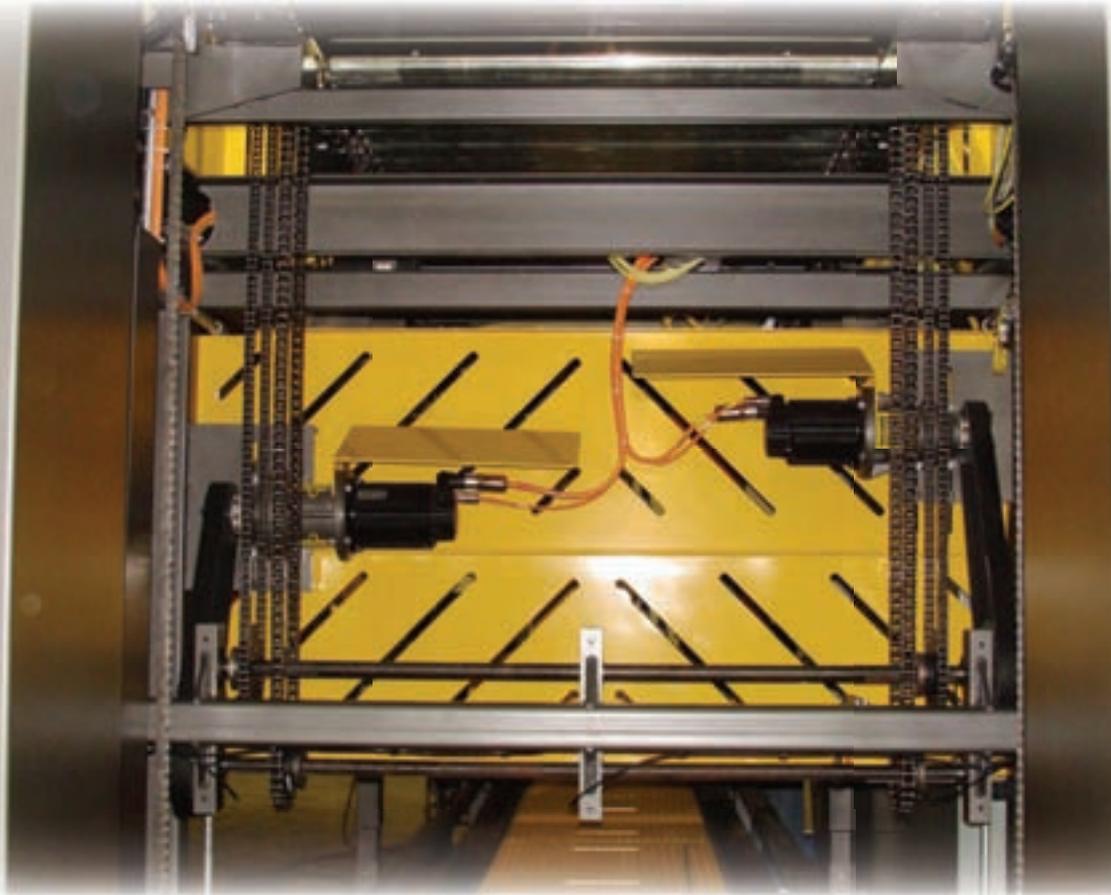


# PTE

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## Features

- Siemens Aids Machine Tool Redesign
- Rexroth Upgrades Soft Drink Distribution
- Honeywell/SAE Go to School

## Technical Articles

- Direct Drives vs. Gear Motors: An Update

## Power Play

- NuVinci Transmission a Work of Art

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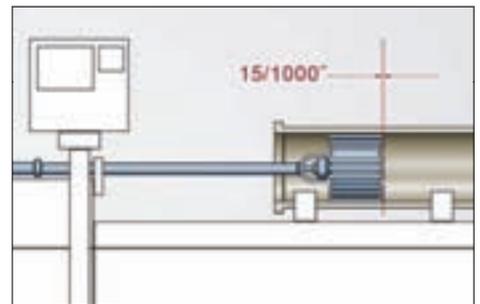
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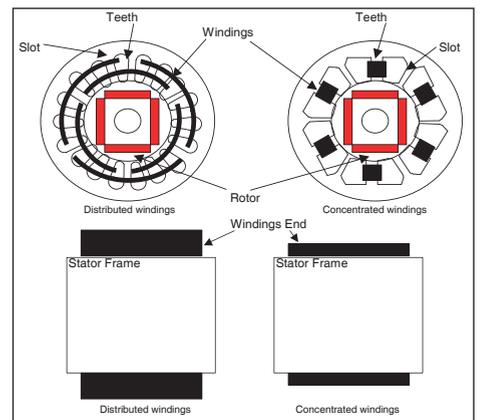


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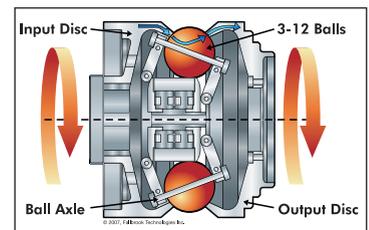
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NuVinci Transmission a Work of Art

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The strength of many.**

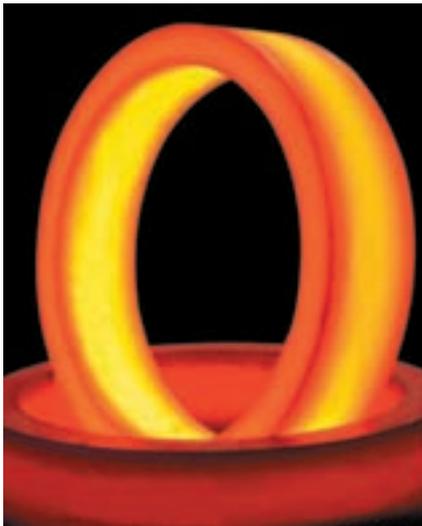
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**December 2009**

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- Rexroth Upgrades Soft Drink Distribution
- Honeywell/SAE Go to School

**Technical Articles**

- Direct Drives vs. Gear Motors: An Update

**Power Play**

- DoVinci-Inspired Transmission is Work of Art

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**Photo courtesy of Bosch Rexroth.**



**The OSPE electrohydraulic steering unit from Sauer-Danfoss combines OSP technology with an integrated electrohydraulic steering valve.**

## Steering Unit

### MEETS NEW SAFETY LAWS

The OSPE electrohydraulic steering unit from Sauer-Danfoss has several features specifically targeted at meeting strict new safety legislation. OSP steering technology along with an integrated electrohydraulic steering valve helps simplify hydraulic system construction.

The “safe state” system construction features selectable reactive and non-reactive steering modes, load sensing and open center options with a variable steering ratio. The OSPE handles demanding off-highway applications.

“Today’s vehicles require versatile solutions that increase productivity, reduce operator fatigue and provide a safe, comfortable working environment,” says Tom Rudolph, product portfolio manager. “With the new OSPE steering unit, we are able to introduce a range of features that help improve vehicle performance and operator comfort, while facilitating compliance with the safety demands of Machinery Directive 2006/42/EC.”

The “safe state” construction of the OSPE steering unit complies with revised safety legislation and new standards, like ISO 25119. In the case of an electronic or hydraulic system malfunction, the “safe state” function is activated by an external watchdog controller, and it can isolate the electrohydraulic section of the steering valve, protecting the steering unit.

In the electrohydraulic (non-reactive) steering mode, the steering ports from the OSP do not block as a safety feature. This is accomplished by an extra connection from the hydrostatic steering unit to the cylinder. Unlike other systems, this feature allows the steering wheel to remain fully operational and the driver in complete control.

“Recent European safety legislation has revised Machinery Directive 2006/42/EC and applies to all vehicles built in or shipped to Europe after December 29, 2009,” Rudolph says. “This means that our customers must perform and document a hazard and risk analysis for all vehicle functions. The new OSPE steering unit has been designed to comply with this new legislation and provide the basis for a ‘safe state’ system architecture—for example, Category 2

(ISO 25119). As a result, OEMs can speed up steering system development and certification, reduce costs and bring vehicles to market faster.”

With its two steering modes, the OSPE allows for reaction steering on vehicles with an auto-steering function. Second generation “reaction” technology, reaction monitoring (RM), is available in load sensing or open center. RM technology improves the automatic self-centering feature of the steering system, which increases vehicle stability at high speeds and provides more operator comfort.

When combined with the Sauer-Danfoss PVED-CL digital actuator and SASA steering sensor, the OSPE allows operators to fine-tune steering performance. The PVED-CL digital actuator incorporates steering software for tractors and articulated vehicles, and the SASA steering sensor detects absolute position and speed of the steering wheel. Using this system, operators adjust the number of times the steering wheel is turned from stop-to-stop, which adapts steering performance to meet specific working requirements or on-road driving conditions.

It is also possible to adjust the steering ratio automatically, depending on vehicle speed. The complete solution provides more flexibility in vehicle system design, improves productivity and reduces work-related fatigue.

“Using ISOBUS auto-guide messages, the PVED-CL actuator enables direct electric interface for GPS auto-steering systems, joysticks, electric mini steering wheels or quick steering for agriculture and construction vehicles,” Rudolph says, “from tractors, combines and sprayers to backhoe and wheel loaders.”

#### For more information:

Sauer-Danfoss Inc  
250 Parkway Drive, Suite 270  
Lincolnshire, IL 60069  
Phone: (847) 876 1700  
Fax: (847) 876 1799  
[www.sauer-danfoss.com](http://www.sauer-danfoss.com)

## PV Inverter

COMBINES  
ALL SOLAR ELEMENTS

The RPS450-TL photovoltaic inverter from Bonfiglioli is a solar industry first as a modular solar power inverter system. It was released at the Solar Power International show in Anaheim, CA in October.

“The RPS450-TL represents the latest in solar inverter technology,” says Greg Schulte, president and CEO of Bonfiglioli USA. “The unit offers distinct advantages over other forms of solar technology, including critical improvements to overall efficiency, energy harvesting and financial returns.”

The modular construction of the RPS450-TL combines all components of a solar power inverter in one unit including UL1741 construction and performance, fast response, maximum power point tracking, power plant monitoring and high reliability. The system integrates string combiner boxes, monitoring and a data logger with 24-hour access to solar energy sites and allows operators to identify maintenance issues. A high-efficiency ratio improves the overall inverter performance and maximizes power generation.

The heart of the inverter is a power electronic building block with an onboard controller (PEBB) that provides a simple, reliable inverter and improves uptime. The ‘plug and play’ concept allows owners to stock spare

PEBB modules as opposed to the entire inverter, so training is only required on a singular design, improving maintenance productivity.

Ideal applications range between 30kWp and 1MWp, “So it’s a very large product range,” Schulte says. “Our inverter efficiency is at 99 percent. It provides the market with the highest available max

point power tracking of any other inverter manufacturers out there.”

### For more information:

Bonfiglioli USA  
3541 Hargrave Drive  
Hebron, KY 41048  
Phone: (859) 334-3333  
Fax: (859) 334-8888  
[www.bonfiglioliusa.com](http://www.bonfiglioliusa.com)



## Siemens

INTEGRATES VIRTUAL PLANNING  
WITH PHYSICAL PRODUCTION

A software solution from Siemens introduced at EMO in Milan integrates manufacturing planning with shop floor machining operations associated with producing parts. The solution

links *Teamcenter* software from Siemens PLM software with its Motion Control Information System (MCIS). The result guarantees digital planning data is delivered to the exact point of manufacturing.

“In 2007, Siemens announced a unique software vision to unify the global manufacturing industry’s product and production lifecycles by leveraging

the synergies between its newly acquired PLM business and other business units in the Siemens Industry Automation Division,” says Peter Thorne, managing director, Cambashi Ltd., a PLM industry analyst firm.

*Teamcenter* is a widely used PLM portfolio, according to Siemens PLM in a press release, and this new solution combines *Teamcenter* with two

MCIS components: Direct Numerical Control (DNC) and Tool Data Information (TDI). The solution allows manufacturers to manage the delivery of accurate manufacturing data—like NC part programs created by CAM software, or tool availability information—from a central information management and planning area to the appropriate space on the shop floor.

“When Siemens acquired UGS Corp., one of the industry’s leading

PLM software and services companies, we committed to producing solutions that would merge the virtual world of PLM software with the physical world of shop floor production,” says Chuck Grindstaff, executive vice president of products and CTO of Siemens PLM Software. “By integrating *Teamcenter* and MCIS, we are delivering on that vision with a solution that will help companies reduce production time and costs and improve product quality by

ensuring close coordination between manufacturing planning and shop floor production.

### For more information:

Siemens PLM Software  
13690 Riverport Drive  
Maryland Heights, MO 63043  
Phone: (314) 264-8216  
Fax: (314) 264-8926  
[www.siemens.com/plm](http://www.siemens.com/plm)

## Linear Position Sensor

### EXPANDS STROKE RANGE

CeleSCO Transducer Products’ PT9420 linear position sensor performs under the harshest environmental

conditions and features an expanded stroke range from 75 to 1,750 inches. It is built for any type of environment and is used in a range of industries including material handling, water management, hydraulic cylinder position and crane applications.

Electrical outputs include a two-wire 4–20 mA output signal and a three-wire

0–20 mA. An intrinsically safe option is available for hazardous areas, and it comes in an aluminum or stainless steel housing.

“Its ability to provide customers with a wide range of options means it is one of the best values of any sensor available,” says Jim Bishop, general manager at

**continued**

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# product news



Celesco. “There isn’t a sensor out there that offers a more significant return on investment.”

The sensor is sealed to meet NEMA 4 and IP67 standards. Optional IP68 conformance and pressure testing

for submerged applications. The potentiometer offers a long life cycle before signal degradation begins. The sensor installs in minutes, and it works without perfectly parallel alignment. It measures six inches when the cable is

fully retracted. Optional pressure testing is available down to 100 feet of water for submerged applications.

“Both our standard and extended range PT9420 sensors are considered to be among the most durable and reliable products in the market today,” Bishop says. “What sets these sensors apart is how versatile they are. For example, we have an all-synthetic, high strength cable for high acceleration applications along with a more rugged stainless cable.”

## For more information:

Celesco  
20630 Plummer Street  
Chatsworth, CA 91311  
Phone: (818) 701-2750, or  
(800) 423-5483  
Fax: (818) 701-2799  
[www.celesco.com](http://www.celesco.com)

## VFD Accessory

ENHANCES PERFORMANCE



Marathon Drives introduces the Aegis Shaft Grounding Ring accessory for industrial, commercial and HVAC/R motors.

The accessory addresses the issue of harmful currents often emitted by variable frequency drives on the shafts

of the motors they control. If shaft grounding isn’t performed, the currents cause damage to motor bearings, which result in noise, vibration, downtime and motor failure.

“As leaders in VFD systems using our MAX motor family, Marathon continues to search for solutions to not only make these systems more energy efficient, but more sustainable,” says Tick Munz, product manager of Marathon Electric. “The energy efficiency achieved by system improvements must be sustainable in order to be a truly ‘green’ solution.”

The Aegis Shaft Grounding Ring was developed by Electro Static Technology, a division of Illinois Tool Works, to improve inverter driven motor reliability. The new technology has already succeeded in over 150,000 applications in HVAC, pump and other

industrial processes.

“We are impressed with Marathon Electric’s innovative approach for this new option,” says Adam Willwerth, sales and marketing manager at Electro Static Technology. “We look forward to supporting Marathon and their customers with the shaft grounding ring.”

The Shaft Grounding Ring can be added to most Marathon Electric motors during assembly. They are designed to fit all Marathon Electric NEMA T or TS shafts on non-flanged motors.

## For more information:

Marathon Electric  
Regal-Beloit Corporation  
200 State Street  
Beloit, WI 53511  
Phone: (608) 364-8808  
Fax: (608) 364-8818  
[www.regal-beloit.com](http://www.regal-beloit.com)

## Sporian

### DEVELOPING ROCKET MOTOR HEALTH ASSESSMENT

Two U.S. Air Force contracts were awarded to Sporian Microsystems to develop small, field-deployable sensors for use in solid rocket motor heat assessment in the field or depot.

