

# D P N

# DESIGN PRODUCT NEWS



June/July 2007

Covering the total design engineering function in Canada

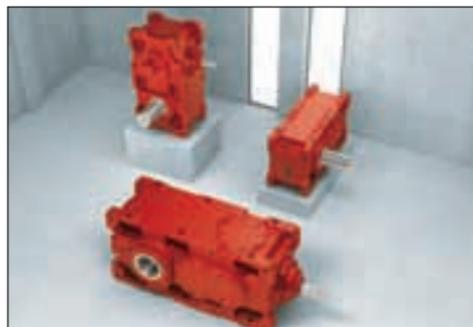


### Aluminum marking plotter

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[weidmuller.ca](http://weidmuller.ca)

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### Industrial gear units

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[sew-eurodrive.ca](http://sew-eurodrive.ca)

Info Card 340



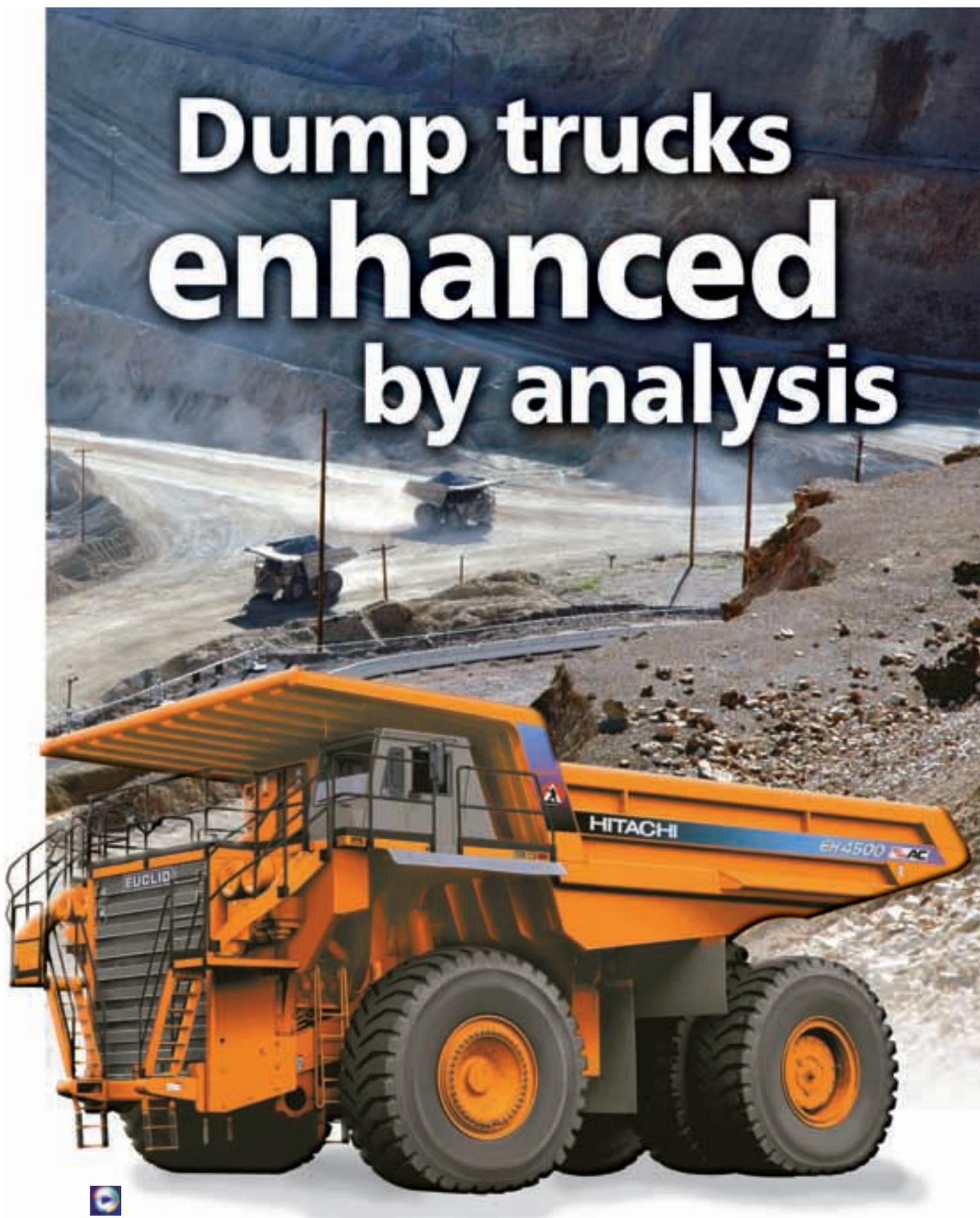
### Industrial RFID system

The BL ident industrial RFID system from Turck provides a programmable gateway that relieves higher-level control functions. The system permits either multiplex or parallel operation of the write-read RFID tag heads.

[chartwell.ca](http://chartwell.ca)

Info Card 341

Volume 35 Number 4



*By Mike Edwards*

**Y**ou can see them in mines from Fort McMurray to China and from Colombia to Indonesia – rigid dump trucks made in Guelph, ON, by Hitachi Construction Truck Manufacturing Ltd.

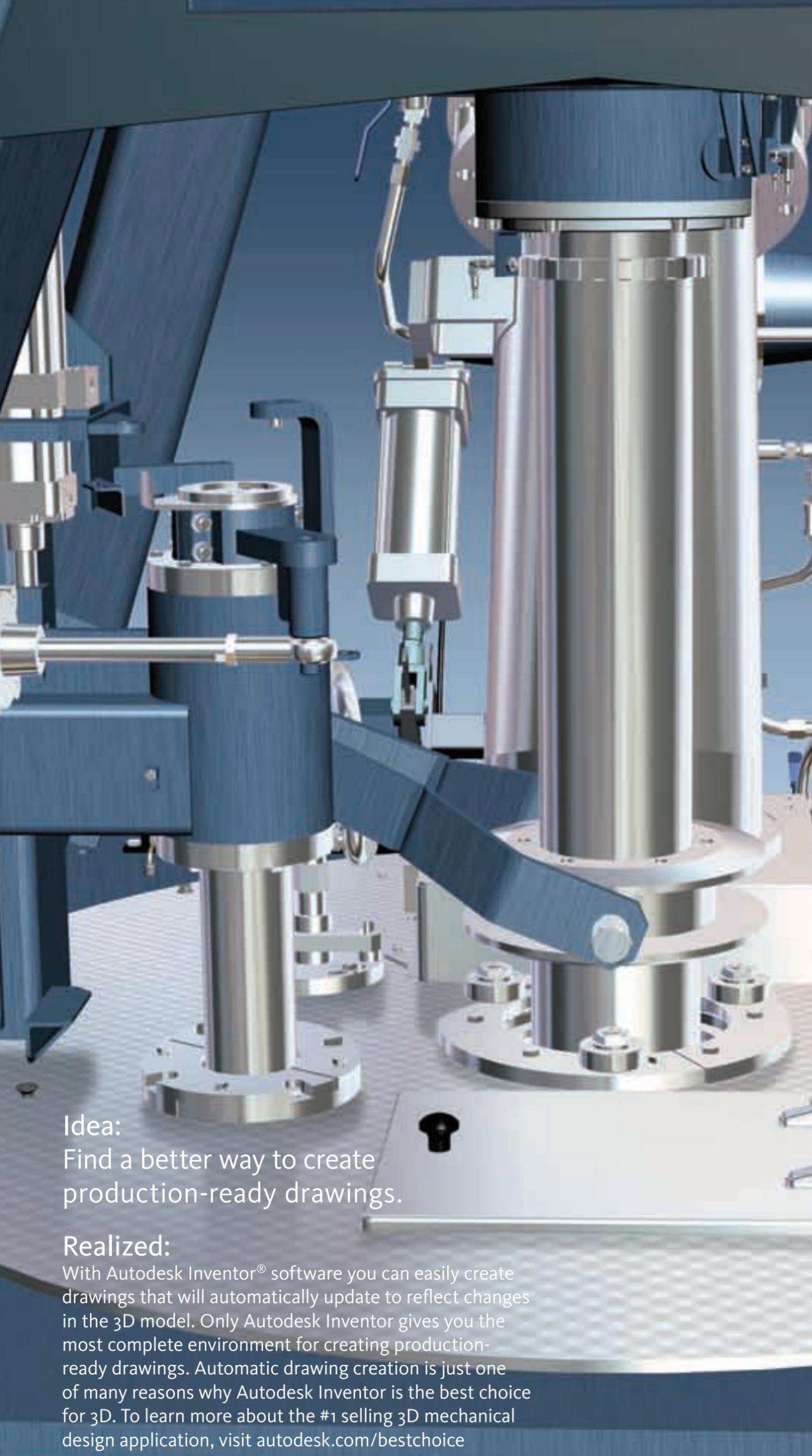
The trucks work in the most hazardous of conditions hauling 300-ton-plus payloads and have to be built to last in around-the-clock operations. Units are also so big – over 1 million lb fully loaded and up to 47 ft from the ground with the bed tilted up to dump – they have to be shipped in sections and welded

together on site. They are also subject to the typical mining environment of falling debris, extreme temperature fluctuations and constant dust in the air.

