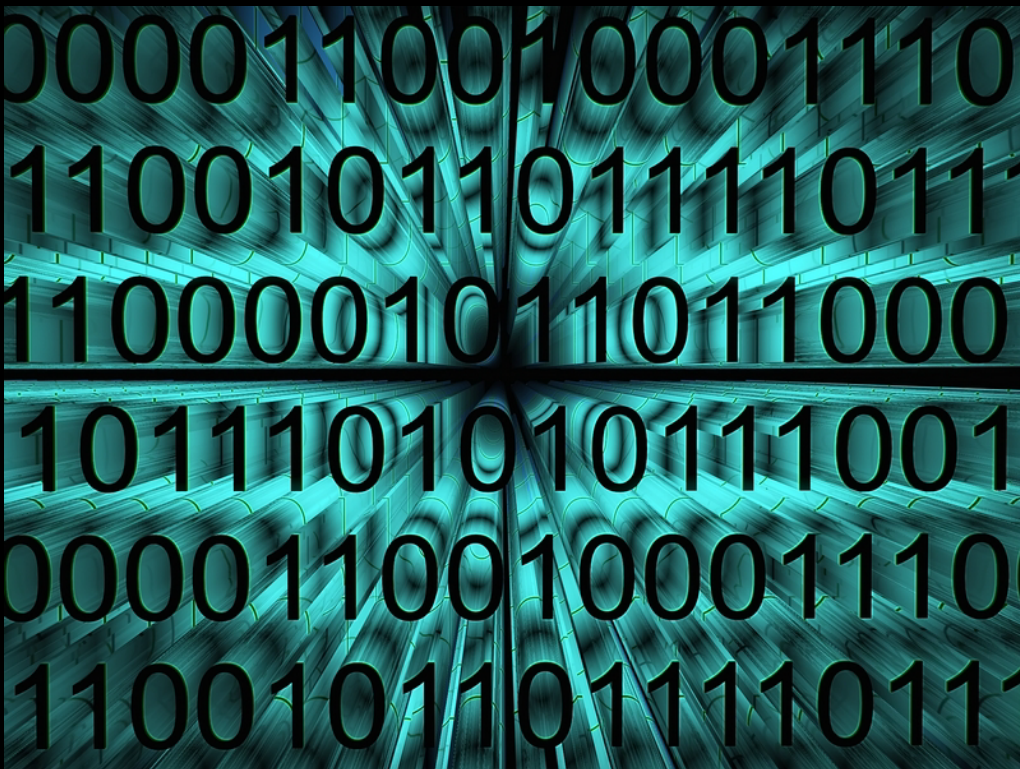
Chambers, along with his partner and wife Betsy, SMMA executive director, coordinate event planning details such as marketing and hotel arrangements, with input from SMMA volunteers and, after many years with the association, the benefit of knowing what works for SMMA. “We really don’t want a trade show,” he says. “The emphasis is on information and education. We’re trying to give people some good, solid material by the way we put the program together, along with ample time for interaction with industry colleagues also attending the conference.”

The SMMA 2010 Spring Management Conference takes place May 4–6 at the Sanibel Harbour Marriott Resort and Spa, Fort Myers, FL. For more information, visit www.smma.org.



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calendar

May 1-4, 2010—Bearing Specialists Association Annual Conference. Naples Grande Beach Resort and Spa, Naples, FL. The 2010 annual BSA convention adopts the theme “A Look Back to Step Ahead,” in homage to the association’s 44-year history as it looks to new opportunities and markets in the recovering economy. The intention is for attendees to answer the question of leveraging growth in the current economy with a three-part presentation consisting of a panel discussion about industry and economic lessons learned the past 20 years, a present industry overview and a future industry panel discussion. The convention will also offer industry updates from ABMA and BSA, as well as a session of pre-scheduled conferences. An opening reception and manufacturing appreciation event, golf tournament and a tennis round robin offer the usual networking opportunities. For more information, visit www.bsahome.org.

May 4—Packaging Automation Forum. InterContinental O’Hare Chicago. Rosemont, IL. This fifth installment of the Packaging Automation Forum is an educational conference that looks at state-of-the-art manufacturing and packaging operations and demonstrates how today’s products and technologies are providing increased efficiencies and capabilities. The day before the conference features the Make2Pack and Connect-and-Pack training workshops. For more information, visit www.packworld.com/paf.