One project will use Sporian's AssetOverseer SS family of accelerometers to focus on sensing potentially damaging vibrations and impacts. The other project will monitor solid rocket motor bore vapor chemistry.

"The system should help increase operational readiness and reduce the cost of ownership by extending the service life of assets and reducing lot level replacements based on time alone," says Brian Schaible, of Sporian. "We expect to develop a low-power, networked system that will give an unprecedented, yet cost effective view of the evolving health of these systems."

#### For more information:

Sporian Microsystems  
515 Courtney Way, Suite B  
Lafayette, CO 80026  
Phone: (303) 516-9075  
Fax: (303) 516-9116  
info@sporian.com  
www.sporian.com

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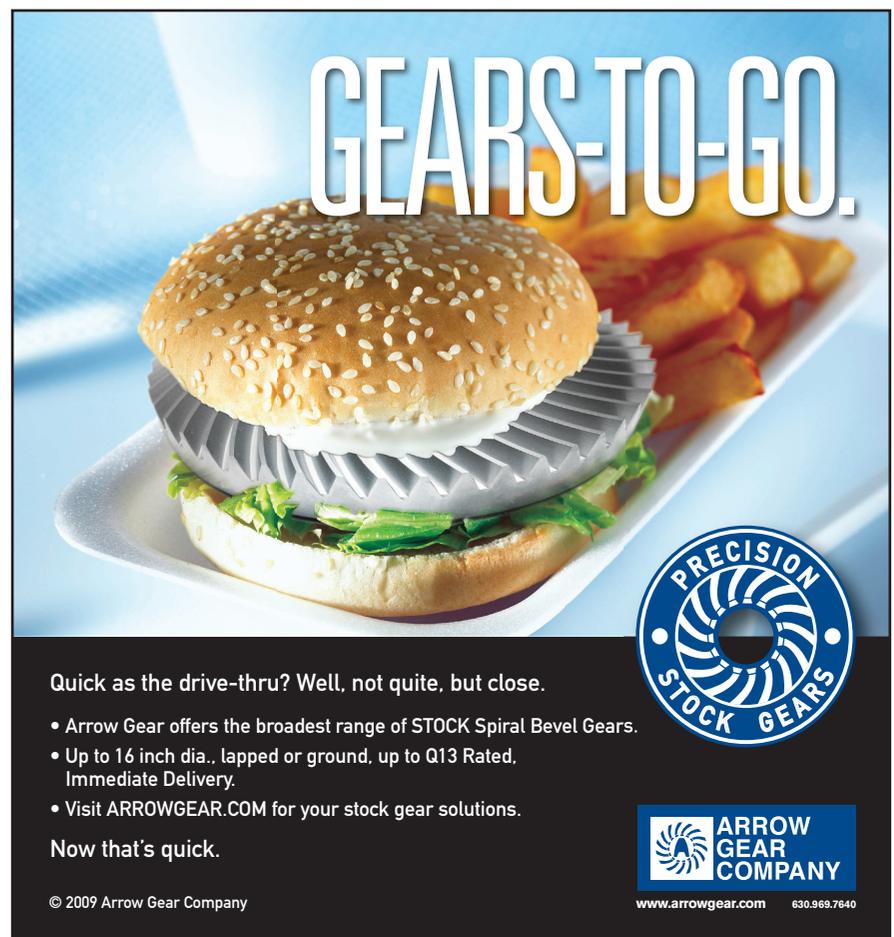
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# product news

shaft misalignment. The BK3 has high torsional stiffness to contrast its low moment of inertia, so it quickly handles indexing and reversing servo applications.

These couplings are manufactured with a tapered conical clamping component, which allows for high shaft clamping forces without keys, compared to other hub designs. For help in tight spaces, the BK3 has disassembly screws.

Clamping sleeves are custom bored on each side for shaft diameters from 10 to 80 mm (0.39 to 3.13 inches). They are available in sizes for torque capacities from 15 to 10,000 Nm (133 to 88,500 in-lbs.).



## For more information:

R+W America L.P.  
1120 Tower Lane  
Bensenville, IL 60106  
Phone: (630) 521-9911  
Fax: (630) 521-0366  
[www.rw-america.com](http://www.rw-america.com)

## Linear Actuator

### GENERATES HIGHER LOADS

The Series 500 programmable linear actuator from Nook Industries offers an expanded performance range in generating higher loads, longer life, increased duty cycles, higher speed and programmability. The series provides



versatile, precise control for a range of market applications, including military, packaging and automotive.

Developed by Nook's Precision Actuator Group, the Series 500 has an optional external Linear Position Sensor (LPS) that provides programmable positioning and verification feedback for both parallel and higher speed in-line configurations. Load capacities range up to 550 lbs. for in-line configurations with parallel configurations ranging up to 1,000 lbs., with stroke lengths from 2–24 inches. Custom lengths are available on request.

The linear actuator is designed to configure with stepper or servo motors and controls, either supplied as a complete system—including motors and controls—or with just a motor. For continuous high-speed, high-cycle rate applications, ball screw drive designs are available, and they operate at speeds up to 25 inches per second. For low duty cycle applications where self locking is needed to hold loads with a brake or power loss, acme screw driven designs are an option.

Nook's Series 500 is designed with T-slot extrusions for adjustable limit switches and the optional external LPS. The LPS is a non-contact/no-wear sensor with a small package size that needs a short operating space, which

is half the space LVDTs or rod and cylinder pots require. It can fit in small spaces and offers the same benefits of magnetostrictive sensing.

“Whereas normal applications only require theoretical positioning, the Series 500 LPS option provides a defined linear positioning lock for advanced accuracy and programmable control,” says Christopher Nook, CEO of Nook Industries.

Other benefits of the LPS are a choice of analog or self-interrogating PWM signals; use with printed circuit-level supplies of +5 VDC; no periodic re-calibration necessary; optional supply voltages, which allow for use in +12 VDC; and customizable reading direction.

The Series 500 actuator offers a stepper controller option, which is capable of full, half-step or micro-stepping, with a 10-foot motor power cable included. A servo controller is the other option, which includes a controller and amplifier, with 10-foot motor power cable and feed-back cables included.

More options are available for mounting styles, rod ends, brakes, protective bellows, stroke lengths and linear encoder contained inside the actuator. The Series 500 actuator also meets the IP65—Ingress Protection—environmental rating for products,

which guarantees resistance against dust and water.

## For more information:

Nook Industries, Inc.  
4950 East 49th St.  
Cleveland, OH 44125  
Phone: (216) 271-7900 or  
(800) 321-7800  
[www.nookindustries.com](http://www.nookindustries.com)

## Linear Roller Bearings

BOOST LOAD CAPACITY 20 TIMES



The RW64-V RoundWay Linear Roller Bearing from Thomson is a four-inch bearing with a dynamic load capacity of 70,000/bf (310,800 N), which is 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 and 31 m/s.

“Thomson RoundWay Linear Roller Bearings are specifically engineered to withstand extreme loads, speeds, temperature and contamination, and have the unique advantage of providing high load capacity without the instal-

lation costs typically associated with Profile Rail products—and with significantly greater resistance to environmental contaminants,” says Ellen Steinbrunner, product manager. “RoundWay users will also benefit from what we call the ‘RoundRail Advantage’—a round shaft enables the

bearing to rotate, thereby eliminating the potential for induced torsional stresses and facilitating reliable and robust operation, even when mounted on less-than-ideal surfaces.”

The RoundWay Linear Roller Bearings operate on Thomson 60

**continued**

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Case LinearRace shafting, and they are available in sizes ranging from 1/2 inch to 4 inches, due to the RW64-V addition. They feature concave rollers to handle high loads with a 10 million inch L10 rated travel life. RoundWay chain-link rollers enable high travel speeds up to 100 ft/s (31 m/s). They are suitable for use in severely contaminated applications, such as metal removal, paper and wood processing, and granite quarrying—applications in which metal chips, paper flour, wood chips and abrasive dust would be normally destructive.

Featuring an all steel and iron construction increases rigidity and durability in extreme environments. A lateral self-alignment feature means that the bearings may be out of parallel as much as 0.1875 inches, so they are suited for gantry system use and other applications where it is difficult to maintain the necessary 0.001 inch or better parallelism tolerances needed over long rail lengths that may be spread far apart.

A trunion pin feature enables pitch self-alignment for operating in inaccurate mounting surfaces. A  $\pm 0.030$  inch height adjustment can set preload in “locked-in” arrangements. This is ideal for applications that require maximum stiffness and minimal deflection.

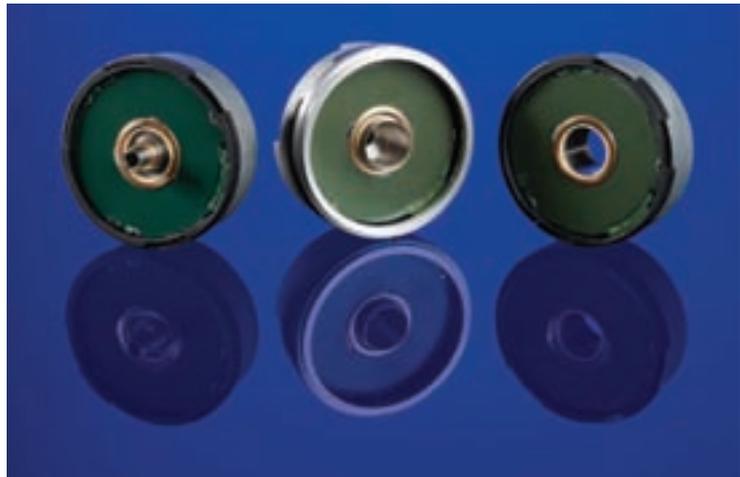
A recirculating ground roller assembly is capable of spanning gaps in a shaft for quicker and more efficient pallet changing in assembly and packaging systems. This feature provides a 0.005 coefficient of friction and a  $\pm 0.003$  height tolerance that produce energy efficient, high load and precise linear motion with smoother, quieter operation than anti-friction linear bearings and guides.

## For more information:

Thomson  
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Wood Dale, IL 60191  
Phone: (540) 633-3549  
Fax: (540) 633-0294  
Thomson@thomsonlinear.com  
www.thomsonlinear.com

## Motor Feedback Systems

OPERATE BEARING-LESS



The SEK/SEL52 Capacitive Motor Feedback Systems from Sick Stegmann, Inc. are high resolution devices with HIPERFACE interface that come in a 52 mm housing. They are available in single-turn and multi-turn versions with servo clamp, hollow shaft or tapered shaft configurations. The bearing-less design provides robust operation when compared to traditional motor feedback systems.

“At the heart of SEK/SEL52 motor feedback systems is a bearing-less, capacitive sensor element that is not only an attractively-priced alternative to the resolver, it also offers enormous technical benefits,” says Jon Whittelsey, application engineer. “Impulses are generated by a star-shaped rotor that changes, through its rotation, the dielectric material between the sender and receiver PCBs. The holistic scanning process means that neither radial nor axial tolerances introduced during rotor rotation can impair the accuracy of measurement. Moreover, the system configuration permits extremely low power consumption. In terms of robustness and precision, the SEK/SEL52 delivers the very features needed in the lower end segment of industrial position and speed determination applications.”

The SEK/SEL52 systems are an alternative in applications that use resolvers, and also where users require higher performance final positioning, such as servo motors, handling drives, feed axis or standard robot applications. They can be used in traditional motor feedback applications that need higher than normal robustness for reliable operation in high temperature and vibration environments common in textile machinery and mining applications.

With 16 sine/cosine periods, 512 steps per revolution resolution and one (single-turn) or 4,096 (multi-turn) steps per revolution, the systems are rated for up to 100 g/10 ms shock resistance, 50 g/10...2,000 Hz vibration resistance, and they operate in temperatures ranging from  $-40$  to  $+115$  degrees Celsius (single-turn) or  $-20$  to  $+115$  degrees Celsius (multi-turn).

A gearbox combined with magnets and Hall sensors activate the multi-turn properties of the SEL versions. All electronics are part of an integrated ASIC, so an external evaluation unit is unnecessary.

HIPERFACE is an eight-wire interface standard that enables commutation, speed regulation and position information from the same

device. The mechanism comprises two wires for an RS485 link, four wires for sine and cosine signals and two wires for power supply; whereas, a traditional system could have 19 leads.

The motor feedback systems with HIPERFACE combine incremental and absolute encoder functions.

#### For more information:

Sick Stegmann, Inc.  
7496 Webster Street  
Dayton, OH 45414  
Phone: (800) 811-9110; (937) 454-1956  
Fax: (937) 454-1955  
sales@stegmann.com  
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#### For more information:

Ogura Industrial Corp.  
P.O. Box 5790  
Somerset, NJ 08875-5790  
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Fax: (732) 271-7580  
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## Power Up!



If you have a background in gears, bearings, motors, belts, couplings, sensors or actuators, we'd like to talk to you. Power Play, the back page feature in *PTE*, is all about your industry. If you've got a funny anecdote, an interesting observation or perhaps a limerick on motion control, feel free to send it our way. This column is dedicated to the stories too radical to make the cut in industry or product news. We need story ideas, and we're confident you can provide them.

The rules are quite simple: submit a story idea about the power transmission industry, make it entertaining as well as informative, and become a *PTE* magazine editor-at-large today (salary not included). Submit your award-winning material to [publisher@powertransmission.com](mailto:publisher@powertransmission.com).

# Honing a Competitive Advantage:

SUNNEN GROWS PRODUCT PORTFOLIO WITH MOTION CONTROL SOLUTIONS FROM SIEMENS



With the adoption of a new basic servo positioning package from Siemens, Sunnen's HTA tube-hone bore sizing and finishing system brings affordable performance capabilities for tube machining.

Using market insight coupled with new technology, Sunnen has been able to grow in a downward economy. The company expanded its platform of high production, high-precision bore sizing and finishing systems to include honing systems for maintenance and repair operations. The deeper secret to this 85-year-old OEM's success is its ability to adopt simpler, yet more advanced and cost-effective motion control.

### Problem and Opportunity

Traditionally, the company's bore sizing and finishing systems have been customized, high-end designs. Having identified a new market segment opportunity, the immediate problem was system cost versus the market's willingness to pay. But the larger, long-term problem was how to evolve the company's technology platform while maintaining its competitive advantages in systems design, manufacturing and service efficiency.

"When we went into this, the costs were not in line with the envisioned spec," Carl Mik, product design engineer, recalls. "The stroker would be an AC motor and the spindle would be an AC motor. We wanted some sort of encoder on the AC motor for the stroker to hold relative position, and then we wanted a touch screen display. The costs were becoming prohibitive."

An early breakthrough came when Sunnen learned that Siemens could offer a basic performance servo motor with resolver feedback for the price of an AC motor. But Sunnen still faced the challenge of developing an all new system design for low-cost honing that would be consistent with the company's established product platform, supported by the multi-axis high-performance Sinamics S120 drive line and Simatic automation platform from Siemens.

This need for platform consistency is an industry-wide challenge, as OEMs and their end-customers evaluate the cost-performance advantages of emerging motion control solutions versus traditional hydraulic, mechanical and electro-mechanical machine system designs. For Sunnen, this evaluation has been facilitated by Siemens' mutual interest in the possibilities of new servo-based systems design.

### Synchronized Innovation

"I have been on the motion control side from the beginning," says Mike Nikrant, Sunnen product engineer. "Back

in 2002–2003, we did a lot of research on different communication bus structures and what people had to offer. We chose Profibus because of component availability and cost, along with its high acceptance in the market. Then we began using Siemens drives because they were the most flexible and configurable. We went with them on our KGM product line, which required extreme accuracy for all axes of motion when finishing cylinders. Then, we used a lot of the same components when we introduced our SV vertical honing machines."