Consequently, it sure would help if the truck design was completely validated before it gets shipped to the customer site.

Helping Hitachi ([hitachi-c-m.com](http://hitachi-c-m.com)), which owns about 10% of the global rigid dump truck market, achieve this goal is Harry Tempelman, manager of Technical Analysis. Tempelman and his design team in Guelph use a couple of mechanical CAD solid modeling packages, but for detailed analysis they have turned to Toronto-based Altair Engineering Canada, Ltd. and its HyperWorks CAE software

*Continued on page 8*

The Autodesk logo is positioned in the top right corner of the page, oriented vertically. It consists of the word "Autodesk" in a white, sans-serif font against a teal background.A photograph of a complex industrial machine, likely a lathe or mill, with various metal components, including a large vertical shaft and a horizontal tool holder. The machine is set in a factory environment with a blue background.

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Image: Fives Cail  
Industry: Industrial Machinery

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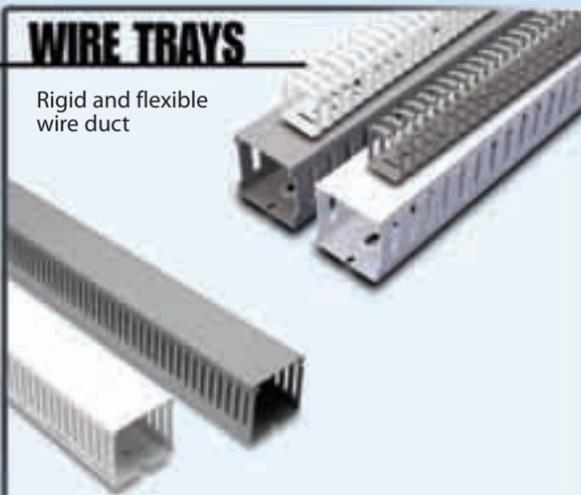


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## In this issue



### Cover Story

## Design, analysis cuts costs at Hitachi Truck

CAE specialist Harry Tempelman (centre) with Hitachi Construction Truck designers Vinh Tran (left) and Sorin Guidea at Hitachi's Canadian operations in Guelph, ON. Over the years, Tempelman's analysis work with Altair HyperWorks software has encompassed everything from Hitachi's 300-ton haulers to Blackberry handheld communication devices.

### FEATURES:



#### Fluid Power Challenge in Toronto middle schools

Fern Avenue Public School won 2007 event coordinated by the Canadian Fluid Power Association



#### Hannover Trade Fair makes waves in automation

Four-day show displays everything from student-designed soccer robots (above) to integrated work cells



#### Continuously variable transmission technology

Feature details CVT inside applications such as "The Ride" by Ellsworth Handcrafted Bicycles pictured above

### DEPARTMENTS:

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Auto parts makers make collaboration a priority
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Bill Vance examines the appeal of new hardtop convertibles
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Canadian companies find the many ways to improve productivity with CAD

#### 3D in DPN Online Edition

Look for the 'DPN 3D' logo throughout this issue and go to DPN's online PDF edition at [dpncanada.com](http://dpncanada.com) to view images in 3D.



Also look for the Windows Media logo to view video clips. 

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# Renderings



## Mexico editorial rings alarm bell, but can Canadian manufacturing jobs be saved?

By Mike Edwards, Editor

When the last issue of *Design Product News* left for the printer, I knew I might be in for a bit of “stick.” Why?

Just as my editorial pointed out some of the benefits of manufacturing in Mexico, protests started to build in the province of Ontario by workers concerned about mounting job losses in that sector. The timing for such advice was too much for one reader, a technician in Owen Sound, ON.

“What a wonderful thing to do for an editor of a Canadian magazine,” he said, “encourage Canadian companies to desert Canada and move to Mexico. You should be encouraging (them) to lean down, see what cost savings can be found, not cut and run.”

### Find the cost savings, don't cut and run

“With advice like yours Canada will have no manufacturing jobs in the near future.”

Indeed, Statistics Canada reports that from January 2006 to April 2007, Ontario has lost 58,200 jobs in the manufacturing sector.

I have experienced some of this pain directly in the past. In my ten years working as an electronics engineering technologist in manufacturing, I was subject to plant closures both from foreign ownership decisions and to the march of technology (my last manufacturing job before becoming an editor was as a QC technologist for a telex machine builder).

Staying in business is the bottom line for most companies; I simply hope that Canadian design entrepreneurs will survey the entire manufacturing landscape, even “off-shoring,” rather than retreating without their product ideas ever seeing the light of day.

Now as far as advice on how to stay productive and keep manufacturing and design jobs in Canada, I hope the other 99.9% of the articles and information you have found and continue to find in the pages of *DPN* will help you do just that.

Certainly productivity gains through applying the right software can make a tremendous difference in new product and machine designs. In this issue's CAD Special Feature Section, starting on page 20, there are many examples of Canadian companies that have used these tools to help them become more productive and compete in the global economy.

Safety products designer and manufacturer PenSafe of Stoney Creek, ON, realized back in 2003 that it was facing business threats on several fronts, including global competition and the rising Canadian dollar. As a corporate philosophy, said PenSafe president John Leavitt, his company has applied “curiosity, imagination and learning,” while practically applying 3D solid modeling, finite element analysis and product data manage-

ment software packages.

Many believe that while Canada can't really compete with low-wage offshore mass production in the current business climate, we can use our technical expertise to serve niche markets. Cambridge, ON-based IST is exploiting an engineer-to-order software environment to develop “once through steam generator” energy recyclers for international customers like GE and Siemens. “IST's goal is to reduce the total average design hours for each steam generator project by 60%,” according to Kerry Saumur of Autodesk Canada.

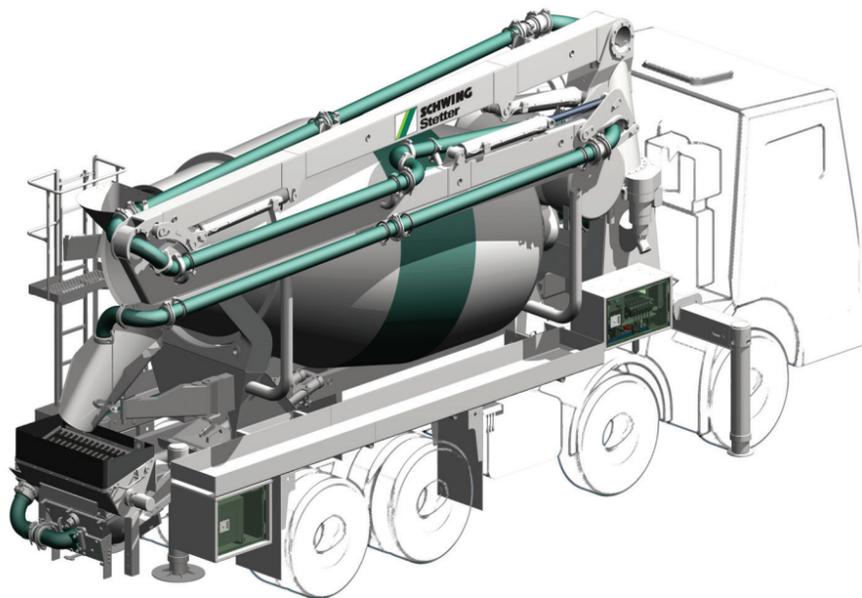
Coincidentally, Tom Lee of mathematics software developer Maplesoft in Waterloo, ON, has found to his surprise that “the vast majority of us still find pencil, paper and calculator to be the most frequently used tools for analysis and design.” Should more Canadian design engineers use tools like Maple from Maplesoft and Mathcad from PTC, perhaps they could get – and keep – a leg up on the competition (the latest versions of both of these products are reviewed by Bill Fane on page 36).