May 23-26—Windpower Conference and Exhibition. Dallas Convention Center. Dallas. Windpower is produced by the American Wind Energy Association (AWEA) and is the premier wind energy event in North America. Over 23,000 visitors and about 1,300 exhibitors attended the show last year. The goal of Windpower is to advance wind industry policy and promotion, advocate the wind industry in renewable energy legislation and

communicate the benefits of wind energy to all. For more information, visit www.windpowerexpo.org.

June 7-9, 2010—Sensors Expo and Conference. Donald E. Stephens Convention Center. Rosemont, IL. Sensors Expo and Conference is the North American industry event exclusively focused on sensors and sensor integrated systems. Attendees find the latest sensing solutions, evaluate emerging standards, find and compare suppliers, or solve new design challenges. The conference program features international, leading authorities, who examine the most up-to-date sensing innovations. The expo floor brings together world-class vendors to help find solutions. This year’s Sensors Expo is co-located with the Embedded Systems Conference, a leading event for the global electronics industry. For more information www.sensorsexpo.com.

June 8-9, 2010—CTI Symposium North America. Four Points by Sheraton Ann Arbor Hotel. Ann Arbor, MI. This event, organized by the German Car Training Institute (CTI), focuses on the latest technical innovations in automotive transmissions, including hybrid and alternative drive trains, with experts and suppliers from the United States, Asia and Europe. This year’s focus will also address improving efficiency of today’s drive trains. The symposium will examine current debates on economics, politics and the environment. Topics will be examined from the perspective of technology, customers and the context of market success. CTI aims to emphasize the potential of development tools in light of the financial crisis. For more information, visit www.transmission-symposium.com/north-america.

June 8-11—Automatica 2010. New Munich Trade Fair Centre. Munich, Germany. This biennial show serves as a meeting point for manufacturers and users of assembly

and handling technology, robotics and machine vision as well as the corresponding suppliers. Automatica covers the entire spectrum of automation. From individual components through to complete systems, from concrete applications through to relevant services, Automatica exhibits total value-added chains while bringing suppliers and customers together worldwide. For more information, visit www.automatica-munich.com.

June 15-16—Design-2-Part Show. Saint Charles Convention Center. St. Louis, MO. The Design-2-Part Show is for buyers of custom parts, components, services and design. The show attracts the leading contract manufacturers for immediate, hands-on comparison of quality, technology, price and service. Over 300 manufacturing processes will be displayed. The Design-2-Part shows take place regionally throughout the year. For more information, visit www.d2p.com.

June 24-26, 2010—China (Shenzhen) International Small Motor Exhibition. Shenzhen Convention and Exhibition Centre. The eighth installment of the China International Small Motor Exhibition is co-located with several other industry events: The China International Electric Machinery Industry Exhibition 2010; The China International Magnetic Materials and Equipment Exhibition; International Electronic Equipment, Components, Photonics and Laser Exhibition; China International Power Supply Exhibition; and International Industry Control and Automation Expo for South China. Visitors come from all across China with 11.5 percent coming from overseas. Exhibitors include Schneider Electric, Siemens, Emerson and ABB. For more information: Wise Exhibition (Guangdong) Co., Ltd., phone: (8) 620-8735-0040, ex360sf@126.com, www.motor-expo.cn.

Schuler Group

PURCHASES
DIRECT-DRIVE WIND DRIVETRAINS



Finnish energy generator manufacturer The Switch has received an order from the Shuler Group for two direct-drive 3 MW drivetrains. The custom-built permanent magnet generators are optimized to work with 2.7 MW full-power converters (FPC). They are scheduled for delivery and testing in April 2011 and are expected to be connected to the grid in full operation by summer 2011.

According to Joachim Beyer of Shuler Group's board of management, the company is expanding its focus from the

automotive industry to the wind market. The Schuler Group aims to develop and supply large-scale wind power plants in Germany initially, and eventually other Central European and international markets.

According to Jürgen Millhoff, key account manager for The Switch, Hamburg office, "With the current shift to low-maintenance, gearless turbines in the wind power industry, The Switch was seen to be a good option for Schuler Group."

Pacamor Kubar Bearings

WELCOMES BACK DWIGHT CALKINS

Dwight Calkins has returned to Pacamor Kubar Bearings (PKB) engineering department. After holding several positions at PKB, including QC engineer and operations manager, he rejoins the PKB team to help develop and launch several strategic new products for the American-owned and -operated ball bearing manufacturer.

"We're pleased to have Dwight back with us at PKB," says Ed Osta, executive vice president. "Dwight's experience and knowledge of bearing design and production processes will enable us to develop new products and expand our current product offering."