Sunnen's product platform evolution soon fell into that of the Siemens drives technology platform, Nikrant recalls.

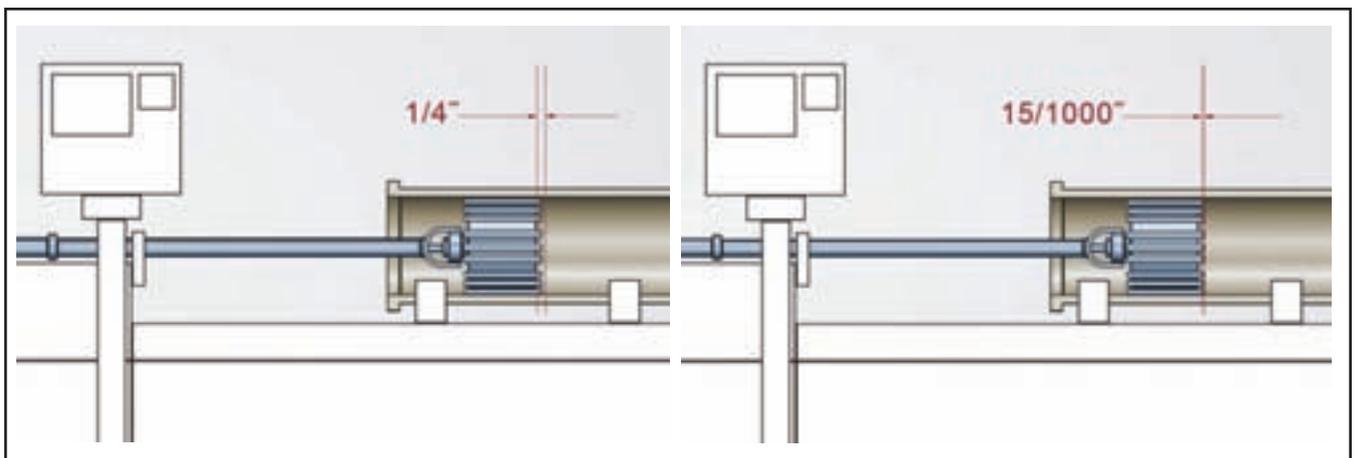
"When we first started the SV vertical honing line, we were attempting to use ball screws. At the time there was only one company that had a motor that could handle the load we were doing because of the reciprocation. Then Siemens designed a motor that fit our application requirements and assisted us in our initial synchronization and tuning. We established a common DC bus drive structure with the Siemens drive platform, which made it possible to have all the same drives in the system for servo or vector applications. It is a very clean and proficient design because there are no mixes and matches of drive types. Everything just flowed a lot better with that solution and our customers like this common approach and service efficiency."

### Advanced—yet Simple—Positioning

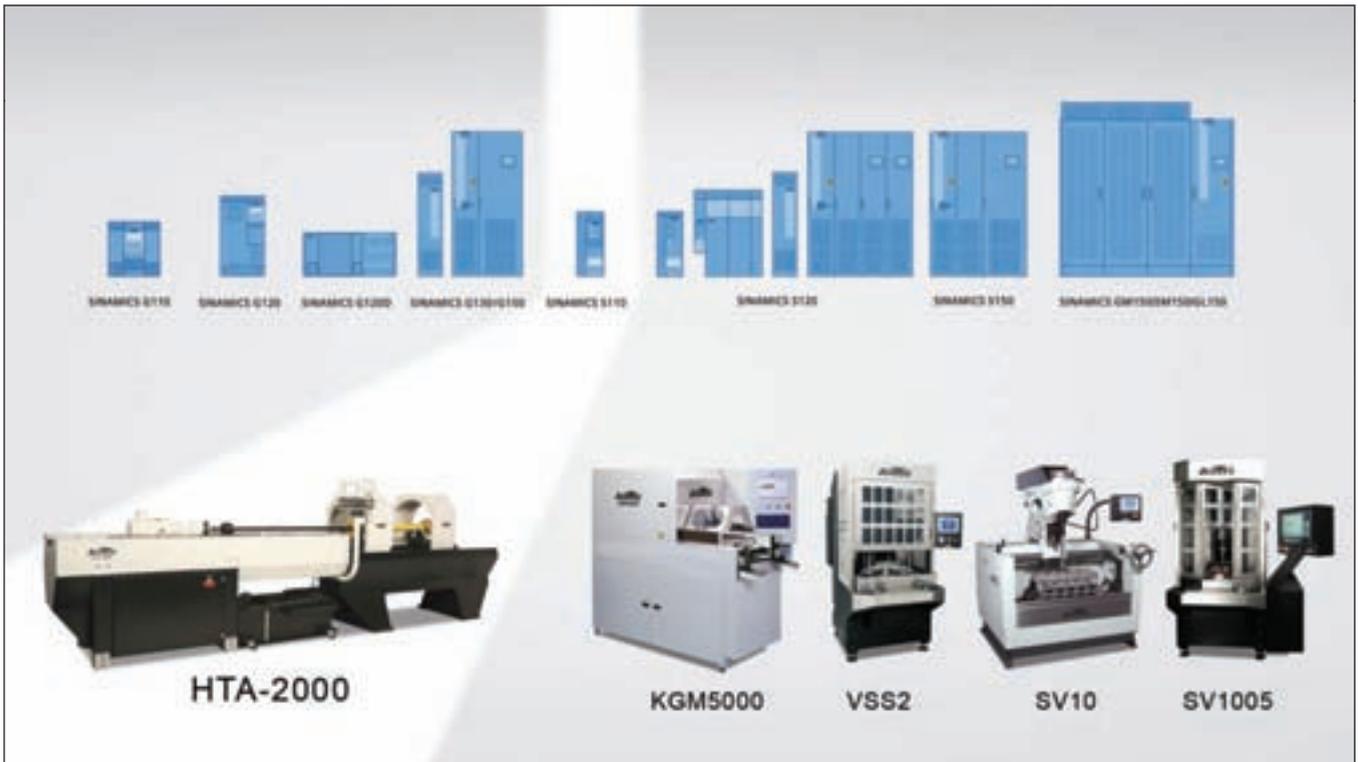
As Sunnen's attention moved last year to the development of a basic large-bore horizontal honing system—or HTA—both Nikrant and Mik were on the same page regarding product platform evolution. Joining them were other engineering team members, including Russ Jacobsmeyer, the company's chief technology officer, who oversees technology adoption in support of Sunnen's global growth.

According to Jacobsmeyer, Siemens brings a global support capability that is becoming increasingly important to Sunnen's growth strategy. He says the relationship is based on more than just meeting a spec. It is based on system performance exploration. "One reason why we like working with Siemens," Jacobsmeyer adds, "is we have built a partnership with them, and they understand what is required of our products. They can make suggestions in an intelligent manner,

**continued**



**Quarter inch repeatability to 15/1,000 inch repeatability (before and after). The new HTA machine's repeatable reversing accuracy was greatly increased using Siemens new Sinamics S110 servo drive.**



**Sunnen has expanded its product platform (bottom row) to offer both high-end and basic honing systems. Siemens' evolving motion technology platform (top row) continues to support Sunnen's strategic growth.**

helping us solve problems that add value for our customers. Precision bore sizing and finishing is a very niche capability that requires significant engineering content and resultant product performance. Our customers value what we have to offer with our systems and our ability to solve their difficult bore sizing and finishing applications."

Jacobsmeier recalls that when the engineering team first looked into developing a new basic bore sizing and finishing system to fill a gap in the Sunnen product line, Siemens was

the logical resource.

In regard to control system design, "We didn't have anything at that point," Jacobsmeier says. "We heard from our customers and engineers in the field that there was a need for a basic economical system. However, we were not sure if we could satisfy the product requirements and meet the market price point."

Mik agreed about the scope of the engineering problem. "Remember, this was August and September of last year," Mik says. "So I started programming and put a prototype system together, and the biggest issue I found was spindle response time, due to delays in signals between the display, PLC, and a servo and general purpose drive. We had 300 milliseconds altogether, which may be acceptable from the standpoint of introducing a basic system at a basic system cost, but it was unacceptable for our application, so we decided to go back to Siemens."

This was in January, with production of the new basic system to occur in May or June, Mik explains. "That is when Siemens told me that they had this new Sinamics S110 basic performance servo drive coming out, along with their new MP177 six-inch touch display, which allows soft PLC capability with the WinAC MP software. The direct connection between Sinamics S110 servo drive and MP177 display over Profibus made the system very cost effective and responsive. Not only did this reduce components, but [it] also made it possible for us to stay in line with our migration to a single platform on the Sinamics family of drives because we could use the same Step 7 software already being used to program our S7 automation on other machines."

According to Mik, the new basic servo positioning pack-



**The Drive-ClIQ connection between motor and drive allows automatic configuration at the motor's power-up, and encoder parameters provide a plug-and-play servo system.**

age gave Sunnen an unexpected level of performance for basic machine development. “If you think about trying to stop an AC induction motor to do stroking back and forth, it’s pretty difficult. Even when applying dynamic braking and braking resistors, traditionally acceptable reversals on a tube-hone machine are around a quarter-inch repeatability. But our tests show the new system is achieving under 15/1,000 of an inch, and this is a low-cost system.”

Mik explained that the key components of the new system are an easily programmable soft PLC at a low cost point and a low-cost distributed motion control—solutions brought about by the Siemens Sinamics S110 drive and 1FK7 servo motor. This also accomplished a new level of simplicity for this basic machine because the Drive-Clq cable between the Sinamics S110 drive and motor provides automatic configuration as well as the feedback of the servo system. Additionally, the MP177 with WinAC software made the configuration and communication simple and straightforward.

“We have a color TFT display, we are programming everything with ease, and we can even automate the machine. It’s not in the original spec, but we could do this to add even more value to our offering. And spindle response time is down in the 25-millisecond range, instead of 300,” adds Mik. “For such a low-cost machine, I cannot believe we have such a capable system.”

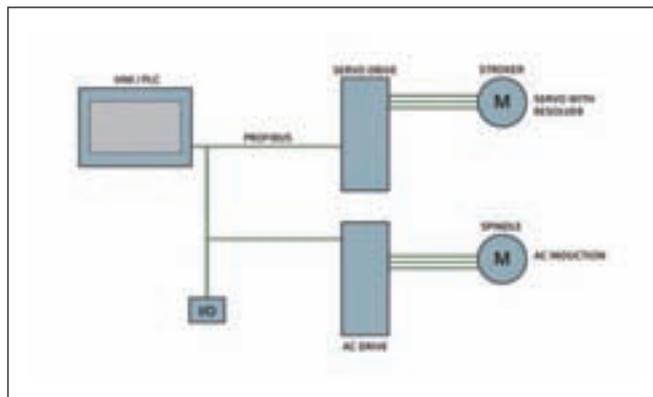
#### Platforms for Growth

Mike Nikrant believes alignment between the Sunnen and Siemens product platforms is helping to drive Sunnen’s business forward. The decision to develop new, more basic systems was facilitated by the product range of Siemens motion control solutions. The two companies are already talking about performance improvements for Sunnen’s next generation of high-end PC-based systems with integrated safety functions.

“Siemens is coming out with motion control ideas that fit what we want to do,” Nikrant observes. “For our high-end PC line, we are trying to come up with a common circuit for multiple machines. Siemens drives, bus structures and components fit really well in that respect because of the way some of the logic can be split up as far as the controllers go. Their Sinamics drives are easy to use and highly configurable. The same piece of hardware can be used for multiple functions. Some systems can be configured to use any functionality the user can conceive. On other systems, where there is no need for all that functionality, a product like the Sinamics S110 servo system provides a simple and efficient solution. And control, programming and communication are all the same. The Siemens platform works well for us, for both the higher and entry level.”

Jacobsmeier adds, “Building upon common platforms from Siemens, which are stable and high performance, serves our customers and entire Sunnen organization quite well—around the globe, enabling us to more efficiently use our global resources to engineer, construct, service and sell product.”

According to Sunnen’s David Moehn, manager of engineered machines and custom systems, the adoption of the Siemens Sinamics S110 servo drive is just part of the story



**The above represents a bore sizing and finishing system, with call-outs to components and function. Sunnen provides end-users, including engine builders, with customized systems that may include automated parts loading, in-process or post-process gauging and prescribed abrasives.**

for Sunnen.

“The bigger story is Siemens’ ability to work with us, standing with us and helping us find solutions,” Moehn says. “This relationship continues to improve our market success by getting us to market faster and ahead of competitors.”

Phil Hanna, Sunnen’s global product manager for machines, agrees. “The goal of partnering with Siemens has been to standardize control systems across all of our machine platforms—horizontal, vertical and tube hones, of which the new HTA machine is the latest addition as an entry-level market machine. This is part of an ongoing effort at Sunnen to produce modular designs that can easily be modified to new configurations. The SV machines are a perfect example of this concept. The modular columns with integral Siemens controls can be easily configured on a custom basis to optimize the customer’s process. One, two, three, etc., columns depend on the customer’s stock removal and geometry requirements. This lends great flexibility to the product line. And with component standardization and Siemens’ global presence, the machines are much more supportable globally because of Siemens’ technical expertise and resources. 

#### For more information:

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# Soft Drink Solutions

SERVO SYSTEM HELPS CREATE  
MORE EFFICIENT BEVERAGE PALLETIZER



Using Rexroth's IndraDrive M drives and MSK servo motors, T-TEK saw a 15–20 percent improvement in apron and compression cycle times (courtesy of Bosch Rexroth).

**W**ith the high demand and consumption of soft drinks, fast production is an obvious challenge for packaging companies. How can a company control energy consumption, soft handling of lighter and thinner packages and palletize a widening range of materials? T-TEK Material Handling, Inc., a specialist in building material handling systems for the beverage industry, recently developed a new model to address these specific issues. With the assistance of Bosch Rexroth and their distributor, FPS Technologies, T-TEK developed a servo system that could increase speed, provide better material handling and use less energy.

“With Rexroth’s servo technology, we’ve significantly reduced the machines’ energy consumption,” says Brian Traff, vice president of T-TEK. “Although our goal was to improve the performance of our packaging capabilities, the energy savings that accompany this solution is a welcome bonus to our customers.”

T-TEK’s TS Series three-axis palletizer is designed to handle a variety of packaging configurations of cans or bottles in layers containing as many as 32 packages each. During beverage production, the filled packages move down the packaging line to the palletizer, which handles them at a rate of up to 180 packs per minute. They are then oriented into a specific pattern—each layer is offset from the previous—and the entire accumulation is placed on the pallet. The filled pallets proceed down a conveyor belt for shrink-wrapping and pickup.

During development of the system, T-TEK identified three primary components where speed and energy usage could be improved: apron, compression and hoist. The apron allows each layer to drop cleanly on the pallet, the compressor applies pressure and holds the layer in place and the hoist is responsible for raising and lowering the pallets.

T-TEK immediately turned to Bosch Rexroth’s electric drives and controls technology for servo solutions that could improve the speed and energy usage in these areas. By incorporating Rexroth’s IndraDrive M drives and MSK servo motors, T-TEK found a solution that allowed the components to move faster but decelerate more smoothly with less jarring. This is crucial not only for extended component life and lower maintenance costs, but because the demand for sustainability in packaging has led to the use of lighter and thinner materials for product packaging.

Since plastic bottles are now produced using half the plastic used two years ago, palletizers are being challenged to handle these cases at higher speeds, but more gently. Control throughout the compression process is vital, with improper handling leading to damage and waste, especially with thinner materials. The TS Series uses the Rexroth servo to maintain a high level of control for even the most delicate packaging.