And if software isn't on your daily work rounds, you can see how Technology LED

of Beauport, QC, is using adhesives to improve its illuminated signs and lighting products on page 10; while on page 26 find out how Lafarge cement products are monitored with wireless technologies to improve quality control.

If you found **Renderings** interesting, please fill in Info Card 346 or send a message anytime to [medwards@clbmedia.ca](mailto:medwards@clbmedia.ca).

## When making the move to 3D, the choice is clear...



## ...the one with the Edge.

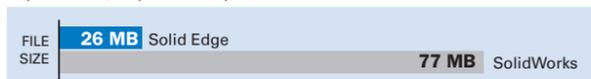


### SOLID EDGE vs. SolidWorks

Top View of 10,895 part assembly, no hidden lines



Top View of 10,895 part assembly, hidden lines



Draft Quality View of 10,895 part assembly



### SOLID EDGE vs. Inventor

**In comparisons, Inventor simply cannot match the functionality Solid Edge delivers with rapid blue surfacing, 3D wizards, feature recognition, direct editing, data management and large assembly performance.**

“I evaluated eight systems, including Inventor and Solid Works and determined that Solid Edge by far has the best 2D to 3D AutoCAD compatibility out there. My first assignment upon entering Lochinvar was to evaluate the benefits of a 3D CAD system, and if practical, make a recommendation as to which product would best suit our needs. I found that Solid Edge met or exceeded our requirements in almost every aspect.”

Michael Valcarcel,  
Lochinvar Corp.

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## By Design

# Diversity of solutions highlight 2007 Fluid Power Challenge

Judges at the seventh annual Canadian Fluid Power Challenge, held recently in Toronto, were pleasantly surprised by the wide variety of designs students used to solve this year's problem. The 2007 competition coordinated by the **Canadian Fluid Power Association** (cfpa.ca) and the Toronto District School Board, attended by gender-balanced teams from 15 west Toronto middle schools, was won by the team of grade eight students from Fern Avenue Public School.

This year's machines featured some very innovative gripping mechanisms and some very elaborate chutes for getting the ball into the top of the hopper. "When we set the problem, we think we know what most of the solutions will look like," noted Steve Rogers of **Kidder-Technology Teaching**

Systems who acts as Challenge facilitator.

"But it never ceases to amaze me how many other solutions these bright young minds come up with! And this year's students were a particularly creative group."

At a minimum, the organizers hope that the Challenge will encourage students to select more mathematics and science courses in their high school curricula to keep their options open for technology-based post-secondary studies.

The CFPA, in collaboration with **PIQ** (*Produits pour l'industrie québécoise*) and **DPN** magazines, also recently awarded, for the first time this year, a \$500 scholarship to the student that proved to be the best in industrial maintenance. Laurent Paradis, student at the Cégep du Vieux Montréal, was the winner.



Laurent Paradis (left) received his honorary diploma from Daniel Fournier, CFPA president and Quebec sales manager for Bosch Rexroth Canada, and Linda Nadon, publisher of *PIQ*.

## Delcam Plc broadens CAD/CAM offerings



CHARLOTTE, NC – Delcam hosted its "innovation and integration in cadcam technology" conference here last month, demonstrating a broadening of its CAD/CAM software offerings. According to managing director Hugh Humphreys, acquisitions over the past year included Crispin, a footwear design software developer, and the PartMaker range of software that includes specialty applications for Swiss precision milling. Humphreys noted that Crispin will put Delcam into the leather shoe and orthotics business, extending its reach beyond the sports shoe market where it dominates with Nike.

Left: PartMaker executive VP and CTO Lena Fishman.

## News in Brief

### Barksdale joins Wainbee

Wainbee Ltd. (wainbee.ca) has been appointed channel partner for the Barksdale line of products for Canada. L.A.-based Barksdale makes products for measuring pressure, temperature, level and flow, as well as seals for directional and air suspension valves.

### Cleaver-Brooks milestone

Stratford, ON-based Cleaver-Brooks Inc. (cleaver-brooks.com) has produced its 10,000th deaerator, units that are used to extend boiler and steam system life by preventing corrosion.

### More PTDA members here

The Power Transmission Distributors Association (ptda.org) has three new Canadian members: **Harvey Industrial Specialties** (Quebec City), **Ampro Electric Ltd.** (London, ON) and **Dura Sleeve Inc.** (Surrey, BC).

### Schmersal partnership

Vickers-Warnick (vickers-warnick.com) has announced a partnership with **Schmersal Canada**, manufacturers of industrial switches and safety systems.



## Altair opens training facility

**Altair Engineering Canada, Ltd.** (altairengineering.ca), a subsidiary of CAE software developer Altair Engineering, Inc., has opened a new office in Toronto. Robert Little, a Canadian and a 19-year Altair employee, is president of the Altair subsidiary. "The growth Altair is experiencing in the Canadian marketplace is testimony to the strong product offering of HyperWorks and the proactive technical support offered by Altair Canada," he said.

## Rittal signs agreement with Axiom

Broad line enclosure products supplier **Rittal Systems Ltd.** (rittal.ca), has announced a partnership with **Axiom Technologies Ltd.** (axiom.on.ca) specializes in industrial automation for the manufacturing industry, including automation and safety. Pictured: **Phil Campbell**, president Axiom Technologies (left), **Oliver Obermeier**, president Rittal Systems and **Phil Jacques**, CEO Axiom Technologies.



## Calendar

August 7-9, 2007. Austin, TX. Virtual instrumentation conference and exhibition NIWeek 2007 presented by National Instruments (ni.com/niweek).

September 24-27, 2007. Rosemont, IL. National Manufacturing Week conference and exhibition held in Chicago suburb includes the

Design Engineering and Assembly Technology Expo shows (manufacturingweek.com).

October 22-23, 2007. Montreal. CYCLE 2007: Towards a Life Cycle Economy is the third annual Canadian Forum on the Life Cycle Management of Products and Services (cycle2007.org).

March 12-14, 2008. Las Vegas. IFPE 2008 Technical Conference (ifpe.com).

See more events @ dpncanada.com



Keynote speaker John Felice, vice president of Global Marketing for DaimlerChrysler, said Chrysler has a Recovery Transformation Plan that includes \$3 billion for powertrain development.

# Auto parts makers must innovate, collaborate

By Mike Edwards

HAMILTON, ON – Building Strength Through Collaboration was the theme at the annual **Automotive Parts Manufacturers Association** (apma.ca) conference held here last month.

"We can't live in silos anymore," warned Gerry Fedchun, APMA president. "What you need to do is set your business up like a beehive, where everyone is working together and coming up with an end product that a consumer likes and is made in a cost effective manner."

Keynote speaker John Felice, vice president of Global Manufacturing at **DaimlerChrysler**, said Chrysler will become more competitive by reducing model platform and part variations.

The Future Trends Panel at the conference discussed how innovation will

deliver products the consumer will want, and in a socially acceptable way. Panel moderator John Mann, director of Engineering & Regulatory Affairs at **DaimlerChrysler Canada Inc.**, said "climate change is going to change the way we do business." Mann predicts the day will come when vehicle will run on genetically engineered biofuels called "plantaline" instead of gasoline.

Panel participant Steve Polakowski, executive director, Advanced Interiors and Electrical/Electronic Systems, **Decoma International**, pointed out that automotive electronics has come a long way since the 8-track of the 1970s. "The automobile is becoming the hub of the 'lifestyle network,'" with custom lighting and iPod-ready audio systems being designed into vehicles.