Calkins most recently served as a senior technology engineer for General Electric, in Schenectady, NY, which manufactures turbines and generators. When asked about returning to PKB, Calkins says, "I learned a great deal from GE and am very appreciative for the opportunity, but I missed the dynamic environment and camaraderie of the PKB team."



Dwight Calkins

Maxon

COLLABORATES WITH NATIONAL INSTRUMENTS



DARwin, a humanoid robot developed by the Robotics and Mechanisms Laboratory at the Virginia Tech University, is driven by motion control products from Maxon Precision Motors (courtesy of Maxon).

A strategic collaboration between National Instruments (NI) and Maxon Precision Motors looks to highlight mutual areas of interest in the field of robotics.

In 2006, an informal relationship between the two companies began with the inclusion of NI *LabVIEW Vis* in Maxon's EPOS family of digital position and speed controllers. More recently, the companies worked together designing and developing ViNI, an all inclusive robotics platform NI engineers created. The ViNI is driven exclusively by Maxon motors, gearheads and encoders and NI CompactRIO embedded controls.

"NI and Maxon have worked together to integrate the high productivity of NI *LabVIEW* graphical software and the high-precision drive systems of Maxon Motors, so roboticists don't have to assume the integration workload," says Shelley Gretlein, senior group manager of *LabVIEW* Real-Time and Embedded at National Instruments. "Also, with the release of *LabVIEW* Robotics software, design engineers now can access native Maxon Motor interfaces ready-to-run on their next autonomous system."

Other robotic applications driven by Maxon motion control products include the Mars Rover, by Jet Propulsion
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industry news

Laboratory, Da Vinci surgical robot by Intuitive Surgical and DARwin, a humanoid robot developed by RoMeLa, which is the Robotics and Mechanisms Laboratory at the Virginia Tech University.

Maxon and NI have several joint marketing efforts slated for 2010. Maxon will continue its focus on R&D efforts on electric motors, sensors and motion controllers while National Instruments will leverage its *LabVIEW* platform, NI *LabVIEW* NI SoftMotion Module and CompactRIO.

“It is an exciting time to be involved in the robotics industry. Over the years, Maxon has directed a significant portion of our engineering efforts toward the development of specialized products for robotic applications, and we are just beginning to realize the benefits of our investment,” says Kirk Barker, electronics product manager for Maxon. “We are pleased to be working with NI and their talented group of engineers.”