An immediate benefit from incorporating Rexroth’s drives into the TS Series involves the concept of regenerative energy. This is energy created during an application where the load possesses more energy than the motor, which is often the case when lowering heavy pallets. Motors convert electrical power into mechanical power for the machine. However,

continued



**Rexroth’s drives brought significant improvements to the TS Series hoist operations (courtesy of Bosch Rexroth).**



**The TS Series from T-TEK not only performs faster than earlier models, but it uses less energy (courtesy of Bosch Rexroth).**

servo motors have the potential to generate electricity, too. Simply put, as the heavy pallet decelerates, the braking motor turns into a generator, converting mechanical power back into electrical power, which needs to be removed. Traditionally, most systems would take this excess energy and burn it off using a brake resistor.

Instead of brake resistors, the palletizer uses Rexroth's MSK motors, IndraDrive M servo drives and HVR power supply to take the extra energy and regenerate it. The advantage is converting usable energy for the machine by powering the other servo motors on the DC voltage bus that may be in acceleration mode, instead of burning off the energy to a resistor.

Prior to using Rexroth's servo components, T-TEK used a 20 hp motor to power the hoist. Rexroth's MSK servo motors produce faster results with only a 10 hp motor that permits better case handling and greater load deceleration control. Rexroth's MSK motors feature intelligent feedbacks, meaning the drive can read each motor for its current, torque and speed capacities, thereby allowing for greater motor control and faster startup. With the small motors and regenerative drive capabilities, this creates additional energy savings.

"The overall energy savings is estimated to be around 20 percent compared to the machine T-TEK built about six months previously," Traff says.

Incorporating these features into the TS Series has led T-TEK to explore other new developments, including the conversion of other motor, hydraulic and pneumatic cylinder applications to servo control.

"We're seeing that the benefits extend well beyond the considerable performance improvement," Traff says. "We are investigating several other applications to implement as servo solutions."

In addition, the engineering support from Rexroth has been instrumental during the development of these new high-speed palletizing systems.

"Rexroth offers good local, as well as solid international support. We have applications in Mexico and Canada, and the Rexroth staff has always been extremely helpful from the design phase through field implementation and follow-up," Traff says. "Rexroth has helped make the TS Series vastly outperform our competitors. Their strong reputation within the packaging industry made them an easy selection." 

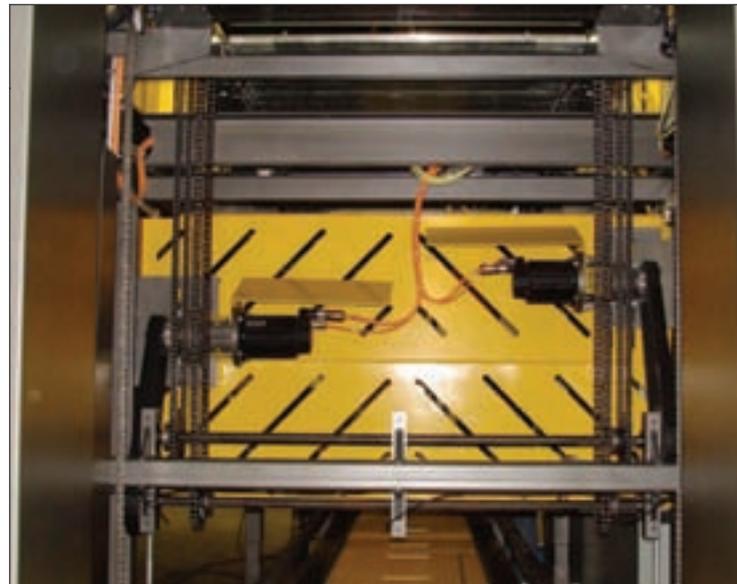
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[www.t-tek.com](http://www.t-tek.com)



The need for more delicate material handling led T-TEK to develop the TS Series for faster speeds, but more gentle operation (courtesy of Bosch Rexroth).



T-TEK can now produce faster results using smaller Rexroth MSK motors (courtesy of Bosch Rexroth).

# Start, Design and Market Your Engines

Honeywell, SAE team up for unique middle school initiative

Matthew Jaster, Associate Editor



The Honeywell/SAE Student Automotive Design Challenge allowed students the opportunity to research, design, test and build electric, gear-driven toy cars (courtesy of Honeywell International).

**A**ccording to Matthew Miller, director, Society of Automotive Engineers (SAE) Foundation and pre-college programs, there are only two groups in the world that consider engineers rock stars: "Other engineers and 11 to 14-year-olds."

Kids in this age group are endlessly curious about how things are made, what it takes to make them and how they can be made better. During a time when there seems to be less interest in Science, Technology, Engineering and Mathematic (STEM) programs, there are still companies and organizations trying to influence the next generation to consider careers in these fields.

Honeywell International partnered with the SAE to specifically address engineering education in the classroom with the Student Automotive Design Challenge. This program, based on SAE's A World in Motion (AWIM) "Motorized Toy Car" curriculum, provides students an assignment from a mock corporation to research, design, test and build electric, gear-driven toy cars.

"Last year, we partnered with the SAE for the Student Automotive Design Challenge to get students excited about science and math," says Joe Toubes, vice president of communications for Honeywell Transportation Systems. "Students work in design teams of four to build a vehicle and write proposals, draw sketches, model designs and develop plans that meet the specific set of design requirements



**Students were asked in the 2009 competition to incorporate a green component in the toy design (courtesy of Honeywell International).**

identified in market research. Students share their results with their international peers via an online forum, designed to directly connect students at a global level."

Toubes hopes the program will prompt students to continue to pursue an interest in engineering or at the very least an appreciation for the work it takes to design and build a product.

"We need talented innovators to find new and better ways to meet the challenges of today and tomorrow, not



**Design teams of four were instructed to create a toy car product for a mock corporation (courtesy of Honeywell International).**

just for our company, but for the world," Toubes says.

During the final week of the program, each class was asked to select the winning car, which was then entered into the global contest against other schools. The top three vehicles in the competition were selected by Honeywell employees through an online survey. The Student Automotive Design Challenge expanded in 2009 to include schools from China, the Czech Republic, France, Germany, India, Mexico, Switzerland and the United States.

"The international component adds a level of interest and prestige for the students and schools. They are very excited about interacting with other students from around the world. Kids who would normally never have the opportunity to interact are coming together around an engineering program, which is pretty cool from our perspective," Toubes says.

Toubes adds that the international component has also been beneficial for Honeywell.

"Since we are committed to improving the communities where our employees live and work, we're excited to offer

the program, not only to local communities, but also to our dedicated employees who have been going into the classroom weekly for the duration of this two month program."

A green component was also added to this year's competition where students either had to use recycled materials, materials that can easily be reused or have a "green" concept behind the design of the vehicle itself.

"We've been impressed by how innovative the students have been," Toubes says. "Each school has taken the challenge to heart and has produced excellent work. Kids today seem to be interested in how engineering can be utilized to develop new and cleaner technologies."

After viewing the most recent designs, Miller at the SAE is not as concerned about the future of engineering as he used to be.

"The future is so bright in engineering and manufacturing. These kids brought creativity, innovation and a real sense of community to each project. The end result was nothing short of exceptional. Our job is to continue to uncover this middle school talent and raise awareness on the opportunities out there in engineering."

Miller adds that more can be done at the federal and state level to make sure these subjects are getting the proper amount of time and commitment in the classroom.



**The competition allows students to interact with peers from around the world and share results via an online forum (courtesy of Honeywell International).**

"We pay a lot of lip service on these issues," Miller says. "We talk about how important STEM programs are to the next generation, but the world is clearly not doing enough to get the message out. More needs to be done to bring industry into the classroom."



**The winning car from each class was entered into a global contest to compete against other schools (courtesy of Honeywell International).**

Miller deems these engineering education programs vital to the future of engineering and manufacturing.

“It’s one of the most important things we do at the SAE, promoting these areas globally and working with manufacturing companies to develop the next engineering workforce. Programs like this give kids the knowledge, experience and appreciation required to work in these fields.”

But can an eight-week program influence an 11-year-old toward a career in engineering and manufacturing?

“Our chief technology officer at Honeywell, Karl-Heinz Bauer, has said that an engineering competition in middle school inspired him to be an engineer,” Toubes says. “It’s taking math and science, which some kids may find dry subjects, and making them fun.”

Competitions like this are also beneficial for the teachers. A unique and diverse education community was formed when Honeywell and the SAE brought all the participating teachers together at Honeywell’s site in New Jersey for training sessions to learn the curriculum.

“The teachers seemed to be just as enthusiastic and excited as the students,” Miller says. “It’s a nice change of pace when you’re giving educators a unique way to present these lessons in the classroom.”

Adds Toubes, “What we have heard from teachers is that they are always looking for new ways to teach math and science. I think programs like this that meet such high curricular standards are a helpful tool to boost learning.”

The feedback from the program has been outstanding, according to both Miller and Toubes.

“In Torrance, a parent told us, ‘Your program works! My daughter wanted to be a chef; now she wants to be an engineer.’ We have also received e-mails from schools and individual parents not affiliated with the program asking us how they can participate or get the program in their school,” Toubes says. “It makes learning math, science and engineering principles fun. It challenges students to be innovative and demonstrates how these lessons can be applied to their everyday lives.”

Miller believes the current crop of middle school kids with an interest in engineering and manufacturing will be vital in changing the way the world

conducts business.

“When you start talking about alternative fuels, the green movement and urban development, it’s this generation that’s going to have to find a way to fix things.”

For more information on the Student Automotive Design Challenge and to look at photos of some of the participating classrooms, visit [www.honeywell-sae.com](http://www.honeywell-sae.com). 

## Be Proactive

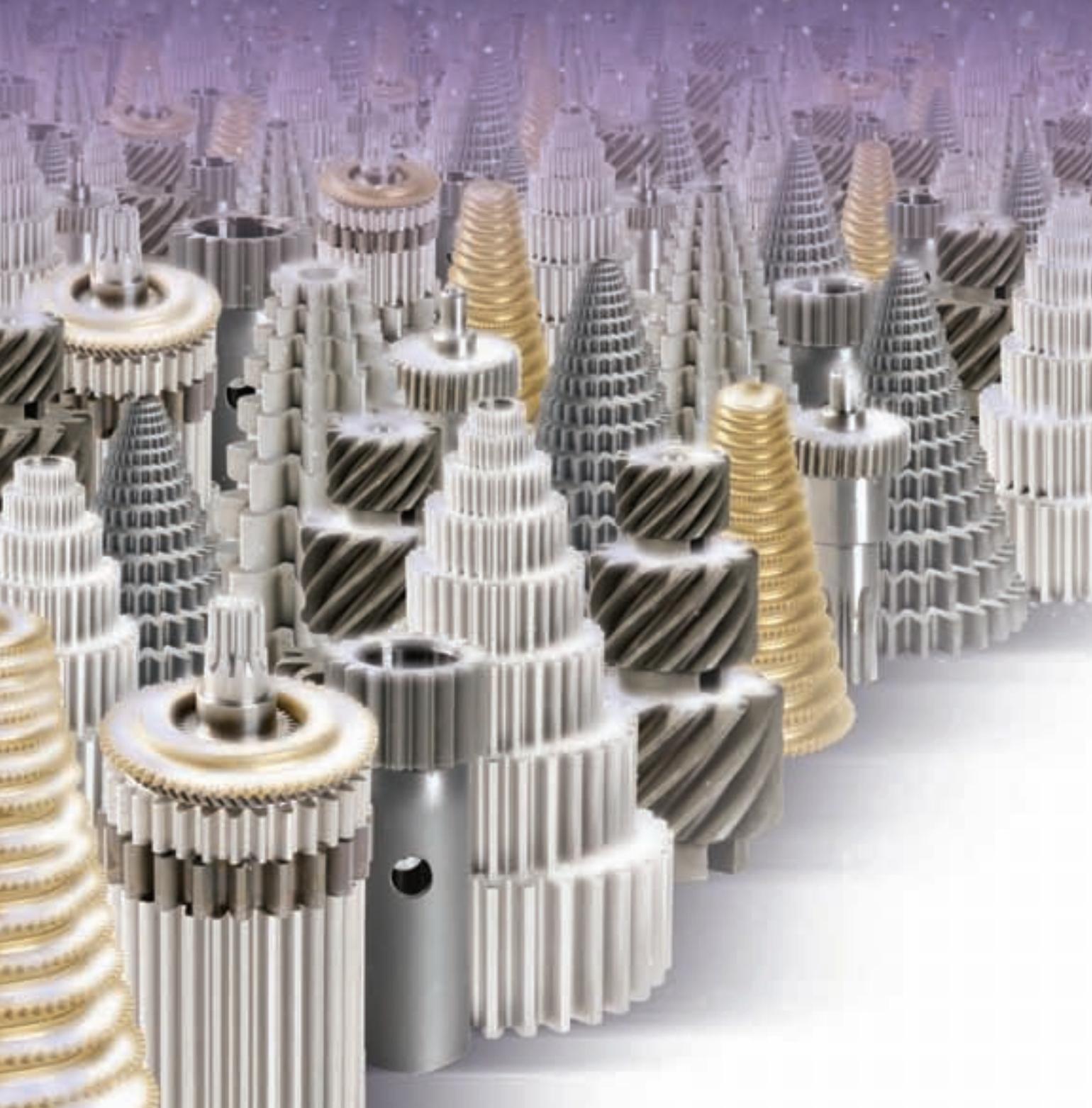
The Society of Automotive Engineers (SAE) is always looking for assistance from the manufacturing community when it comes to student engineering programs. “We’re trying to offer as many options and opportunities to college, high school and junior high students as possible,” says Matthew Miller, director, SAE Foundation and pre-college programs. The SAE Foundation serves today’s students in an effort to help them become tomorrow’s engineers and scientists. Miller believes both the industry and education communities play a vital role in preparing students to become the next generation of innovators. It starts with funding STEM education programs or volunteering your time and expertise to local competitions.

Supported programs include the award-winning A World in Motion (AWIM) curriculum that blends science and mathematics into age-appropriate design challenges and the Collegiate Design Series (CDS) that allow engineering students to receive hands-on experience in the design, manufacture and testing of real vehicles. The SAE Foundation also offers a full program of scholarships, grants, loans and award opportunities for high school seniors, undergraduate and graduate engineering students and professionals.

“In the simplest sense, we’re trying to provide a sense of practicality for students in regards to science and math,” Miller says. “This wouldn’t be possible without the help of our corporate sponsors and volunteers.”

If you’re interested in working with the SAE Foundation on student engineering and manufacturing initiatives contact the SAE at (724) 722-8515 or visit [www.sae.org](http://www.sae.org).

WHO SAYS YOU CAN'T SEE THE



# FOREST (CITY) FOR THE TREES?

*On behalf of all the folks at **Forest City Gear**, we wish you a very Merry Christmas and happy holiday season. It's during this special time of year, as we reflect on family and friends, when we're most thankful for the blessings we've received. Sometimes, especially in the tough economy we've experienced this year, it's good to pause and just say "thank you" to all our business associates. We really appreciate your business and the continued confidence you place in our abilities.*

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# Direct Drive Technology and Its Impact on Gearmotor Business

Masazumi Suzuki

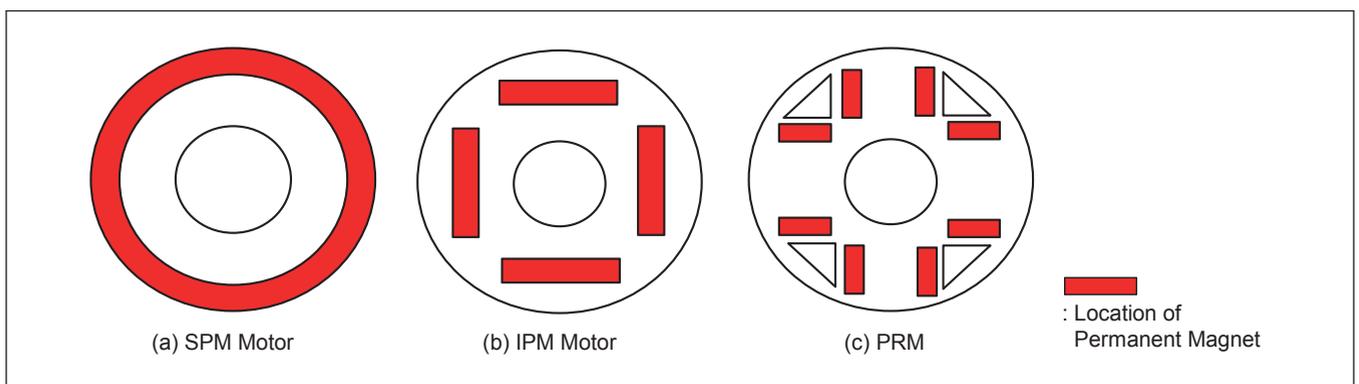


Figure 1—Rotor construction of permanent magnet motor.