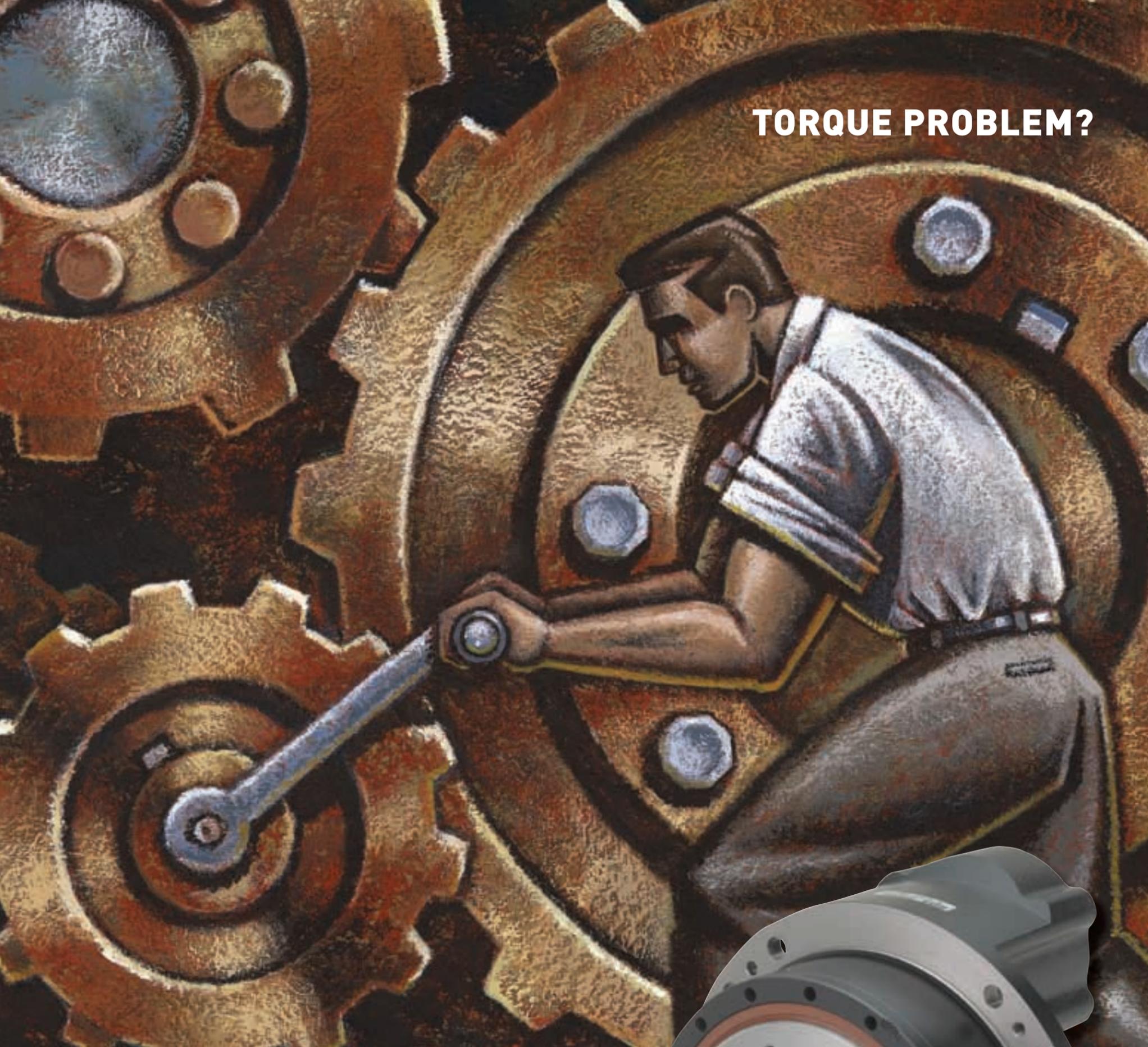


SKF Canada president (centre) Jan Lindhe with members of the Gothia Cup-bound Brampton East "Chiefs '92," a team of 15-year-old boys that SKF is sponsoring as Canadian representatives in Sweden.

## SKF Canada celebrates two major anniversaries in 2007 at open house event

TORONTO – Celebrations that began in February in Sweden for the 100th anniversary of industrial giant SKF continued here at its Canadian headquarters last month. Jan Lindhe, president of SKF Canada Ltd. (skf.ca), also noted that the company will celebrate 90 years in Canada next month. Lindhe emphasized the SKF commitment to sustainability and the environment both through its products and internal manufacturing processes. SKF is bringing energy-efficient bearings to market this year that will provide 30% less friction, according to Jennifer Moritz, SKF application engineering supervisor.

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## Cover Story

# Hitachi trucks receive full CAE validation before fabrication

From Front Page

environment (altairengineering.ca).

Tempelman brought his HyperWorks and analysis expertise from working on contrasting applications like the BlackBerry handheld maker from Research in Motion and at logging heavy equipment maker Timberjack. He noted that no job is too big or too small for doing detailed analysis on mechanical structures.

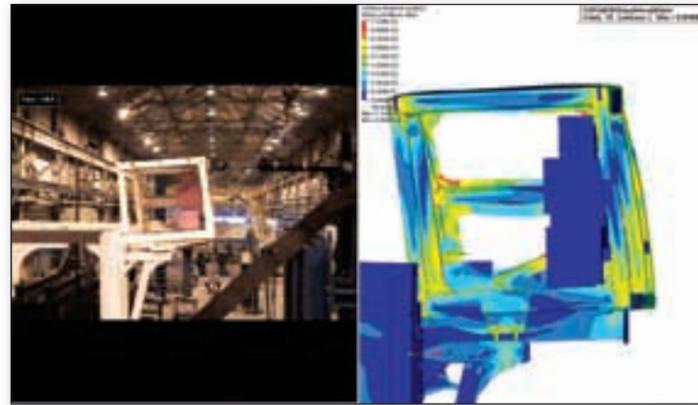
When he joined Hitachi in 2005, Tempel-

man's immediate focus was reducing the mass of the welded steel cab structure while still meeting the qualification of ISO 3471 ROPS (rollover protection system) and FOPS (falling object protection system) specifications.

Standards-based ROPS and FOPS behavior is a vital parameter for the big trucks Hitachi makes. During 24 h mining operations there is the possibility of accidents. The cab has to stand up to a variety of static, dynamic, and impact loads to protect the operator. Hitachi engineers

had been meeting this challenge by iterative designing of the structure and running a finite element analysis (FEA) to verify that it would meet ISO 3471 specification.

Tempelman took a different approach using HyperWorks. "We modeled the non-linear uniaxial material and structure and transferred



Video taken of a Hitachi Construction Truck cab under stress testing matched the simulation animation provided by HyperWorks.

the geometry native model directly into HyperMesh," said Tempelman. "Within a few days we submitted the first structural analysis. We then used Altair OptiStruct to run multiple loadsets and learn where the steel should really be, and we presented a report describing the potential weight saving. The decision was to move ahead using HyperWorks tools."

He added that the design now has the material where it is needed most, an important factor for safety and for management trying to lower steel costs in today's expensive commodities market.

"We used LS-DYNA to run non-linear explicit analyses on the structure. The beauty of the link between Altair and LS-DYNA is that we can easily modify the geometry, run another analysis, and redefine the structure through repeated what-if studies."

A few days and multiple iterations later, Hitachi had a structure that exceeded the ISO specification in calculation. When the company ran the required physical tests on the prototype, it confirmed that all the non-linear behaviors of the structure had been correctly predicted using HyperWorks tools.

Hitachi no longer waits weeks for traditional FEA and prototyping to show a design function. "We can run dozens of OptiStruct analyses in a tenth of that time," said Tempelman.

Tempelman has found Altair HyperView, a visualization environment for simulation and test data, to be extremely useful in sharing analysis results with Hitachi managers and to customers he meets on location around the world.

"Sometimes when I'm talking about elastic/plastic or flow stress behavior," said Tempelman, "a manager will say, 'Explain this to me.' HyperView gives me a tremendous capability for displaying results to the people who approve funding for this work. Being able to pull these results out of this black box and share them with people who don't have the same level of technical knowledge is a great advantage."

Hitachi uses Altair MotionView and MotionSolve for multibody analysis of the entire truck. Applying motion analysis on a system level to all subsystems – front axle, rear axle, frame, cab, engine, and body – gives the company the loads it needs to run detailed FEA analysis in Altair OptiStruct or LS-DYNA with excellent results.