Gates

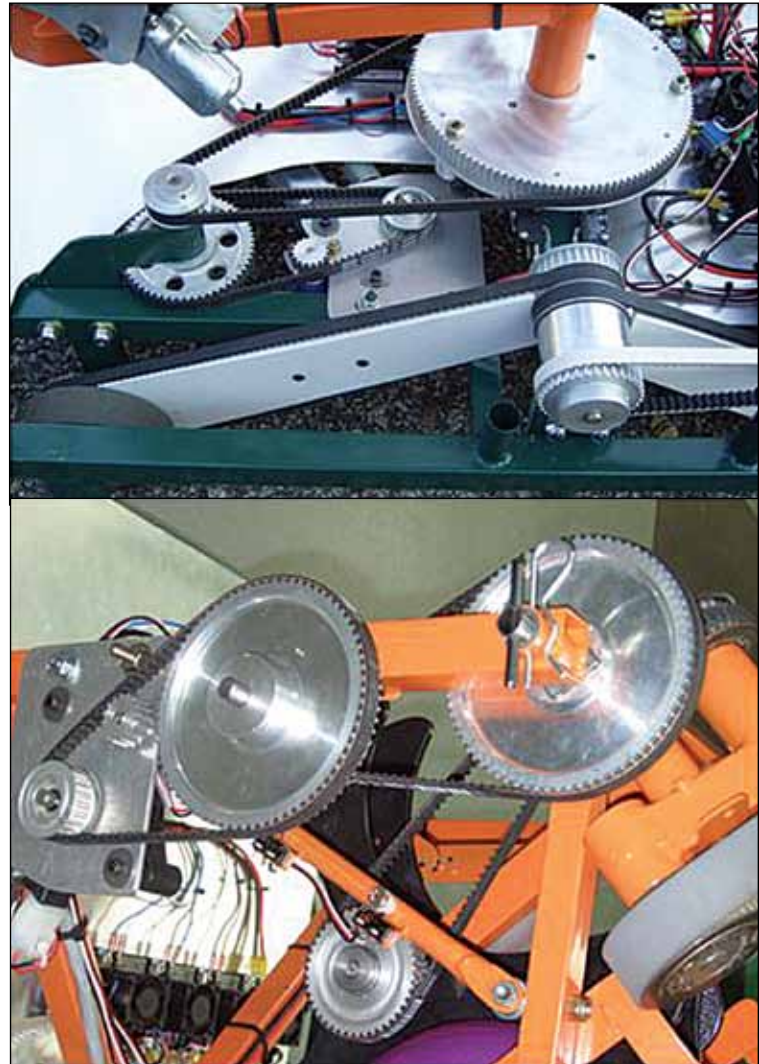
SUPPLIES ROBOTICS COMPETITION

As a Diamond Supplier of the For Inspiration and Recognition of Science and Technology (FIRST) Robotics Competition (FRC), the power transmission unit of Gates Corporation invited student teams to select belt drives as part of the 2010 FRC Kit of Parts, which was distributed to more than 1,800 teams of high school students.

FIRST is a not-for-profit organization founded by inventor Dean Kamen to inspire young people’s interest and participation in science and technology.

“Gates Corporation’s participation as a Diamond Supplier furthers our goal to inspire energy and enthusiasm for science and technology,” says FIRST president, Paul R. Gudonis. “It clearly demonstrates their local and national commitment to play a leadership role in STEM education and workforce development by helping students gain the technology and life skills that will help them succeed in their future careers.”

More than 45,000 students from 12 countries will design and build robots to compete in regional events with winners advancing to the FIRST Championship in Atlanta, April 15–17. Participating students are eligible to apply for nearly \$12 million in scholarships offered by leading universities, colleges and companies, including Gates. More information about FIRST is available at www.usfirst.org.



Robots built for the FIRST student competition use belt drives supplied by Gates Corporation as a cleaner, quieter alternative to roller chains (courtesy of Gates Corporation).

Hydraulic Institute

ANNOUNCES 2010 BOARD OF DIRECTORS AND OFFICERS

During the Hydraulic Institute’s (HI) 93rd Annual Meeting recently held on Marco Island, FL, the 2010 Board of Directors and Officers was announced. The new board will be mostly responsible for providing organizational oversight to the institute and guiding the direction of its strategic plan.

Dennis Ziegler, president and CEO of GIW Industries,



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Inc., was elected chairman of the board, after serving as president of HI in 2009. He received the President's Award at the meeting gala in recognition of his efforts and leadership.

Ken Napolitano, president of ITT Residential and Commercial Water, is taking Ziegler's place as HI president. Napolitano previously served HI as vice president, knowledge and education in 2009. In recognition of his service in this capacity, he received the Institute's Vice President's Award.

The new board members include three vice presidents: Dave McKinstry, vice president, IMO Pump, for technical affairs; Dean Douglas, president of Dover Pump Solutions Group, for member services; Jim Swetye, regional training manager of Grundfos Pumps USA, for knowledge and education.

Other board members include Sven Olsen, president of Leistriz Corporation; Mike Medaska, vice president of ARO Fluid Products; Rich Heppe, president of Industrial Motors and Systems, Emerson/U.S. Motors; Mike Sutter, vice president and general manager of Flowserve Flow Solutions Group; Chad Tuttle, COO Americas of CLUDEUNION; Dave Brockway, president of Intelliquip, LLC; Dave Roland, president of Pentair Engineered Flow Technologies; Tom Conroy, vice president and general manager of Chempump—A Division of Teikoku USA Inc.

U.S. Air Force

AWARDS CONTRACT FOR MAGNETIC REFRIGERATOR

Electron Energy Corporation (EEC), a producer of rare-earth magnets for critical applications, was recently awarded a \$100,000 Small Business Innovation Research (SBIR) contract from the U.S. Air Force Research Laboratory, of Dayton, OH, to develop a magnetic refrigerator. EEC is collaborating on the project with Astronautics Corporation of America, of Milwaukee, which develops magnetocaloric refrigeration systems.