## Introduction

Sumitomo Drive Technologies manufactures PTC (power transmission and control)-related products such as gearmotors, gearboxes and inverters used in various industries. Para-

max parallel and right-angle gearboxes are used in the steel industry, mining conveyors and material handling machinery, etc. Cyclo-concentric gearmotors and hyponic right-angle gearmotors are used in automotive conveyors, food machinery

and other applications. Although the gearmotors have been used primarily in industrial manufacturing processes, they are now being used in consumer products such as residential elevators and wheelchairs.

At the same time, environmental concerns and attention to energy saving are growing. Global warming impacted by large consumption of energy is one of the biggest environmental concerns worldwide. Therefore, energy saving, high efficiency and recycling are becoming very important, as well as low noise and vibration. As a result, direct drive (sometimes called DD) motor systems become attractive for home electric appliances and other uses. DD motors do not require gears, theoretically increasing efficiency, reliability, maintainability and responsiveness. This paper discusses direct drive technology trends and investigates their potential impact on gearmotor business based on application examples using DD motors.

### DD Motor Technology Trends

Induction motors are commonly used in applications ranging from home electric appliances to industrial process equipment, providing advantages such as simple construction, durability, reasonable cost and ease of control. But, increasing the efficiency of induction motors is a big obstacle due to the large copper loss. As previously mentioned, environmental and energy concerns are driving development of higher efficiency in motors—e.g., upwards of 70% of energy consumption in industry is by motors. So for example, highly efficient, brushless DC motors are beginning to be used in place of induction motors for home electric appliances and other applications. Brushless DC motors use permanent magnets in their rotors. This eliminates copper losses in rotors and results in higher efficiency.

DD motors are, by definition, motors that transmit power to the application directly without the use of mechanical reduction elements like gears, pulleys, chains or belts. DD motors within this broad definition are used in a wide range of applications and come in different forms. But for this presentation, we are interested in applications that until recent history had normally used gearmotors. By replacing a gearmotor with only a motor, a DD motor must typically be able to provide high torque at low speeds—not a strong feature of induction motors. Thus, commonly, most DD motors are some type of permanent magnet (PM) motors operated by an electronic controller.

### Types of Permanent Magnet Motors and Rotor Construction

Permanent magnet motors are roughly classified into two types—SPM (Surface Permanent Magnet) motor and IPM (Interior Permanent Magnet) motor (Fig.1). An SPM motor requires a holding tube that secures permanent magnets to prevent them from flying apart due to centrifugal forces at high speeds. The increase in iron loss from this holding tube degrades the efficiency. To decrease the iron content and improve the efficiency, the IPM motor has permanent magnets located in the rotor. This construction prevents the centrifugal forces from damaging the permanent magnet. This is one of the main reasons the IPM motor is used.

The inductance of an IPM motor, as viewed from its stator core, changes in relation to the location of the permanent magnets in the rotor. In addition to the magnetic torque gen-

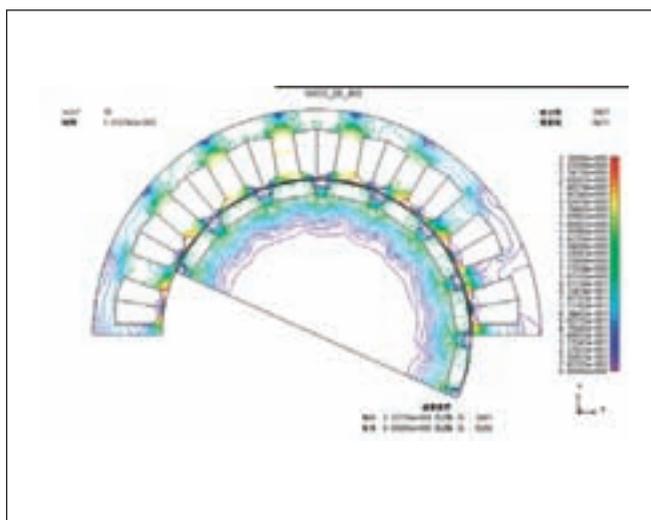
erated, the IPM motor also generates reluctance torque from inductance differences at different rotor angles generated by the intervening magnetic steel of the rotor. The IPM motor makes effective use of the reluctance torque to improve efficiency when compared to an SPM motor. A PRM (Permanent Magnet Reluctance Motor) is a kind of IPM motor. It is designed to enlarge the reluctance torque by optimally locating permanent magnets and cavities.

The output torque characteristics of PM motors are affected by magnet saturation in their cores, which depend on the size of magnets and their location. Therefore, PM motor design is optimized according to the analysis of the magnetic flux density distribution by using FEM (Fig.2).

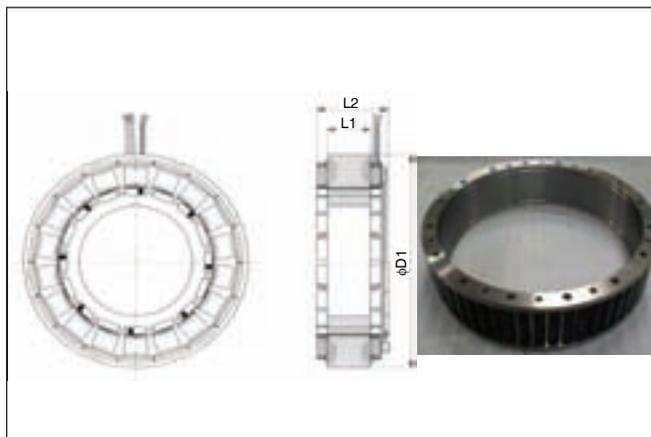
### Construction of the Stator Core of a Permanent Magnet Motor

A distributed winding system has been adopted for stators in the past. In this system, windings are wound in advance and then inserted into stator slots. The disadvantage of the distributed winding system is that the overall lengths of the windings become excessive. The effective winding length is the winding length in the slots. The windings at the ends serve no purpose other than for electrical connection, and they increase winding length by about 1/4 of the stator circumfer-

**continued**



**Figure 2—Static magnetic field analysis of a Sumitomo DD motor (3.3kW, 500r/min).**



**Figure 3—Sumitomo built-in type DD motor.**

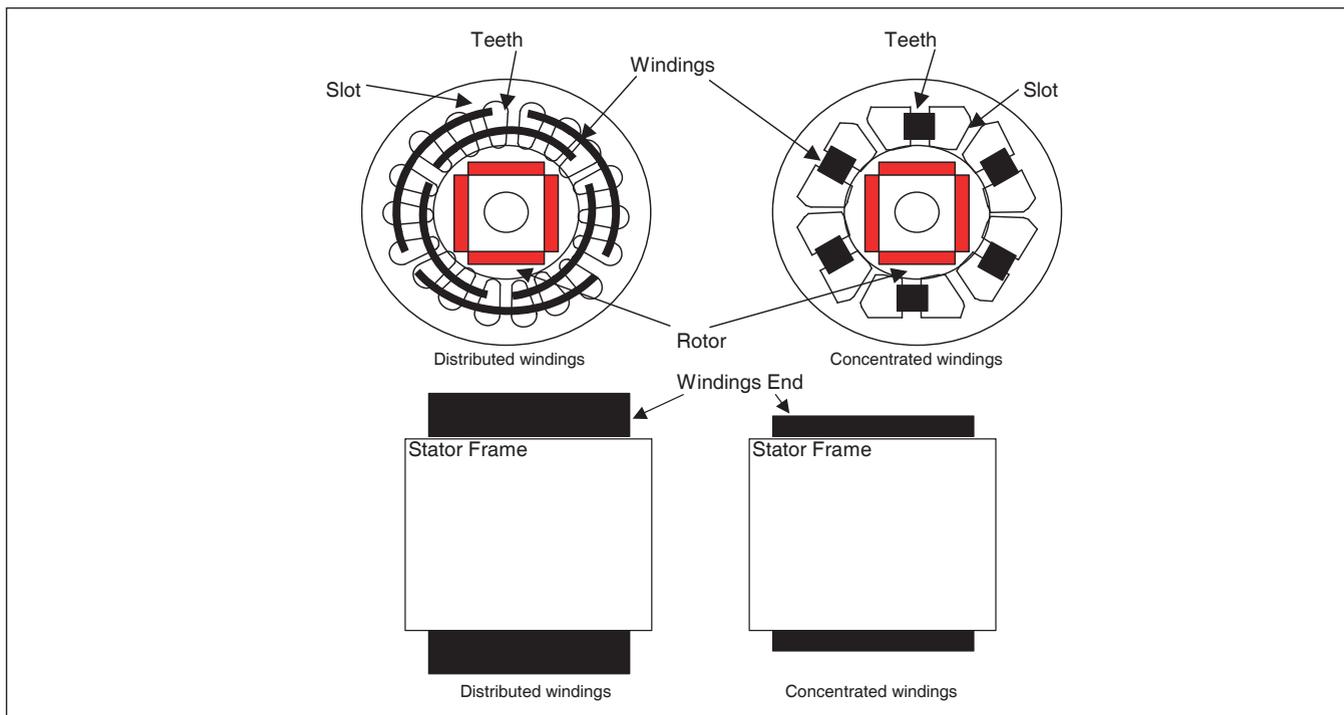
ence (Fig.4). The alternative to distributed windings is concentrated windings, sometimes called one-slot winding. This system uses windings wound directly on a single stator tooth. The benefit is that the overall length is shortened drastically. This system, used with thick wire and dense winding, achieves a drastic reduction of the winding resistance and results in higher efficiency. Compared to a traditional motor, this system can drastically reduce the amount of copper windings and helps to save natural resources, lower cost and reduce weight and size.

**Examples of Applications where DD Motors are Used**

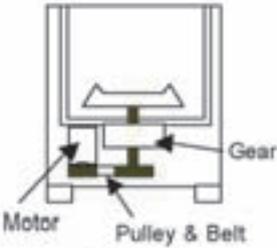
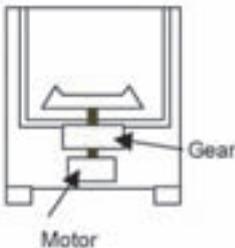
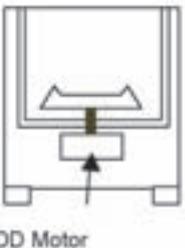
**Home electric appliances.** The load characteristics of a washing machine are washing—which needs large torque at low speed; and spinning—which needs high speed but low torque. Laundry is agitated by the agitating blade during the wash cycle and spin-dried by rotating the load bin during

the spin cycle. The drive mechanism of a washing machine is classified as a belt drive, gear drive or direct-drive system, as shown in Table 1. The belt drive system has been the most common mechanism used. Motor output torque is transmitted by a belt drive and a gear. Also, a reduction ratio changer is built into this mechanism. This mechanism can keep the motor load almost constant during spinning and reduce the required motor output torque during washing. However, the disadvantage is the noise and vibration generated by the belt and the gear.

Conversely, a direct drive system has the advantage of low noise and vibration because the motor directly drives the agitating blade and the spinning bin. It does not need a gear and belt, which generate noise and vibration. However, the direct drive system’s motor load during washing is very large compared to that of the belt drive system’s because there is



**Figure 4—Stator core construction.**

Table 1—Drive Mechanism of Washing Machine			
	Belt Drive System	Gear Drive System	Direct Drive System
Construction			
Ratio of Pulley	about 2:1	-	-
Ratio of Gear	about 7:1	about 7:1	-
Balance	Not Good	Good	Good
Low Noise	Not Good	Good	Very Good
Motor	Induction Motor/ Brushless DC Motor	Brushless DC Motor	Brushless DC Motor
Torque	Small	Medium	Large
Cost	Very Good	Good	Not Good

no gear reduction mechanism; this results in a larger motor torque requirement.

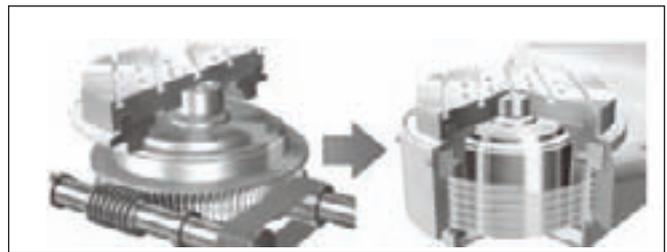
Therefore, IPM-type, brushless DC motors that provide both magnet torque and reluctance torque are used to achieve high torque capacity and high efficiency. Additionally, concentrated windings are adopted for reducing copper loss in the stator core and optimization of the permanent magnet shape, and other improvements are used to reduce torque fluctuation.

**Machining centers.** In this industry, demand for five-axis machining centers and multi-axis machining centers is rapidly increasing. Benefits of five-axis machining centers are process integration and high precision, which are achieved by simultaneous five-axis control.

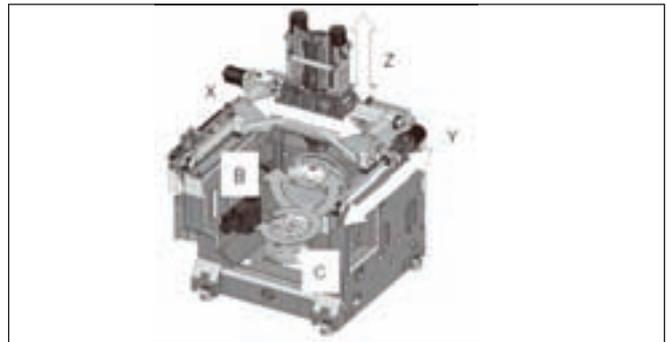
Generally, a five-axis machining center includes three axes of the linear motion and two axes of rotational motion. The linear motion mechanism is highly developed to achieve high speed and high precision through the technology advancement of the servomotor and the feed screw. On the other hand, the drive system of the rotational motion still uses a worm gear reduction mechanism. The rotational speed is about several dozen rpm and positioning accuracy is limited due to the backlash generated by the worm gear. Therefore, the speed of machining a curved surface—which needs synchronization of the linear and rotational axis—is limited by the feed performance of the rotational axis, even though the feed performance of the linear axis is high. So, the worm gear rotational mechanism is the factor that slows the speed of a five-axis machining center. As a result, DD motors are beginning to be used (Figs. 5 and 6) to avoid a speed unbalance between the linear and rotational axis.