Tempelman is also happy with the support he has received from Altair. "Too many companies come in and say, 'Here's the software. Call me if you have questions.' That doesn't work anymore. I know that if I call the Altair hotline, or type in hwsupport@altair.com, I will get a very good response. That's important to Hitachi and to me."

According to Robert Little, president of Altair Canada, productivity and mechanical CAE go hand-in-hand. "Designers and stress engineers are under double-digit productivity time constraint pressures."

Concluded Tempelman: "My equation for success comes from having good people and good tools."

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**Feature: Adhesives & Fasteners**

# Hot melt adhesive a marine alternative to mechanical fasteners

By Ross Noel

Until recently, manufacturers of marine products have had limited choices when it comes to joining parts together without trading off productivity, performance, quality and cost.

Traditional screws and bolts require drilling holes, which can provide an avenue for water to penetrate into the substrate.

## Holes created for bolts allow water to penetrate

These holes can also create pockets for moisture and debris to accumulate, which can cause leaks, corrosion, contamination, and even loosening of the screws and bolts, leading to loss of attachment. In addition, bolted areas of the substrate concentrate tension into stress points that can result in fatigue, crazing and cracking.

Organic, one-component room temperature vulcanization (RTV) sealants are frequently used to fill

the space in the cavity, and pre-formed organic gaskets can be used as an inter-layer between substrates to maintain a



Hot melt adhesives develop strength and adhesion very quickly, and can eliminate the bottlenecks in manufacturing caused by waiting for sealants to cure.

seal during differential thermal expansion and stress. However, exposure to contaminants, high temperatures and ultraviolet (UV) rays can break down and weaken organic materials.

More recently, heat- and UV-resistant silicone sealants have provided longer-term performance in keeping out moisture and debris. Unfortunately, as with organic RTVs, silicones require time to cure and develop adhesion and strength; this limits their use to filling space and being used as gaskets.

Taking that technology a step further are new, reactive hot melt silicone adhesive sealants, which provide the high performance of neutral cure silicone sealants, the immediate adhesion of pressure sensitive adhesives (PSAs) and the immediate green strength of high-viscosity materials. Because this hot melt adhesive develops strength and adhesion very quickly, it can eliminate the bottlenecks in manufacturing that are caused by waiting for sealants to cure. Also, the fast increase in viscosity reduces the "squeeze out" mess that comes with typical RTV sealants.

When applied at temperatures from 120° to 130°C, the sealant has bonding strength similar to double-sided tapes, with adhesion between 3 and 11 psi. Once cured, it has a tensile strength from 350 to 700 psi, yet remains flexible and stable at temperatures from -45° to 150°C.

These dual adhesion mechanisms, from the PSA and the neutral cure sealant, have resulted in the reduction or elimination of surface preparations with solvents, priming or surface activation that many RTVs and tapes require. The silicone hot melt adheres well to common substrates such as metal, wood, painted surfaces and glass, as well as low-energy surfaces such as PVC, ABS, PE, Teflon and many other plastics.

In addition to sealing strength, the cured silicone provides flexibility that mechanical fasteners cannot. Rather than the focused bond points of mechanical fastening, hot melt sealants create a bond line that allows the stress to be evenly distributed. It also absorbs some of the stress caused by substrate movement from thermal expansions and mechanical stress.

Because it is not heat-activated, silicone hot melt has a long pot life and 15-minute open time, so it works well with automated and hand-applied equipment. In addition, it has a very low volatile organic content (VOCs), which makes it user- and environmentally friendly.

Ross Noel is Senior Applications Engineer, Dow Corning (ross.noel@dowcorning.com).

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Bimba introduces the RL Series Rod Lock Cylinder to the TRD product line. With a 100% ball bearing design, the new RL series distributes even locking (clamp-holding) force along the shaft, providing low fatigue on clamping components and no appreciable wear on the piston rod. This unique design extends the life of the Rod Lock and gives superior locking forces that are rated highest in the industry.

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[bimba.com/bandsvideo](http://bimba.com/bandsvideo)

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Info Card 15



## TRD STAINLESS STEEL TIE ROD

These stainless steel, tie rod cylinders are available in a variety of designs to meet your heavy-duty food processing demands: NFPA interchangeable, non-rotating, force multiplying and air/oil.

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## SQUARE ROD

This Original Line cylinder delivers precise, guided motion in one convenient, cost-effective package. By incorporating a stainless steel square rod with rounded corners and a tough aluminum alloy rod guide, the Square Rod ensures non-rotational motion without the need for multiple components.

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## EF2 CYLINDER

This compact, complete and ready-to-use solution is perfect for applications requiring non-rotation. Constructed of durable, hard-anodized aluminum, the EF2 uses two outboard guide shafts, eliminating any twisting or spinning upon actuation to guarantee consistent performance.

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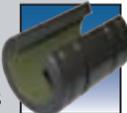
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Info Card 22

## Products: Adhesives & Fasteners

### Clamping swing cylinders



Jergens, Inc. has announced a line of swing cylinders for workholding. The hydraulically-activated clamps are available either in top or bottom flange styles, with either single or double acting actions. Either style can be manifold-mounted using #2 SAE ports, or can be plumbed conventionally through two #4 SAE ports. Three sizes are available, with clamping capacities from 1100 to 5000 lb. The clamps' piston rotates 90° to the right in its standard configuration, but may be ordered with either a 90° left rotation or no rotation.

[jergensinc.com](http://jergensinc.com)

Info Card 348

### Galvanized metal adhesives



Two adhesives from Devcon are suitable for bonding galvanized, galvaneal, or Galvalume metals. Flex WelderFC (Fast Cure) methacrylate adhesive and Dev-Thane 5 urethane adhesive can replace welding, the company says. Flex Welder FC is designed for metals, nylon, compos-

ites, and plastics subject to flexing, shock, vibration, or variations in temperature up to 250° F. Dev-Thane 5 also forms tough yet flexible bonds on many substrates, including metals, rubber, concrete, wood, foam, EPS and ABS. When cured, Dev-Thane 5 has a tensile strength of 2100 psi and a tear resistance of 400 pli (ASTM D624) and withstands service temperatures up to 180°F dry, 120°F wet.

[devcon.com](http://devcon.com)

Info Card 352

### Fibre-filled transfer tapes



Adchem Corp. has introduced adhesive transfer tapes with bond strengths sufficient for splicing metal coils. Testing has demonstrated resistance to thermal cycling, salt solution, acid, brake fluid and UV environments. Brands 7742-74 and 7745-74 durable transfer tapes, 2-mils and 5-mils respectively, consist of a pressure sensitive acrylic adhesive system and are said to provide excellent shear strengths at elevated temperatures up to 300°F. The polyester fibre reinforcement provides roll stability when slit to widths as narrow as in 1/8 in.

[adchem.com](http://adchem.com)

Info Card 353

### Nylon spacers/supports



Keystone Electronics has introduced Nylon spacers/supports for PCBs or chassis mount

applications. The board-to-board and chassis-to-board stacking components snap into position with a retentive grip without the use of tools. For PCB use, the spacers/supports lock-fit or tension-fit into PC boards and lock-fit for chassis use. Reverse chassis mount designs, which enhance appearance, also lock-fit. Screw-mount designs which tension-fit into PCBs and screw down into a chassis are manufactured in #4, #6 and #8 sizes. Configurations include push-in and screw-mount types and ranges from 4.75 to 25.4 mm heights.

[keytelco.com](http://keytelco.com)

Info Card 349

### Disposable dispensing parts



UV and cyanoacrylate fluid adhesives require disposable products suited to their properties, according to I&J Fisnar. UV fluids will vary in sensitivity and it is therefore possible to use a less opaque barrel; where fluid level can be observed, however check the specification with the material supplier. The tip should be manufactured using a high grade of stainless steel. Cyanoacrylate requires Polyethylene and/or Teflon disposable parts. Teflon inserts are provided within a stainless steel needle to avoid contact.

[ijfisnar.com](http://ijfisnar.com)

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Info Card 25

## Feature: Adhesives & Fasteners

# Signs, signal and architectural lights benefit Adhesives, sealants ensure reliable product operation

Technology LED in Beauport, QC, is a technology leader for integrating light emitting diodes (LEDs) into signs, signals and architectural lights.