High efficiency magnetic refrigeration systems will reduce aircraft heat signatures and improve the service life of electronic devices when able to operate at modestly lower temperatures. The systems can also be used to cool drilling instruments and data logging equipment typically used in environments where temperatures exceed 120 degrees Celsius. "Magnetic refrigeration will be a sustainable, attractive technology for cooling high power density rotating machines and electronic devices used in military and commercial applications," says

continued

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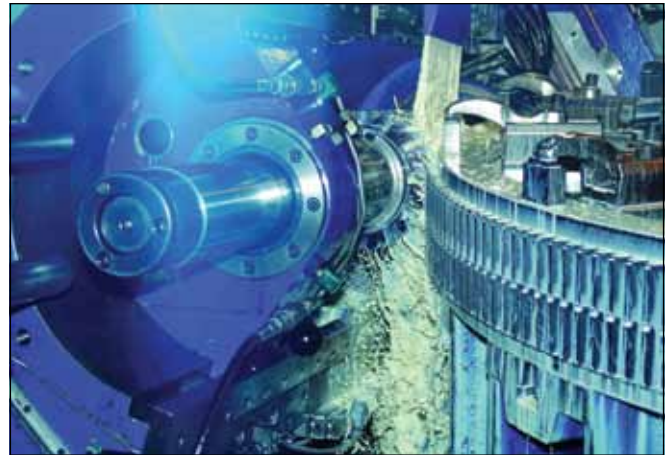
Michael H. Walmer, president of EEC.

The systems provide cooling in remote locations of aircraft and operate in any orientation, which is vital for aircraft engaged in inverted flight or sharp banking maneuvers. The technology will help the Air Force advance its Interdependent Vehicle Energy Technologies (INVENT) initiative. "Chillers that provide cooling for electronics and electronic components aboard U.S. Navy ships and military aircraft are good examples of a niche market for magnetic refrigeration systems," says Jinfang Liu, vice president of technology and engineering for EEC.

Phase I of the contract extended from March through December 2009. According to Peter Dent, EEC vice president of business development, the research will focus on developing high temperature magnetocaloric materials for compact, lightweight magnetic refrigerators that can provide hundreds of watts of cooling and operate in the 120–500 degrees Celsius range.

The magnetocaloric effect is a phenomenon in which a reversible change in the temperature of magnetic materials occurs in the magnetization/demagnetization process. By cycling magnetocaloric materials through hot and cold states and exchanging the heat through a fluid medium, the system generates an overall cooling effect, according to Dent. He notes that research during the past decade has resulted in discovery of materials with a giant magnetocaloric effect at room temperature, and research has demonstrated that magnetic refrigeration—i.e. using materials that exhibit the magnetocaloric effect—offers great potential improvement in energy efficiency of up to 60 percent of a Carnot cycle.

Liu is serving as the principal investigator for the project with Melania Marinescu leading the magnetocaloric material development at EEC. The research will also be supported by Steven Jacobs, Carl B. Zimm and Steve Russek of Astronautics Corporation of America.



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Rotek

LAUNCHES CONTRACT MACHINING SERVICES

Rotek Incorporated, a North American manufacturer of slewing bearings and seamless rolled rings, now offers contract machining services using advanced machining cells at its Florence, KY facility.

The multiple-machine cells feature pallet transfer systems and 120-magazine tool changers. They offer competitive solutions for larger workpieces produced in high-volume runs and for smaller, repetitive production runs. Rotek can machine irregular-shaped workpieces from supplied materials or provide seamless rolled rings to customer specifications

EPTDA

FORMS STRATEGIC EUROPEAN ALLIANCE WITH DEUTSCHE MESSE

With a joint awareness that today's industrial marketplace is ever changing and develops innovations at a rapid pace, the European Power Transmission Distributors Association (EPTDA) and Deutsche Messe have formed a strategic European alliance.

EPTDA, the largest organization of distributors and manufacturers of power transmission and motion control products in Europe, representing almost 200 companies in the industry, recognizes the advantages Hannover Messe offers its members in bringing innovations and developments to a fast-paced, global audience. Hannover Messe, which takes place April 19–23 this year, features nine international trade fairs and 1,000 themed presentations and forums.

The Global Business and Markets foreign trade platform within Hannover Messe is an area where EPTDA members can foster international business contacts. This essentially serves as a matchmaking platform for EPTDA members as high-ranking economic delegations come to the Global



The Global Business and Markets foreign trade platform within Hannover Messe offers an atmosphere for establishing and nurturing international business contacts, and it is an area EPTDA members can take advantage of with its European alliance with Deutsche Messe (courtesy Deutsche Messe).

Business and Markets hall with the intention of visiting industrial professionals. This provides EPTDA members with opportunities to make new, high-level business contacts, find appropriate joint-venture partners and interact with other industry professionals at an international level.