**Extruders.** As mentioned, energy saving is addressed in the extruder industry as well as other industries due to recent environmental concerns. In the past, the drive mechanism has been constructed of motors, pulleys, belts and gearboxes (Fig.7). However, the drive mechanism using gearboxes is gradually being replaced with the direct drive system using

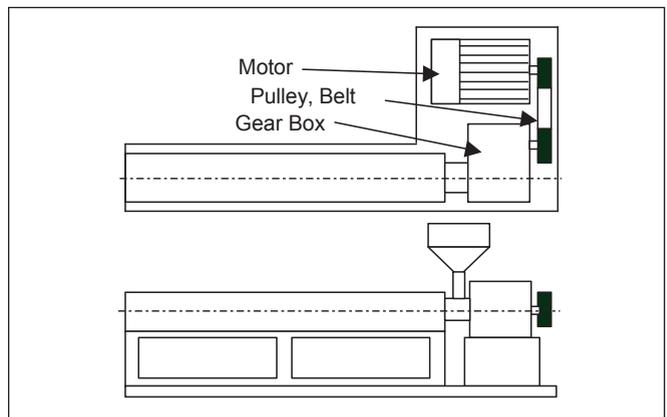
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**Figure 5—Worm gear system and direct drive system.**



**Figure 6—Five-axis machining center.**



**Figure 7—Belt and gearbox system.**

Table 2—Lift Mechanisms of Residential Elevators			
Hydraulic System	Geared Winding Drum System	Geared Traction System	Direct Drive System
<p>Hydraulic System diagram showing a blue CAR connected to a vertical hydraulic cylinder. The cylinder is connected to a machine room.</p>	<p>Geared Winding Drum System diagram showing a blue CAR connected to a winding drum, which is connected to a gearmotor.</p>	<p>Geared Traction System diagram showing a blue CAR connected to a chain and sprocket system, which is connected to a gearmotor.</p>	<p>Direct Drive System diagram showing a blue CAR connected to a DD Motor.</p>

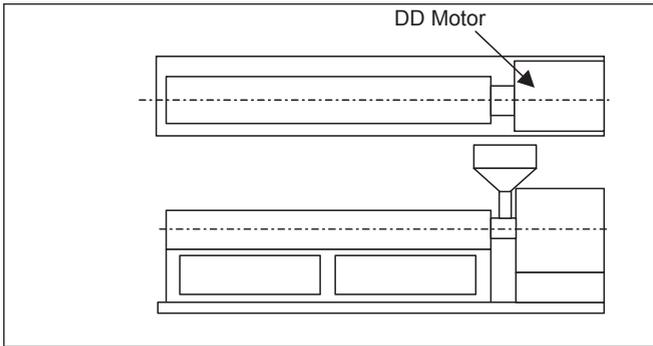


Figure 8—Direct drive system.



Figure 9—Injection machine Sumitomo SE-DU series.

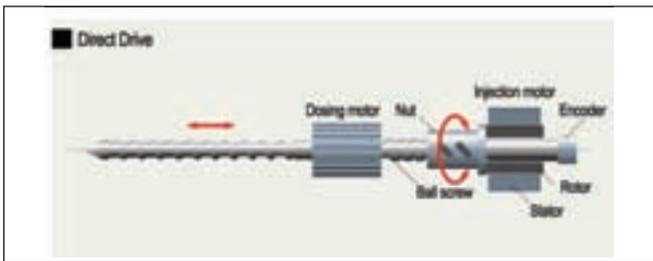


Figure 10—Drive mechanism of injection screw.



Figure 11—Hyponic gearmotors.

DD motors connected directly to the screws (Fig.8). This construction not only improves energy efficiency, it also improves maintainability by eliminating oil changes of the gearboxes and inspection of the pulley belt tension. The construction of the extruder using the DD motor is very simple and compact. This provides more floor space flexibility with extruders for multilayer, blown film processes, thus providing enhanced options for an operator because a larger space is available within to work. Also, some extruder manufacturers report that the power consumption is reduced by 15–20% by means of using DD motors.

**Injection machines.** Belt drive systems have also in the past been used in injection machines. However, noise from the belt drive mechanism, belt wear and maintainability, are problems. To avoid them, belt drive mechanisms are replaced with direct drive systems. The direct drive mechanism achieves fast response, high speed and energy saving, as well as low noise and increased maintainability.

**Residential elevators.** There are four kinds of lift mechanisms for residential elevators—hydraulic, geared winding drum, geared traction and direct drive systems. The hydraulic system seems to be most popular in the market, but many manufacturers are using the geared winding drum system as well.

The advantages of the hydraulic system are smooth ride and low noise, but, once installed, it requires a machine room and more aftermarket maintenance. But the geared winding drum system and the geared traction system require less aftermarket maintenance and are very reliable. This is why many manufacturers are now using these systems. For example, Sumitomo hyponic gearmotors are used in residential elevators (Fig.11). Typical specifications of gearmotors are right-angle type, low-noise gearing and braking and a square-shape motor shaft end to attach a hand wheel in emergencies. Low-noise gearing technology and other typical specifications for residential elevators are available in hyponic gearmotors.

The disadvantages of systems using gearmotors are that gearmotors still transmit gear noise even though low-noise gearing is adopted. Also, the ride quality of a gearmotor system has no advantage over the hydraulic system because torque control is difficult at slow leveling speeds. High-end elevator applications in large buildings have used DD motors for decades to eliminate these types of issues. With the cost of DD motor systems coming down, some premium residential elevator markets are beginning to adopt DD motors to elimi-

Table 3—Summary of Values in the Applications

Applications	High Torque at Low Speed	High Efficiency	High Precision	Fast Response	Low Noise and Vibration	Maintainability	Compactness
Washing Machine	Yes	Yes			Yes		
Machining Centers		Yes	Yes	Yes		Yes	
Extruders	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Injection Machines	Yes	Yes	Yes	Yes	Yes	Yes	
Residential Elevators	Yes	Yes			Yes	Yes	Yes

nate gear noise and achieve smooth ride. But, DD motors are still expensive for the general market at this point.

### Potential Impact on Gearmotor Business

This paper discussed DD motor technology trends and some examples of applications. There are some important points in these examples (Table 3). They are high efficiency, high precision, fast response, compactness, light weight, low noise, low vibration and increased maintainability. Based on these advantages, the potential impact on gear business that DD motors represent is presented in the conclusion of this paper.

### Technology Evolution and Customer Needs

As a rule, technology develops like the curve as shown in Figure 12. This figure is a time history of technology evolution. The curve is known as the S-curve because of its shape. If the S-curve exceeds customer needs, commoditization results, followed by severe cost competition. It is thought that the S-curve of gearmotors does not yet exceed customer needs, but it is close. On the other hand, it is thought that DD motors are in a developing stage of the technology evolution.

This is explained by using the concept of product architecture. Figure 12 maps the customer value in the horizontal axis and the product architecture in the vertical axis. The integrated-type architecture needs a custom design and can be expensive. The customer value is roughly classified as well-defined/general needs and potential/custom needs. It is thought that gearmotors are located in the first and second quadrants. And yet, it is still thought that DD motors are custom and integrated architecture. Based on this product architecture, and with respect to the gearmotor market, the cost of DD motors is not yet competitive. However, with improved cost position, it is expected that the DD motors may move to the second quadrant in the future. But time will be required to modularize and to standardize DD motors because their design is still developing, and current options can be very flexible. There are various speed and torque characteristics and motor design architectures and motor control schemes available.

### Will DD Motors Replace Gearmotors?

The examples that are discussed in this paper show that DD motors create new customer values. The values are high efficiency, low noise, increased maintainability, etc., as previously mentioned. These create added values, and DD motors can be used for specific applications even though they are expensive.

If the customer's value is mapped within the concept of a "value network," the metrics seen in Figure 14 result, which show time in the horizontal axis, the function (value metrics) in the vertical axis and the value network in the axis perpendicular to the page. The value networks of both products are shown in relation to each other, but on different "average" plains; different customer needs are dotted three-dimensionally around the customer needs line. Likewise, the different variations of the products are distributed three-dimensionally around the product technology evolution line. As time progresses, the customer needs line and the product technology line can begin to encroach on or separate from each other. Currently, the value metrics for the gearmotor network are reasonable life, high reliability and reasonable cost. The value

continued

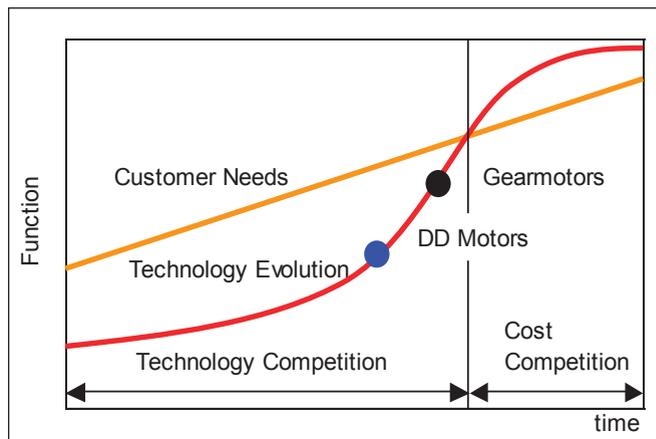


Figure 12—S-curve of technology and customer needs.

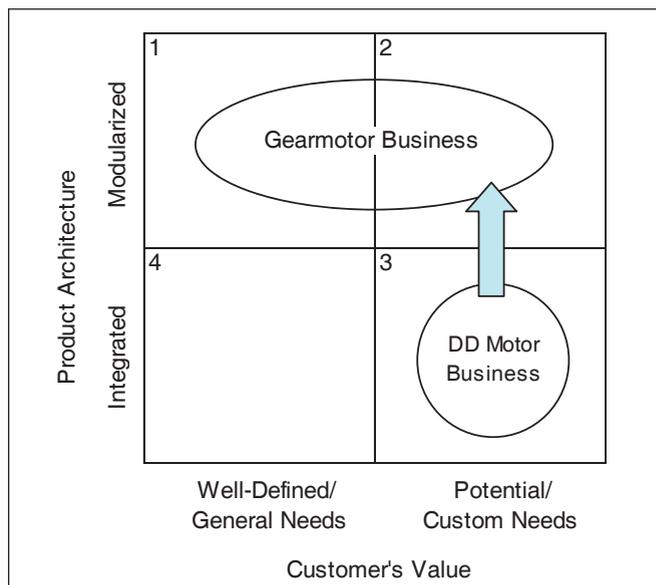


Figure 13—Product architecture map.

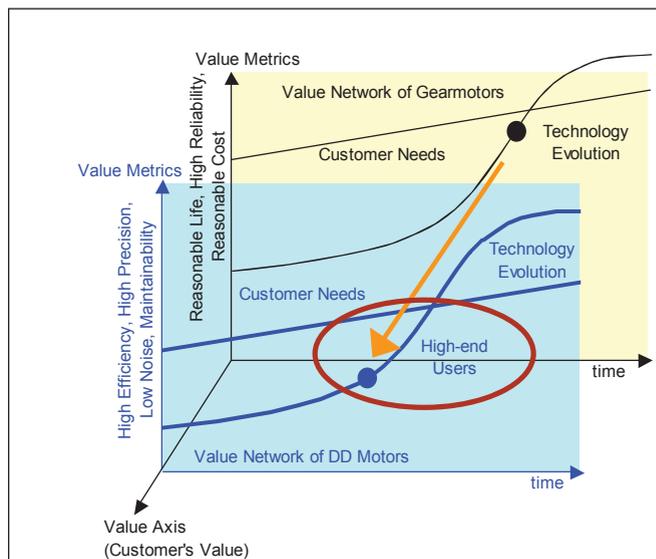


Figure 14—Metrics of value and the value network.

metrics of the DD motor network are high efficiency, high precision, low noise and maintainability.

As mentioned, DD motor technology is still in a development stage of technology evolution, and yet to be modularized. Therefore, it is thought that DD motors are used only for specialized applications for high-end users and that the size of the DD motor market remains small. The entire gearmotor market in the PTC industry incorporates a wide range of applications—some of which are well outside the realm of the DD market. If we restrict the examination of the gearmotor market to ones involving speed control, gearmotors continue to provide advantages such as familiarity, reasonable life, high reliability and reasonable cost. Gearmotors are still a moving target and can be fitted with PM motors to improve efficiency, and new lubrication technologies are continuing to improve gearbox efficiencies.

DD motor applications that can accept tradeoffs between high efficiency and high performance versus high cost and integrated packages are still few in number. However, new values such as energy savings, sustainability costs, improved performance, etc.—due to growing environmental concerns such as increasing CO<sub>2</sub>—could nudge macroeconomic factors to replace more gearmotors with DD motors. Other factors that will impact the market toward DD motors could include new technologies involving design and manufacturing techniques yet to be discovered. Further, governmental regulations and development of industry standards that may tip the momentum toward more DD motor applications may be around the corner. Consequently, we should continue to watch macro trends in the future. 

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## Somewhere in Cyberspace

The Web Master and Binary Experts are gathering together, to discuss New Designs for *geartechology.com* and *powertransmission.com*. The Hot Topics are, "New Features," "Cleaner Navigation" and "Greater Interactivity."

See you then  
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# The Best-Kept Secret

## IN “GREEN” TECHNOLOGY

*Courtesy of the Bearing Specialists Association*

In recent years, much of the nation’s—indeed, the world’s—attention has been focused on the need to be “green.” Whether in our homes or at work, we are frequently being exhorted to convert to “green” technology, use “green” products and adopt a “green” lifestyle in order to save our planet. Well, what exactly does being “green” mean?

*Why bearings may be the ultimate way to go “green.”* In simple terms, to be “green” is to adapt one’s lifestyle so as to do less damage to the environment. In addition to recycling, using renewable and clean energy alternatives to satisfy global power requirements, and meeting the needs of society without damaging or depleting natural resources, being “green” also involves using existing machinery and equipment as efficiently as possible.

The vast majority of people are almost completely unaware of the scope of product generated by the bearing industry, as well as the role that we play in designing the machines and devices that keep our world functioning. While conveyances such as bicycles, cars, trains and airplanes may be most commonly associated with bearings, they represent only a tiny fraction of the vast array of products and applications that rely on these ubiquitous devices. Other less-visible, yet equally essential, bearing applications are found in motors, pumps and compressors. Without them, there would be no gasoline for our cars, no water for our homes and no air conditioning in the summer nor heat in the winter.

*So what do bearings have to do with “green” technology?* As noted, being “green” involves ensuring that machinery and equipment operates as efficiently as possible. To that end, the bearing industry is constantly developing bearings that:

- operate at higher speeds;
- generate less friction, which results in cooler operating temperatures and reduced energy consumption;
- support heavier loads;
- use lubricants that are as environmentally friendly as possible;
- last longer;
- cost less to use throughout their service life.

Considering the seemingly endless variety of everyday products and applications that depend on bearings, extending their longevity and improving their performance so that less waste is generated and less energy is required to operate them—i.e., making the most of our existing machines while reducing their impact on the environment—is the definition of being “green.”

Equally important, though more subtle, is the bearing industry’s role in advising engineers as they develop their new designs. Similarly, the educational materials provided by bearing manufacturers ensure that end users operate their equipment correctly and in the most efficient manner. Helping users and engineers balance the bearing features to achieve optimum machine performance is the ultimate expression of being “green”: taking responsibility for minimizing the impact of human involvement. 

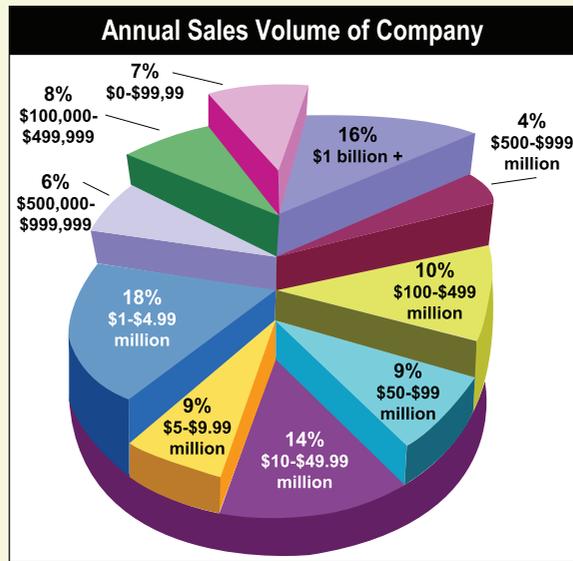
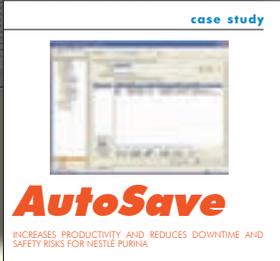
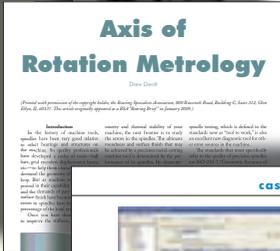
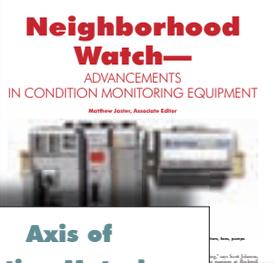
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# events



The city of Detroit welcomed attendees and exhibitors to the first dedicated trade show for small and community wind (courtesy of the Detroit Metro Convention and Visitors Bureau).