When compared to traditional incandescent light bulbs, LEDs are smaller in size, brighter, more resistant to impact and vibration, can be tailored to specific colors, and have a much longer lifetime (more than 100,000 h).

Technology LED uses their expertise with LEDs to integrate them into signs and signals that offer greater comprehension of the messages in fixed forms or with animation. Figure 1 illustrates a variable speed limit sign that can display 30 or 50 mph depending on the time of day. Technology LED is also leveraging the benefits of LEDs in other innovative products.

Examples of other new products include the MR-16 and PAR-20 bulbs that are direct replacements for halogen bulbs (See Figure 2) and spot lights but offer much longer life.



Clockwise from the top: Figure 1 illustrates a variable speed limit sign often found in construction and school zones to alert motorists; Figure 2 is Technology LED's model MR-16 LED bulb designed to replace a halogen bulb; and, Figure 3 shows Loctite's E-60NC Hysol epoxy adhesive, used to seal LED lamp connectors to protect the printed circuit board inside from the elements.

Technology LED's products must be 100% reliable while withstanding frequent cycles between hot and cold extremes, constant exposure to the elements, and high vibration. Achieving these performance requirements while maintaining competitive costs is an ongoing concern for the Technology LED team. To ensure that they had the best solutions currently and remained on the leading edge of technology, Technology LED desired to develop a strategic partnership with a leader in the adhesives and sealants industry. The partner would act as an extension of their engineering department becoming a resource for new product designs and design changes.

Technology LED developed a relationship with Henkel. Loctite branded products offer the broadest range of adhesives and sealants available ensuring that

all possible solutions are considered for engineering challenges. As an extension of their design team, the close proximity of the local account manager ensures

### Diverse product line and expertise solve many challenges

fast response to inquiries and the deep staff of technical experts for Loctite branded products gave Technology LED access an engineering resource they could not maintain internally.

Loctite branded adhesives are used throughout Technology LED products. Several of the applications are described below.

Loctite 495 Super Bonder Instant

Adhesive is used to bond LEDs to alpolc, aluminum and acrylic panels for signs and signals. Loctite 495 fixtures in seconds, achieves good strength and is the only adhesive that Technology LED has identified that is fully compatible with the LEDs.

Loctite 5150 Silicone Adhesive is used to bond and seal the acrylic panels to the sign housing. Loctite 5150 is non-corrosive and achieves good bond strength to the acrylic cover. It is also extremely flexible allowing it to accommodate the stresses caused by the frequent thermal cycling from -35° to 60°C.

Loctite 5150 is also used to seal the joints for aluminum cases and to bond

printed circuit boards to panels.

Loctite E-60NC Hysol Epoxy Adhesive is used to seal the connectors for the LED lamps to protect the printed circuit board inside from the elements (See Figure 3). Loctite E-60NC offers low viscosity for good coverage, high hardness for mechanical protection, good dissipation of heat and good chemical resistance.

Traffic signal panels are constantly exposed to vibration. Loctite 243 Threadlocker is used to secure the PCB to the panel and as well as any other parts that may loosen.

*This article was contributed by Henkel Canada Corp. (henkel.com).*

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# Spotlight

## Motion Control



### Cam roller runner blocks

Rexroth cam roller runner blocks for eLINE profiled rail systems are said to be smooth running with minimal noise at travel speeds of up to 12 m/s. Low friction levels of the lightweight cam roller runner blocks are also said to minimize lubricant consumption and guarantee long service life. The clean-room compatible linear components generate no dust due to abrasion of plastic parts and are easy to clean.

[boschrexroth.ca](http://boschrexroth.ca)

Info Card 396



### Digital PWM motor control

Bodine Electric Company has introduced a digital pulse width modulation (PWM) controlled version of its INTEGRAMotor line. The motors combine the four elements of a typical motion control system – a control, a brushless dc motor, a gearhead and an optical encoder – into one package. The PWM models combine a 24 Vdc brushless dc motor with a built-in open loop voltage mode PWM controller.

[bodine-electric.com](http://bodine-electric.com)

Info Card 300



### Heavy duty linear actuators

Bishop-Wisecarver Corporation has announced the heavy duty SRX-150, is now available in five standard lengths. The product line features aluminum profile linear actuators in belt or ball screw driven versions. Both the ball screw and belt driven units are now available in 400, 600, 1000, 1500 and 1900 mm stroke lengths. The additional lengths are said to shorten lead delivery times.

[bwc.com](http://bwc.com)

Info Card 297



### Digital servo drives

The Electromechanical Automation Division of Parker Hannifin has added four high-current power levels to its Compax3 series of digital servo drives. Units are now available with up to 75 kW of output power. The series has four output currents: 50, 90, 125 and 155 A rms. All these have an input voltage range of 350 to 528 Vac. The drives are capable of controlling both synchronous and asynchronous motors.

[parkermotion.com](http://parkermotion.com)

Info Card 302



### Panel PCs provide control

Beckhoff Automation has announced the CP72xx line of Intel M-Class Panel PCs designed for simple mounting arm installation. Units integrate all features required for HMI hardware and advanced PC-based machine control in a housing depth of 98 mm. Available in screen sizes of 12, 15 or 19 in., the IP65 protected water- and dust-proof Panel PCs feature aluminum housings with motherboards developed by Beckhoff. Units also feature a free Mini-PCI slot.

[beckhoffautomation.com](http://beckhoffautomation.com)

Info Card 298



### High-level language PLCs

The CP 2xx/3xx HLC from Phoenix Contact is suitable for small to medium series applications where a flexible controller that can be programmed with proprietary algorithms using high-level languages is needed. Controller applications and visualizations can be programmed using Microsoft Visual Studio .NET without having to pay a license fee. The Ethernet I/O interface simplifies connections.

[phoenixcontact.ca](http://phoenixcontact.ca)

Info Card 294

### Dual-loop servo system

YET US Inc. has announced the addition of the XtraDrive-DL to its XtraDrive Servo System product line. The DL (dual loop), two-encoder model is said to effectively address instability issues inherent in high-speed precision motion system applications requiring superior precision accuracy. The model automatically senses and compensates for inaccuracies from the effects of repetitive motion and temperature variances, providing position control to  $\pm 1$  micron.

[yet-motion.com](http://yet-motion.com)

Info Card 303



### Ethernet-based motion

Baldor Electric Company has launched Ethernet Powerlink 3-phase ac drives that are said to offer all the major motion control functions, including single-phase drives, a motion and machine controller, and development tools. The introduction of 3-phase ac drives means that users can build all-Ethernet systems with the optimum choice of motor technology for each axis, the company says. Rotary and linear versions of brushless servo, and ac vector motors are all software selectable.

[baldormotion.com](http://baldormotion.com)

Info Card 299



### 0.9° linear actuators

Haydon Switch & Instrument has announced that its size 23 hybrid linear actuators are available with a 0.9° step angle. The step angle is designed for higher resolution and allows for a full step linear movement of 0.0000625 in. Like the 1.8° version, the actuator is available in four designs; captive, non-captive, external linear, and linear rotary. Combined with a stainless steel lead screw, the linear actuator provides operational thrust up to 200 lb.

[hsi-inc.com](http://hsi-inc.com)

Info Card 301



### UL-approved servo drives

Advanced Motion Controls has announced UL approval for its DigiFlex digital servo drives. The drives can operate brushed and brushless servomotors, and support encoder or resolver feedback. A  $\pm 10$  V command reference signal can be used to control either torque or velocity.

[electromate.com](http://electromate.com)

Info Card 304

### VFD conveyor motor control

Dorner Manufacturing has introduced a single input interface VFD motor control for conveyor systems. The unit comes ready to install with no wiring required. The control unit is designed as a plug-and-play, which allows users to hook it up to the conveyor system, plug in the accessory that best meets their specific application and turn it on. Applications include indexing, increasing or decreasing conveyor belt speed and powering a variety of add-on accessories, such as photo eye kits.

[dorner.com](http://dorner.com)

Info Card 295



# DPN

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Info Card #92

### TURCK Connectivity

Turck's new Connectivity catalogue has just been released. It contains over 800 pages of Turck's innovative connectivity products. The introduction to each chapter includes a "Selection Guide" to help you find what you are looking for within each product family (eurofast®, picofast®, pentafast®, minifast®, microfast®, versafast(tm), multifast®, powerfast®, Vfast®, splitters, multibox®, reelfast® etc.) This catalogue is very easy to use and a real asset to design engineers as all specification, dimensions, electrical characteristics and approvals are all clearly delineated.