“Forming such alliances as with the EPTDA is what the Hannover Messe is all about,” says Marco Siebert, director of international relations at Deutsche Messe. “Hannover Messe offers a truly unique platform for industrial professionals to conduct trade at an international level. We welcome the EPTDA to Hannover and look forward to further intensifying our alliance over the coming years. A great deal of synergies between our two entities has already been identified, and we look forward to bringing these advantages to both EPTDA

members and Hannover Messe participants.”

EPTDA views the alliance as a natural progression of its presence at the trade show with many opportunities for its members. “EPTDA and PTDA (our American sister organization) members have been partnering with Hannover Messe for many years now,” says Hans Hanegreefs, executive vice president of EPTDA. “This European strategic alliance is thus a natural evolution of our continued partnership and support to each other. It will help EPTDA to create more valuable and tangible benefits for its members and better streamline the efforts of EPTDA and Hannover Messe to advance the power transmission and motion control industry worldwide.”

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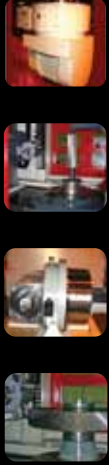

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SERVICE WITHOUT A SMILE



Manufacturing employees have always kept their eyes on the robotic systems that continue to pop up in assembly lines and industrial workspaces. These metallic, low-maintenance robotic employees don't waste time with smoke breaks or catching up on episodes of *Lost*. They tend to stick to the task at hand with little argument or attitude, giving human counterparts a bad name when they gripe about factory temperatures or lack of a decent dental plan.

The manufacturing industry was once the hot spot for artificial replacements, but in the near future it's the service industry that may see a significant increase in robotic employees. The Care-O-Bot 3 is an example of this kind of robot. Designed in Germany at the Fraunhofer IPA, (The Fraunhofer Institute for Manufacturing Engineering and Automation), the Care-O-Bot 3 is a mobile robot assistance system capable of planning and carrying out complex motion sequences.

The first Care-O-Bot prototype was built in 1988 and was able to navigate autonomously and safely indoors. The second prototype was able to manipulate simple objects found in home environments. Today, the third version, thanks to the help of sophisticated robotic components and equipment, can serve so many different platforms that it's really beginning to step into the realm of science fiction. Need a maid? Need a greeter? How about someone or something to set the kitchen table? Early prototypes of the Care-O-Bot have been used as museum guides and welcome robots or for advertising platforms and product presentations. The robot was designed to assist people in their daily lives while carrying out a wide variety of monotonous tasks. As a media manager, the Care-O-Bot can connect people to the outside world via telephone, television or interactive media. It can also provide mobility assistance to disabled or elderly people as an intelligent companion.

Schunk Inc. provided many of the key components for the

Care-O-Bot 3 from its own modular system, including the LWA 3 lightweight robotic arm (pictured above) and the SDH gripping hands.

"These units were selected due to their power density," says Jesse Hayes, product manager/automation components at Schunk. "This arm assembly is well suited for mobile robotic applications. It operates on a 24 VDC power supply and has no external controller, unlike traditional robots. The drives and motor controllers are located in each axis, and each axis communicates over a bus. The power is daisy-chained through the arm assembly."

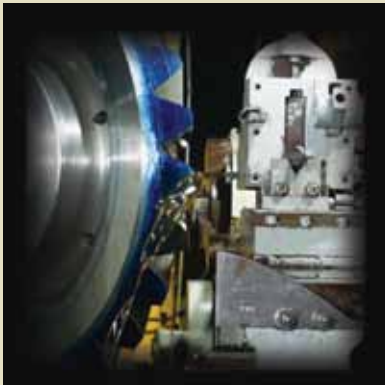
Such factors allow the Care-O-Bot 3 to perform household tasks and grip objects including cups, plates or glasses and place them on the robot's removable service tray. The LWA 3 offers seven degrees of freedom and resembles a human arm in terms of its mobility. These capabilities will continue to push design teams further as they pursue the perfect automated companion that could be used in residential and commercial applications.

"Fraunhofer IPA is marketing the Care-O-Bot as a research platform for other universities to purchase so they can build a community of people to develop applications and software for service robotics," Hayes says. "Currently, service robots are mainly used in research and development applications in universities and government agencies in areas like hazardous waste cleanup, explosive ordinance disposal and close human robot interaction."

In time, you may find these humanoids retrieving your mail, cleaning your kitchen or fetching a cocktail during a summer party. It looks like as though the Roomba, the autonomous vacuum cleaner that first arrived in 2002, was just the tip of the iceberg. For more information on the Care-O-Bot research project, visit www.care-o-bot.de/english/.

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