These plug-n-play home units are located in Mackinaw City, Michigan (courtesy of michiganwindpower.net).

## Michigan

### EYES INVESTMENT AT AWEA'S SMALL & COMMUNITY WIND CONFERENCE

The first trade show dedicated specifically to small and community wind took place in Detroit, Michigan November 3–5. Denise Bode, American Wind Energy Association (AWEA) CEO, was pleased with the turnout for the event and the increasing potential

for this segment of the wind energy market.

“Record attendance at the conference and workshop reflect the increasing importance of the small and community sectors of the industry and the demand for additional wind energy

manufacturing facilities in the United States,” Bode says.

With the automobile engineering and manufacturing expertise—and infrastructure—in Michigan, Detroit seemed the perfect venue to explore

**continued**



A Michigan farm employs a single wind unit to cut utility costs (courtesy of michiganwindpower.net).

further wind opportunities in the Midwest. Michigan Governor Jennifer M. Granholm, the keynote speaker at the conference, urged attendees to bring wind-related projects, both big and small, to Michigan.

“We’re turning the so-called rust belt into a green belt of clean energy

manufacturing,” Granholm says. “We’ve got a robust and growing wind supply chain of more than 70 companies in Michigan already doing hundreds of millions of dollars in business annually. If you’re a wind company looking to invest, we want you in Michigan.”

The Michigan Economic Development Corporation is offering several aggressive financial and economic incentives to alternative energy companies including the 21st Century Job Fund, Michigan NextEnergy Tax Authority, Michigan Green Jobs Initiative and the creation of Renewable Energy Renaissance Zones (*Ed’s note: For more information on Michigan’s energy incentives, visit [www.michiganadvantage.org](http://www.michiganadvantage.org)*).

In a study provided by the Renewable Energy Policy Project, Michigan is one of the top five states in potential manufacturing job creation from large-scale wind power development. Dan Radomski, vice president of industry

services at NextEnergy, believes small and community wind can also be a turning point in the alternative energy market in Michigan.

“The supply chain is here, from design engineering to automation to assembly. There’s an enormous amount of growth potential. We’re working on a variety of different initiatives to drive down manufacturing costs for wind, solar and bio-thermal technologies right here in Michigan.”

Adds Charles Newcomb, CTO at NexGen, “How can we take the engineering expertise that is put into a \$30,000 automobile in Detroit, and apply it to the design and assembly of a wind turbine? A manufacturing hub like Detroit has what the industry needs to explore further developments in small and community wind.”

This wind segment is a relatively new business model in the United States, though it has been successfully deployed across much of Europe. Community



Cobo Hall, located in downtown Detroit, drew more than 2,100 attendees for the conference (courtesy of Cobo Hall).

wind projects allow residents to have a significant amount of control over management, a direct financial stake in the project and a genuine sense of community involvement. These wind projects typically provide 5-20 MW of electricity, although they can range both higher and lower. The basic concept is to provide jobs, wages and business income in communities, since ownership is retained and profits are recycled locally.

The small and community wind industry is growing rapidly, an average of 76 percent per year with a market share expecting to increase significantly by 2012, according to OwnEnergy, a renewable energy developer focused on the mid-sized segment of the wind market. The Brooklyn-based organization enables landowners and communities to build and profit from local wind farms. The recent surge in this specific area of the wind industry was the reason AWEA created a Community Wind Working Group and hosted the inaugural event in Detroit.

Jacob Susman, CEO and founder of OwnEnergy, has ten years of investing and business development experience in the renewable energy field. He's also one of small and community wind's most vocal supporters.

"Small wind is the new big wind," Susman says. "Local investments and state-to-state interest is leading the way, and the growth potential is right here. This is about energy efficiency and job creation, and this segment of the wind industry can offer both."

At the Detroit conference, Bode expressed the importance of this market segment to the wind energy industry as a whole.

"In Detroit, we are giving citizens the tools to take care of their energy future, and showing businesses how they can enter the wind industry, which will create hundreds of thousands of jobs for Americans. With an economic recovery and the right local and federal policies, including a strong renewable electricity standard, there is no limit to what our industry can achieve in producing clean energy and good jobs."

On the state of Michigan's rather lengthy to-do list is an effort to increase wind education, according to Monica Martinez, whom Granholm appointed to the Michigan Public Service



**A vineyard in Leelanau County, Michigan utilizes a low-profile wind turbine (courtesy of michiganwindpower.net).**

Commission in 2005.

"There's some wind fever currently being generated across the state, and we're getting legislation and initiatives passed that will provide wind education to Michigan schools. It's important to get our school districts involved in alternative energy in order to increase community involvement," Martinez says.

At the heart of Michigan is its rich manufacturing history—a history that Granholm believes is a perfect fit for alternative energy applications.

"We know how to make gearboxes and drive trains and brakes; we know how to make that stuff, it's just in a smaller way," Granholm says. "Manufacturing is in the state of Michigan's DNA."

For more information on small and community wind projects, visit [www.awea.org/smallwind](http://www.awea.org/smallwind). 

**January 26—Tier IV Emissions Seminar.** Edmonton, Canada. Sauer-Danfoss teams up with Thermal Transfer to sponsor this free, day-long seminar, which is one of 24 scheduled throughout North America and Canada. The intent is to help OEMs and industry suppliers adapt to the new challenges that come with Tier IV and Stage IV emissions compliance. The seminar agenda features an update on global emissions regulations, an overview on engine emission technology, cooling system solutions (including cooling modules and cores), vehicle control system solutions such as power management, fan power priority and hydraulic power boost, as well as vehicle power transmission solutions such as variable loop flushing. For more information, and to view other seminar dates and locations, visit [www.sauer-danfoss.com/emissions](http://www.sauer-danfoss.com/emissions).

**February 9–11—CeMAT Middle East.** Dubai International Convention and Exhibition Centre. This is the inaugural event for Deutsche Messe's CeMAT show in the Middle East, with existing annual editions in Shanghai, Istanbul, Mumbai and Moscow. The show focuses on intelligent goods handling, warehousing technology, internal transport systems for logistics and material handling operations. Co-located shows include the International Trade Fair for Motion, Drive and Automation; and International Trade Fair for Factory, Process and Industrial Building Automation. For more information, visit [www.cemat-me.ae](http://www.cemat-me.ae).

**February 9–11—Pacific Design and Manufacturing Show.** Anaheim Convention Center, Anaheim, CA. The West Coast's largest advanced design and manufacturing trade show returns to Anaheim. The Canon Communications show gives you one badge with access to the eight co-located shows: Medical Design and Manufacturing West, Electronics West, Automation Technology Expo West, PLASTECH West, WestPack and the Green Manufacturing Expo. Spanning 400,000 square feet of materials, equipment, systems and services used in product design and development, over 2,000 suppliers are expected. For more information, visit [www.pacdesignshow.com](http://www.pacdesignshow.com).

**March 31–April 2—Concrete China 2010/China International Concrete Technology & Equipment Expo.** Concrete China is the concrete industry's international event with exhibition, conference and training featuring raw materials, technologies, equipment and applications to cover the entire industry supply chain. Concrete China 2010 includes a seminar on new technology and equipment of concrete additive agents, training on basic theory, knowledge of GRC and more. It provides domestic and overseas concrete manufacturers, traders and research institutions with a comprehensive service platform on product display, technical exchange and cooperative negotiation, which promotes healthy development of the concrete industry and communication among domestic and overseas concrete enterprises. For more information contact

CCPIT Building Materials Sub-Council by phone: (86) 10-6836-1826; [wangl@ccpitbm.org](mailto:wangl@ccpitbm.org), or visit [www.concretechina.org](http://www.concretechina.org).

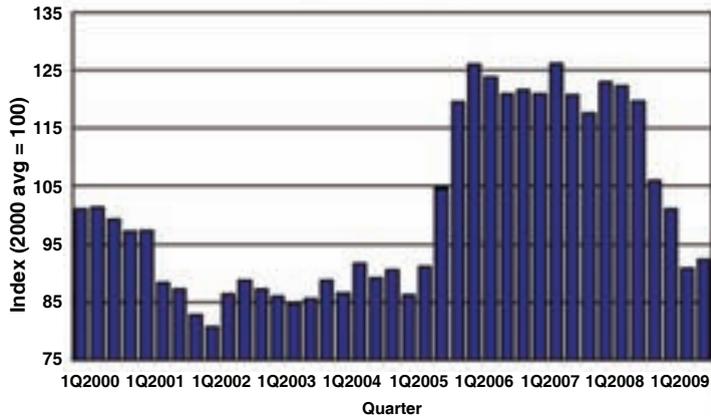
**February 10–12—Wind Power Finance and Investment Summit.** Rancho Bernardo Inn, San Diego, CA. Wind industry project developers, lenders, investors and other figures gather at the 8th annual Wind Power Finance and Investment Summit. The discussion will focus on new developments in wind finance and investment markets as well as future challenges and prospects. This year's event features a pre-summit workshop, Structuring Your Wind Project Financing. This technical workshop provides insight into wind power assets valuation, recognizing potential hurdles and structuring deals and financing to complete a transaction. For more information, visit [www.infocastinc.com/index.php/conference/wind10](http://www.infocastinc.com/index.php/conference/wind10).

**April 9–11, 2010—Techno 4.** CODISSIA Trade Fair Complex, Coimbatore, India. Techno 4 is a new trade exhibition focusing on four different sectors of the engineering industry: pumps and ancillary equipment, foundry, motors and rotating machines and light engineering. The exhibition takes its cue from the rapid expansion of these four engineering sectors in the Indian economy, which stand as the largest contributor to Indian exports. Coimbatore is a hub for engineering businesses in India. It is the second largest city of Tamil Nadu and one of the fastest growing cities in the country. The business infrastructure is in place to hold successful trade events, including an international airport, telecommunication links and multilingual opportunities. For more information, visit [www.techno4india.com](http://www.techno4india.com).

**May 1–4—Bearing Specialists Association Annual Convention.** 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 pre-scheduled conferences. An opening reception and manufacturing appreciation event, golf tournament and a tennis round robin offer networking opportunities. For more information, visit [www.bsahome.org](http://www.bsahome.org).

## 3Q Motor Shipments Up

Motors Shipments Index  
1Q 2000 to 3Q 2009



The NEMA Motors Shipments Index (MSI) rose 1.7 percent in the third quarter of 2009, yet it is still behind 23 percent from its third quarter 2008 level. Inflation and seasonally-adjusted shipments of fractional horsepower motors rose for the second consecutive quarter, and integral HP motors declined for the fifth time in the last six quarters. The slight rise in motor demand was expected in light of other economic indications that the U.S. economy emerged from recession over the summer.

NEMA, the association of electrical and medical imaging equipment manufacturers, also compiles data for the Electro industry Business Confidence Index (EBCI), which gauges business confidence of NEMA member companies. The EBCI for current North American conditions rose 2.1 points, to 54, in November, which is the fourth straight month of improvement. Although, the EBCI for future North American conditions fell for the second consecutive month, by 3.5 points.

## Timken

### NAMES VP-COMMUNICATIONS AND COMPANY DIRECTOR

The Timken Company appointed Kari Groh as vice president-communications and public relations, and the board of directors elected John M. Ballbach as director of the company.

Groh is being promoted from general manager of organizational effectiveness on the company's IT leadership team. Groh has been with Timken since 1975, and in

1977, she joined the PR team and managed several areas of communications. She was appointed general manager of inside sales in Timken's bearing business in 1998 where she worked her way up through various operating roles, eventually assuming responsibility for global customer service, warehouse management and logistics for the distribution business.



Kari Groh

Some of her accomplishments with Timken include implementing CoLinX, for improving warehousing and logistics support, and launching Timken's Project O.N.E. enterprise system and process implementation. In 2008, she was appointed general manager of business process and performance improvement in industrial distribution.

Groh earned a bachelor's degree from The University of Akron, a master's in business administration from Ashland University and graduated from the Executive Development for Global Excellence program at the University of Virginia's Darden School of Business.

"We welcome Kari back to the communications team for this leadership assignment," says Glenn Eisenberg, executive vice president-finance and administration at Timken. "Her depth of experience and successful track record at Timken are well suited to advance our strategies to effectively connect the company with its constituents around the world."

Ballbach's election as director of the company is effective until the company's annual meeting in 2011, when his term expires. His election restores Timken's board to 12 members.

Ballbach has been chairman since 2007, president since 2005 and is also CEO of VWR International LLC. VWR is a global lab supply and distribution company serving pharmaceutical, biotech, industrial, educational and government organizations.

Before VWR, Ballbach was a private investor and president of Ballbach Consulting. From 2002 to 2004 he served as president and CEO of Valspar Corporation. He spent 14 years at Valspar in various positions, including senior vice president, EPS, Color Corporation and operations, and group vice president, packaging. He received a bachelor's degree from Georgetown College and a master's in business



John M. Ballbach

continued

Business School.

According to Ward J. Timken, Jr., chairman of the board, "John's expertise in supply chain management and distinctive industrial knowledge make him the perfect addition to Timken's board as we continue to sharpen our focus on growth opportunities in diverse markets with strong aftermarket potential."

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## World Bearing Association

ELECTS PRESIDENT

At the fourth annual meeting of the World Bearing Association (WBA), Jürgen M. Geißinger, president and CEO of Schaeffler Group, was elected president of the trade organization.

The WBA is an umbrella organization for the American Bearing Manufacturers' Association (ABMA), the Japan Bearing Industrial Association (JBIA) and the European Bearing Manufacturers' Association (EBMA); it was established in 2006. The WBA represents global bearing suppliers, with combined sales of approximately 20 billion euros, which accounts for about 75 percent of the rolling bearing market internationally, according to Schaeffler.

The WBA objectives include eliminating competition-distorting trade restraints, introducing uniform environmental protection standards and opposing product piracy and counterfeiting.

"Counterfeiting earns large sums of money and causes immense economic damage," Geißinger comments. "WBA will therefore further reinforce its initiatives—this means intensified information and clarification of facts for customers on the one hand and uncompromising prosecution of offenders on the other."



Jürgen M. Geißinger

## Vacon

EXTENDS SERVICES IN LATIN AMERICA

Global AC drives manufacturer Vacon Group is extending services in Brazil by adding to staff and moving to a larger facility.

"Now that the economy is picking up again in Brazil, we see a lot of business opportunities in Latin America," says Heikki Hiltunen, executive vice president of Vacon Group. "To serve our existing and new customers and partners even better, we have employed new personnel and moved our office in Barueri, São Paulo to new and larger premises."

Vacon's Brazil office was established in 2007. The new facility was opened in October with customers, cooperation partners and representatives of Vacon Group management in attendance.

"Our growing sales figures have increased the need for technical support. Now we are strengthening a technical support and service network in Brazil, and we will expand the network to cover the entire Latin America," says Claudio Luis Baccarelli, managing director, Vacon Latin America. "We also want to win a bigger share of the mining, pulp and paper and marine and offshore segments, and we are looking for partners in original equipment and original design manufacturer business. With a strong local team, we will be able to provide fast deliveries and high-quality support and services to our existing and new customers."

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## GETRAG

CHANGES MANAGEMENT



Mihir Kotecha

The shareholders and advisory board of GETRAG Group appointed Mihir Kotecha, CEO of GETRAG FORD Transmissions GmbH, as CEO of GETRAG Group. He succeeds Dieter Schlenkermann, and for the time being, Kotecha will assume his duties at GETRAG Group and GETRAG FORD Transmissions GmbH simultaneously.