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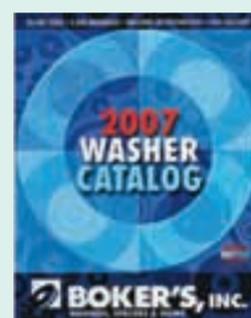


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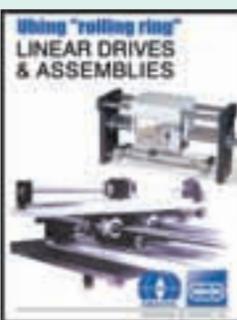
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Info Card #93

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Info Card #94

### NEW PROXIMITY SENSORS CATALOG FROM TURCK

Turck, the industry leader in proximity sensing for industrial automation, has released a new Proximity Sensors catalog encompassing its entire line of inductive, capacitive, analog and ultrasonic proximity sensors. The 600-plus page catalog contains TURCK's entire proximity sensor line, as well as specialty sensors for non-traditional applications.

Many new products are featured in the catalog, including stainless steel sensors, high temperature proximity sensors and miniature **uprox®+** sensors with extended sensing range. Sensors are available in traditional barrel and rectangular housing styles, as well as valve, rung and slot versions. Instructions for customizing cables and connectors to the sensors are also included.

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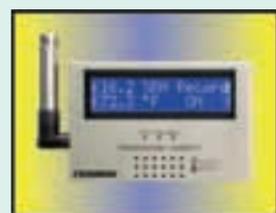
**Pressure Transducers: High Performance, Economical OMEGA's PX309 Series**

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Info Card #107

**Web-Based Remote Environmental Monitor-iSE**



Info Card #108

OMEGA has unveiled its award-winning iSE environmental monitor. This device provides web-based remote surveillance of conditions in critical HVAC applications such as computer server rooms, clean rooms, laboratories, museums and warehouses as well as critical refrigeration and cold chain applications. No special software is needed; all you need is a web browser to view and record temperature, relative humidity and dew point over an Ethernet network. It also lets you monitor physical threats via burglar alarms and can be triggered if there's a power failure. Alarms can be emailed to multiple users and text messaged to Internet-enabled cell phones and PDA's. Relays can also trigger flashing lights and sirens. The iSE comes with flash memory card, 2 relay alarms, battery back-up, universal power adapter and 6 foot extension power cord.

Price \$675

**8, 16 and 32-Channel USB Thermocouple Measurement System OMET-USB-73T Series**



Info Card #109

OMEGA's OMET-USB-73T Series data acquisition devices support all standard thermocouple types-J, K, E, T, R, S, B, C and N-with USB 2.0 compatibility, ±2°C accuracy (including CJC) and maximum sampling of 200 readings per second. Twenty-four digital inputs and outputs let the user control external contacts and relays in case of an alarm or other event requiring action. Perfect for environmental applications such as monitoring of furnace, cold storage and computer rooms, the series ensures accurate results without the high cost of PLC and SCADA systems. It comes in 8-, 16- and 32-channel models.

Price starts at \$1160

**Laboratory-Grade Mini Wind Tunnel, Model WTM-1000 Full Production in September 2006**



Info Card #110

Combining low cost with features more advanced than those of competitive brands, the new WTM-1000 wind tunnel from OMEGA can calibrate either vane or hot-wire anemometers. Along with high accuracy ±0.1% of setting-this rugged benchtop unit offers easy anemometer mounting, built-in electronics, and a 102 mm (4") diameter internal test chamber. Air velocity (2.5, 5.0, 10, or 15 m/s) is user selectable via the ergonomic rotary dial. Typical applications include HVAC, aeronautics, professional calibration services, and science laboratories. An optional NIST-traceable certificate is available. Made in the USA, this product fully satisfies the Restriction of Hazardous Substances (RoHS) directive of the European Union.

Price starts at \$4103

**Municipal/Industrial Magmeter-FMG-1000 Series**

OMEGA's newest Magmeter is simple and economical and can replace those ordinary propeller meters used in the past. The FMG 1000 Series is comprised of flanged electromagnetic flowmeters that come in 4, 6, 8, or 10" sizes, making them perfect for municipal or industrial water/wastewater applications where propeller meters have typically been used. With no moving parts and electrodes which are designed to discourage fouling, maintenance is minimal for this magmeter which is especially suitable for those applications where debris or sand impede propeller meters, such as slurries or wastewater; good also for storm water applications and chemical processing needs. And, since they have minimal straight pipe requirements they're very handy for use in small spaces. The FMG 1000 also has low power requirements that make it ideal for solar and comparable power sources. They are CE Compliant and come complete with a one year warranty and owners manual. Optional solar kit and data logger are also available.



Info Card #111

Price Starts at \$1865

**Technology Breakthrough... "It's a technicians dream come true!"**

Omega's new, patented, "all-in-one" SUPERMETER Model H1M290 combines the power of a True RMS full function Multimeter, Non-contact Infrared Pyrometer with laser sighting and a Dual input Type-K Thermocouple meter with a differential measurement feature into one power-packed handheld instrument. The Multimeter measures...DC/AC Voltage, Current, Resistance, Frequency, Capacitance and features a built-in Logic & Diode tester. The Infrared Pyrometer offers adjustable emissivity, a wide temperature range, a 10:1 field of view and a laser sighting selector switch used to select between "a single dot laser" for hot spot locating and "a circle laser pattern" that outlines the optical field of view for average area measurement. The large backlit LCD display features simultaneous readings in both digital and analog bargraph format with settings for Min/Max and Average readings. Each unit features Auto power-off, fused multimeter inputs, both battery or optional AC wall adapter operation and comes complete with safety test leads, dual type-K temperature probes, rubber protective boot, batteries, spare fuse, users manual and is CE marked.



Info Card #112

Price starts at \$ 336

**Portable Handheld Data Logger - OM-2041**



Info Card #113

Handy yet powerful, OMEGA's palm-size OM-2041 data logger stores up to 10,000 records per channel. It runs on "AA" batteries or via an AC adaptor, working equally well as a portable or fixed-location logger. With the exclusive software, data recording, data retrieval and parameter programming can be done using the logger alone or in conjunction with a personal computer. It accepts Type K, E, J and T thermocouple inputs, as well as 0 to 5 V and 0 to 20 mA signals. Other features include simultaneous four-channel measurement and display, high/low alarms for each channel, display of maximum/minimum/average values and two logging modes. When operated with a waterproof connector, the logger meets IP64 protection standards.

Price starts at \$1085.

**In-Line Ultrasonic Flow Meter - FDT100 Series**



Info Card #114

OMEGA's new FDT100 Series flowmeters employ advanced transit-time ultrasonic technology, in which two flow sensors alternately transmit and receive a signal and "time of flight" is used to measure flow rate. Designed for long, economical service in either consumable or industrial water applications, these battery-powered meters have no moving parts. Pressure loss is minimal and filtration unnecessary. Long-term stability and a wide measurement range facilitate monitoring of consumption and leakage. Both flange styles-150-lb. ANSI and DIN-come in various sizes, with a choice of integral or remote electronics that display flow rate or total at the push of a button.

Price starts at \$2400 (FDT103)

**Infrared Thermometer: Handheld, High Temperature-OS523E & OS524E New E Versions with Enhanced Features**



Info Card #115

The OMEGASCOPE® Handheld infrared Thermometer series provides powerful solutions for non-contact temperature measurement. The OS523E & OS524E are portable and rugged with an adjustable Emissivity from 0.10 to 1.00 in 0.01 increments to be able to measure a variety of surfaces. This series provides built-in patented laser Dot/ Circle sighting that is switchable and a custom backlit LCD with a dual display showing a variety of temperature readings simultaneously. Other standard features include high and low audible alarms, Min- Max- Avg temperature reading, 1 mV/degree analog output, 2 Way RS232 communication, and temperature data storage and logging. Distance-measuring, Digital Video Camera, and Sighting Scope options are available. These infrared thermometers are CE Marked and come with a 2-year warranty. Applications include food processing, HVAC, mining and welding. Not for human use or medical applications.