"GETRAG faces challenges and great chances," says Tobias Hagenmeyer, president of the GETRAG Corporate Group.

“We have selected Mihir Kotecha to be the future head of GETRAG for bringing new strategic impulses into the company. In this phase of continuous weakness of the market, new approaches are necessary to realize our potentials, opportunities and goals.

Schlenkermann’s retirement from management is effective December 1. “We thank Dieter Schlenkermann for his 35 years of extraordinary work for our company,” Hagenmeyer says. “This change is a signal of stability, but at the same time, it shows our will for adjustments, which are essential in these days. Dieter Schlenkermann has significantly given character to the successful way of GETRAG, and he deserves our explicit respect and gratitude.”

## Beckhoff

OPENS CHARLOTTE FACILITY



In response to increased demand from customers in North and South Carolina for sales and technical support as well as training courses, Beckhoff Automation opened a Sales and Engineering Center in Charlotte, NC. With over 3,000 square feet, the Charlotte facility features engineering, sales and administration areas and a training room; it is the company’s seventh regional office in North America.

Beckhoff hired Ron Pryor as a customer service engineer and Les Queen as application engineer to serve the Charlotte office. Pryor previously worked for ATC Carolina and has experience in PLC, HMI and motion control. Queen worked for Cross Automation and ran his own systems integration company before joining Beckhoff. He is responsible for conducting classes at both Beckhoff’s Charlotte and Atlanta

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area facilities.

“Adding a new Sales and Engineering Center in Charlotte with two skilled automation experts like Les and Ron is instrumental to best serve our customers,” says Leo Young, east region manager for Beckhoff. “As in all parts of the country, the economic climate continues to be challenging for businesses in the southeast. However, the Beckhoff team is now stronger than ever to help customers through to better days with cost-saving and performance enhancing automation technology. With a strategically stronger presence in Charlotte, Beckhoff’s east region team can continue to grow market share throughout the Carolinas.”

The facility is located at 818 Tyvola Road, Suite 100, Charlotte, NC 28217; phone: (704) 910-4367; *east.usa@beckhoff.com*.

## John Crane PT

### MOVES INTO TEXAS FACILITY

John Crane Power Transmission opened a power transmission manufacturing facility in Deer Park, TX. The 30,000-square-foot facility includes manufacturing, warehouse, customer service and engineering space.

The plant replaces John Crane’s existing 16,000-square-foot facility in Houston. At 1800 West 13th Street, the Deer Creek location is in Houston’s “energy corridor,” near Beltway 8 and other interstate highways.

The expansion was necessary to meet market demand and growing sales for John Crane power transmission couplings, both domestically and through the Americas, according to Steve Jadney, in a press release. The Metastream flexible stainless steel disc couplings and Powerstream elastomeric couplings, two major product lines, are manufactured and supported from the new facility.

“Our ongoing development efforts have enabled John Crane to create a steady stream of new turbo-machinery products that offer outstanding operational reliability and significantly reduced cost of ownership for our customers,” Jadney says. “This new facility allows us to capitalize on our leadership market position with expanded development, customer service and manufacturing capabilities.”

## PM Bearing Standard Released

The MPIF has published “Standard 35, Materials Standards for PM Self-Lubricating Bearings—2010 Edition.” The powder metal standard provides design and materials engineers with the most recent engineering property data and information available for specifying materials for self-lubricating bearings made by the powder metal process.

The standard was developed by the powder metallurgy commercial parts manufacturing industry. It is divided in sections distinguished by data tables and other explanatory information for each material listed. User-friendly features include detailed explanatory notes and definitions, as well as data in inch-pound and SI units.

The 2010 Edition renders the 1998 Edition obsolete, and copies of the older version should be destroyed, according to the MPIF. The 28-page, 2010 Edition includes new material section, revised footnotes for bronze bearings, data-table-column heading revisions, alphabetical data tables by material, a section on oil impregnation efficiency and other features. For ordering information, visit [www.mpiif.org/Pubs/stand/asp?linkid=81#bearings](http://www.mpiif.org/Pubs/stand/asp?linkid=81#bearings).

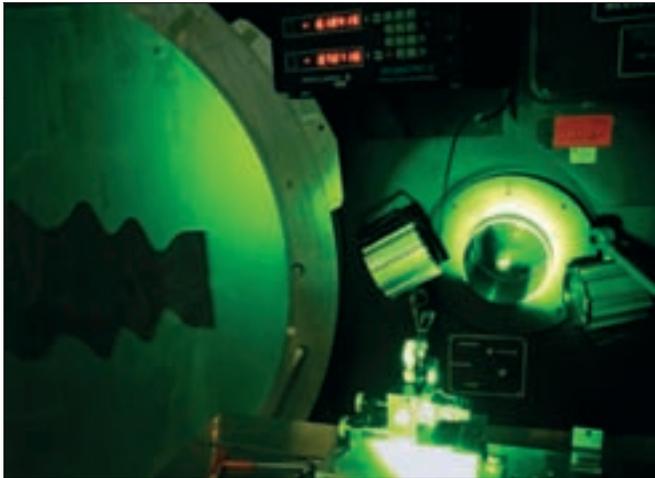
## Chromalloy

### ACQUIRES TURBINE SERVICES LTD.



Chromalloy gas turbine engine blades.

Sole ownership of Turbine Services Ltd., a gas turbine engine maintenance, repair and overhaul business, was acquired



A Chromalloy comparator is used to check blade surfaces for conformity to a master drawing, both for manufacturing and repair.

by Chromalloy in October. Chromalloy and TurboCare previously operated Turbine Services as a joint venture.

Turbine Services serves large frame turbine operators in the industrial and power generation markets. It operates in Scotland, Thailand and Australia. As part of the purchase, a 49 percent share in Masood John Brown, Ltd., a Dubai gas turbine engine operation, was acquired.

“Turbine Services is a full service provider specializing in frame engines, providing replacement parts, repairs, field service, rotor services and controls,” says Armand F. Lauzon, Jr., president. “We intend to enhance and grow the business to better serve customers with advanced component repair, critical parts manufacturing and services.”

Chromalloy launched Turbine Services in Glasgow, Scotland in 2001, and at the same time, an industrial gas turbine repair facility, Turbine Services Thailand, was developed near the existing aerospace component repair facility in Bangkok. Around this time, the company entered into a joint venture with Al Masood Company, forming Masood John Brown in the United Arab Emirates. These operations served regional clients in their respective global territories.

In 2003, Chromalloy United Kingdom Ltd. and Siemens Holdings plc entered into a 51:49 percent joint venture—restructured in 2008 to 85:15 percent—in Turbine Services Ltd., which operated under the Siemens TurboCare brand.

## Specialist Driveline Company

### INVESTS IN UPGRADED FACILITY

Over 4 million euros have been invested by UK-based  
continued

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specialist driveline engineering company Quaife in a state-of-the-art, flexible manufacturing facility designed to produce high performance driveline systems for niche-vehicles.

Quaife technology includes gearboxes, steering systems and an Automatic Torque Biasing limited slip differential. The company is looking to achieve the TS16949 international quality standard to add to its ISO9001.

The 23,000-square-foot factory provides flexible production in volumes appropriate for niche vehicle programs, including specialist high performance models and off-highway and military applications. Part of the facility investment included the latest statistical process control and “no fault forward” tools for quality control. Documentation and audit trails can be finalized for individual customer requirements.

“Our latest investments in computer controlled manufacturing systems allow us to produce gearboxes and differentials in volumes from a few hundred up to 50,000 per year, as well as a wide range of other specialist steering and transmission components,” says Michael Quaife, technical director. “Lots of companies can make five prototypes or five million production parts, but very few can meet the most demanding quality requirements of the OEMs while producing intermediate volumes at economic prices. With the growing importance of niche vehicle programs, it’s an area where Quaife’s expertise provides a very useful complement to a vehicle manufacturer’s existing supplier relationships.”

put 300bhp through the front wheels with next to no torque steer.

“We worked very closely with Ford on this program, and they were rigorous in auditing our quality systems,” Quaife says. “It’s a tremendous compliment to our people that we have not had a single warranty issue throughout our eight year relationship with Ford.”

The new facility is located at Gillingham in the UK. Quaife continues to operate its existing design, manufacturing and logistics center 25 miles away in Sevenoaks.

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## Quality Job Salaries

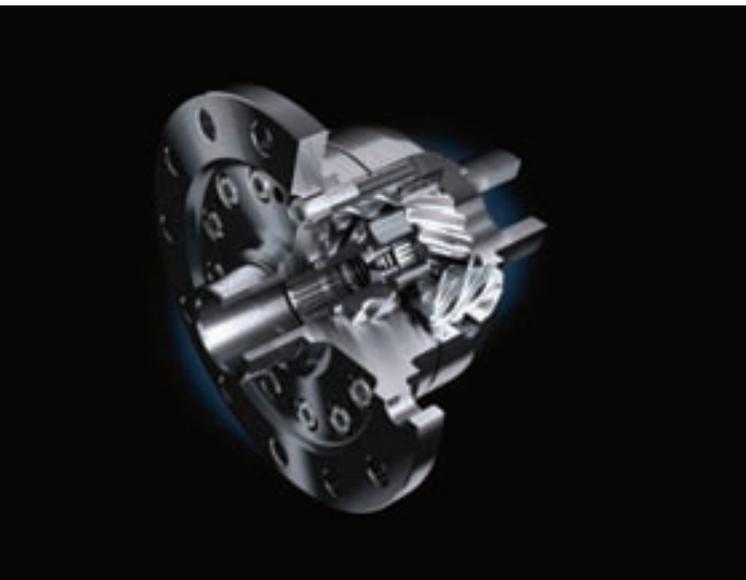
### UP THREE PERCENT

According to the American Society for Quality’s (ASQ) annual salary survey, the average quality job salary rose three percent from 2008 to 2009, to just under \$84,000, despite the economic turmoil. The results show that respondents’ salaries increase proportionately to their experience in the quality field. The survey reports that 57.8 percent of participants have at least one ASQ certification, which the data suggests can help increase earning potential.

The survey was conducted by ASQ’s monthly publication, *Quality Progress*. Full results of the survey and more is available at [www.qualityprogress.com](http://www.qualityprogress.com). The survey has been conducted for 23 years. It indicates the health of the quality profession using salary results by breaking down salary information submitted by ASQ members into 24 categories, including job title, education, years of experience and geographic location. This year 9,072 responses were received, mostly from professionals in the United States and Canada.

Although results were overall positive, the effects of the recession are evident in the survey. Almost 85 percent of participants say their organization is taking steps to minimize economic challenges, including pay cuts, salary freezes, layoffs and hiring freezes. Of those surveyed, 4.9 percent are unemployed, retired or laid off.

“In spite of these tumultuous times, it is encouraging to see that the value quality professionals bring to their organizations to improve the top line and contribute to the bottom line is being recognized and rewarded,” says Paul Borawski, ASQ executive director and chief strategic officer. “By taking advantage of ASQ certifications and training, quality professionals have been able to weather the latest economic storm and prepare for a brighter future.”



**Quaife’s Automatic Torque Biasing limited slip differential will be manufactured at the company’s new facility for Ford’s Focus RS.**

For almost a decade now, Quaife has been providing differentials and other driveline components to Ford, General Motors and Chrysler, including the Dodge Viper. The first project to be completed and delivered by the new facility is for the Quaife Automatic Torque Biasing Differential (ATB) for the new Ford Focus RS, which uses the system to help

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## NuVinci Transmission a Work of Art

Leonardo DaVinci is credited with the idea first, as is the case with many engineering innovations; although, somewhere in China there may be a continuously variable transmission etched into an ancient cave dwelling.

The Power Play staff has dispatched its excavation team to the region to conduct an extensive search for any precursor, but they have yet to come up with any artifacts to challenge the Italian inventor's credit.

The CVT has come a long way since 1490, and DaVinci would be proud to see the innovative applications his concept is applied to today. As the technology has been refined and developed since the first European patent filing in the late 19th century, the CVT has popped up in automobiles, and lately, in bicycles, light electric vehicles, outdoor power equipment and wind turbines.

Fallbrook Technologies Inc., a technology development company focused on improving mechanical transmission-based products, features the renaissance-based model as its core technology in the NuVinci continuously variable planetary (CVP). The NuVinci uses a set of rotating and tilting balls between the input and output components of a transmission. The tilting balls alter their contact diameters and vary the speed ratio. In comparison, to other current CVTs, the NuVinci is less complex and costs less to produce, according to Fallbrook.

Interestingly enough, the advanced NuVinci design was not the result of mad scientists hunched over lab tables, pontificating over complex equations, formulas or theories. "In the late 1990's, Don Miller, a cycling enthusiast, became interested in building the world's fastest bicycle," says Emile Barrios, marketing director at Fallbrook. "At the time, Miller was involved in real estate/mortgage banking and worked on inventions in his spare time. In analyzing the challenges

involved, he quickly found that the transmission was a limiting factor. While looking around for new ideas, Miller came across the concept of a CVT. Although he had no formal engineering background or training, Miller's subsequent experiments led him to develop an entirely new concept for CVT-based bicycle transmissions."

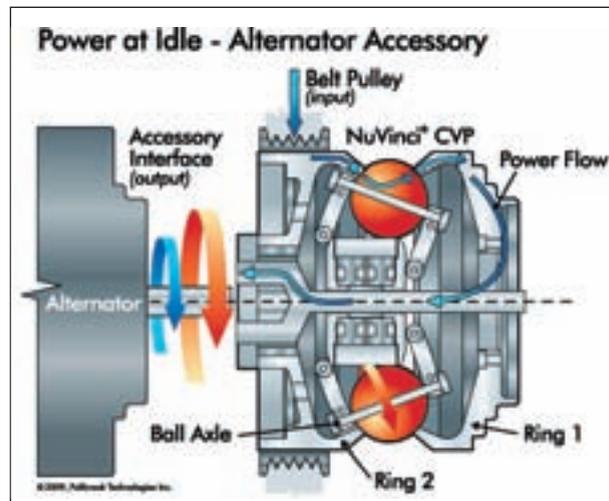
Although developed with bikes in mind, for Fallbrook, the applications seem endless. "In addition to the Hydro-Gear lawn and garden application, Viryid Technologies Inc. has licensed NuVinci technology for use in small wind turbines and plans to have its system available for sale in 2010," Barrios says. "Fallbrook itself is pursuing the use of NuVinci technology in continuously variable accessory drives (CVADs). These applications include superchargers, alternators and A/C compressors in motor vehicles. In addition, NuVinci technology can significantly improve the performance and economics of light electric vehicles."

For NuVinci's inventor, Miller, the technology development was trying, yet ultimately rewarding. "The technology took over 10 years to develop. There were long periods of incremental improvement with occasional major breakthroughs," Miller says.

Miller believes his design will continue to evolve over time, as will the innovative applications DaVinci may not have dreamed of. "The NuVinci CVP is a truly universal transmission that can more efficiently control speed and torque of a drivetrain by allowing the prime mover (motor or human) to operate at its optimum efficiency. Its simplicity should pave the way for hundreds of new applications in the next 50 years. It could be an enabling technology for future applications such as walking robots and deep drilling rigs."

On second thought, DaVinci probably did envision walking robots amidst his other seemingly-wild ideas that were passed off as science fiction at the time.

For more information, including a full list of applications, visit [www.fallbrooktech.com/Nuvinci](http://www.fallbrooktech.com/Nuvinci).



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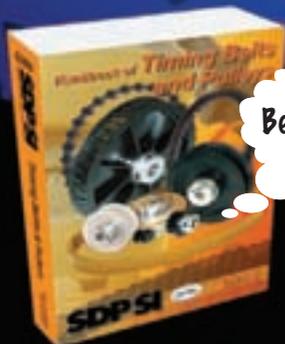
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