Prices Start at \$1635

**Solenoid Valves for Piloting Actuators-SVP-3**

OMEGA's SVP-3 solenoid valves were just made for process control! They feature a NAMUR interface and are ideally suited for piloting quarter-turn actuators on ball and butterfly valves, like the "Black Mushroom" valve. The SVP-3 has a NAMUR flange interface which mounts directly to the valve assembly. The spring clip mechanism ensures easy valve manifold assembly which makes them easy to install, either as a cabinet mount using standard DIN rail or as a surface mount. Other key features include integrated exhaust, high flow, low power consumption; lockable manual override, LED display and suppressor. See OMEGA's entire SVP series on line at www.omega.com. All valves come with a 1 year warranty and complete operator's manual. RoHS compliant, these devices have many applications, including the manufacturing, chemical and wastewater industries.



Info Card #116

Price \$ 128 (SVP-3)

**I/P Transducer: Electronic Pressure Regulator-IP710 Series**

OMEGA's compact, high accuracy I/P Transducers were made for demanding manufacturing applications. Immune to the effects of vibration or mounting position they have a high tolerance to impure air and low air consumption. These electronic pressure regulators give precise, stable pressure outputs to final control elements. Multiple mounting options and I/O ports on front and back make these versatile devices for any number of control applications including valve actuators, air cylinders and brakes and pumps. Ideal for use in the manufacture of grinding, polishing, welding, and web tensioning machines. Also good for semiconductor production, automated assembly and food processing. CE Compliant.



Info Card #117

Price Starts at \$ 560

**Handheld Thermocouple Thermometer with RS232 - HH66R**



Info Card #118

OMEGA's HH66R dual-input thermometer works with thermocouple types K, J, T, E, R, S and N. It has a comfortable keypad and a large 5-digit LCD display. Functions include minimum/maximum readings, switching between °C/°F/°K, auto off and simultaneous display of T1 and T2 temperatures. The RS232 cable and Windows software enable data transfer to a computer. Transmission timing can be set from 1 second to one hour.

Price starts at \$ 225

**Temperature Humidity Alarm with Logging Capability-OM-THA-2**

OMEGA's OM-THA-2 is a hardworking, multi-function unit that not only monitors temperature, relative humidity and dew point, but also provides for out-of-range conditions and continuously logs data. Features include an audible and visual alarm, digital display, relay contacts for remote alarm or auto dialer and remote sensor. This alarm can log up to 170 days of data and no computer set up is necessary to start logging. Recording is performed continuously after the unit is turned on and all logging settings can be viewed or changed through the front panel functions. Best of all, each unit comes with Windows software to allow you to view logged data on your computer while continuously recording new data. These devices are CE Compliant and each one comes complete with operator's manual, Windows software on CD-ROM and ac adaptor. Applications include computer, laboratory and manufacturing.



Info Card #119

Price is \$ 275 (Basic Unit)

**Handheld Digital Manometers-HHP-2000 Ranges from 10.00 to 2815 INH2O**



Info Card #120

OMEGA's new digital manometer is designed for convenient, one-handed use. Its rugged case is custom molded and water resistant which allows heavy use in humid environments. All units have a high-contrast LCD with backlight for easy reading. The HHP2000 has ranges for differential, gauge and absolute measurements with leak testing and data logging options. And each unit is auto-ranging which offers the greatest resolution and accuracy. Ranges are available from 10 in-H2O to 100 psi. These CE compliant manometers come with a two year warranty and a complete operator's manual; two AA batteries are also included. Applications include room and duct pressure-great for HVAC.

Price Starts at \$540

**Enclosed Heaters-SREH600 Reinforced with Silicon & Rubber**

Intelligent construction makes OMEGA's Enclosed Heaters efficient and durable. This SREH series features a serpentine wound heating element laminated between two layers of 15 mil fiberglass reinforced silicone rubber and bonded to an aluminum mounting plate. The plate comes with two holes for mounting either horizontally or vertically (though optimal control is achieved when mounted vertically). Models with built-in air sensing thermostat regulate the temperature in the enclosure to prevent condensation or freezing. This design makes these superior heaters moisture resistant, chemical resistant and radiation resistant. Applications include equipment and industrial plant maintenance and material handling in the manufacturing, petroleum, mining and transportation fields.

Price Starts at \$33

**Temperature Data Logger with Built-in Printer-OM-VLT**



Info Card #122

OMEGA's new Temperature Data Logger does it all! It not only monitors, logs and prints but it can send data to your PC on request. The unit features an easy-to-follow menu-driven programming using front panel keys, integral temperature display and real time temperature printing. The OM-VLT records, saves and prints up to 290 temperature readings and produces an alarm when the temperature goes out of the defined range. This efficient logger also features low battery, chart ending and no sensor indicators. CE Compliant, the unit is ideal for use within a variety of industries including chemical, food, pharmaceutical and computer.

Price \$349 for Basic Unit

**RTD: Advanced Surface Mount with Class A Accuracy-SA1-RTD**

OMEGA's new SA1-RTD gets an "A" for accuracy. This surface mount temperature sensor mounts on flat or curved surfaces and provides Class A accuracy for critical temperature monitoring applications. It's based on a 2 x 2 x 0.8mm thin-film platinum RTD and supplied in PFA-insulated 3- or 4-wire configurations (connectors optional). Convenience is the key with this RTD. Installation is effortless using its self-adhesive backing; or you can permanently mount it using OMEGABOND® cements. Available in 1m (40"), 2m(80") or 3m (120") or custom lengths. The SA1-RTD can be tailored for use in a wide variety of applications, such as monitoring chip, heat sink and environmental temperatures in electronic devices; check piping or ducting temperatures; monitor motor and transformer core heat and test insulation capabilities. In fact, it can be used anywhere in which surface and / or gradient temperatures need to be monitored or controlled.



Info Card #123

Price Starts at \$63 each

**The "All-in-One" Surface Thermocouple - SA1XL**



Info Card #124

OMEGA introduces the next generation of our surface mount fast response thermocouples stocked in 1, 2, and 3-m lengths. Custom lead lengths are also available. The new SA1XL thermocouple achieves response time of less than 0.15 seconds. This thermocouple is constructed using Kapton/fiberglass junction insulation along with a fiberglass-insulated lead wire. The SA1XL can be used as a self-adhering thermocouple for temperatures up to 175°C (350°F) or it can be cemented in place for use at temperatures up to 315°C (600°F). The "All-in-One" surface thermocouple is available in J, K, T, and E Calibrations.

Price Starts at \$110(SA1XL-K)

# Automotive Scene

## Hardtop convertibles make technological advances

By Bill Vance

There is a quiet revolution going on in the world of open cars, those glamour wagons of the automotive scene and darlings of collectors. Traditional fabric-topped convertibles, in spite of drafts and leaks, were always more romantic than hardtops, even though alfresco motoring is enjoyable for only about five months a year in our climate.

That's changing now with the arrival of the true hardtop convertible, not the ersatz "pillared hardtop" that was marketed in the 1950s. These new ones have foldable solid, usually steel, tops that turn convertibles into true year-round cars. And the mechanical choreography as the top folds, stacks, and stows itself in the trunk is truly a sight to behold.

Hardtop convertibles are not new, but modern electronics, hydraulics, body engineering and sealing have made them practical. The first hardtop convertible coupe was shown by Peugeot in 1934. In 1957 Ford introduced its 5-6 passenger Skyliner retractable hardtop. Its large steel top folded via a Rube Goldberg system of motors, relays, switches and circuit breakers, and took up most of the trunk. The Skyliner lasted only three model years.

The modern hardtop convertible era



began with the 1997 Mercedes-Benz SLK, a slick little 2-seater. Cadillac's XLR hardtop 2-seater convertible arrived as a 2004 model. Chevrolet demonstrated ingenuity in the SSR car-like convertible pickup truck by cleverly folding the hardtop roof and stowing it vertically between the cab and the cargo bed. Lexus weighed in with its SC430 folding hardtop, and BMW has its 3 Series convertible. Volvo's C70 offers generous four-passenger space with a folding hardtop.

### Modern era began with the 1997 Mercedes-Benz SLK

In the early years of hardtop convertibles they were confined to the premium price class, but as technology developed they moved into the more affordable bracket. Pontiac's G6 4-passenger hardtop convertible (above), for example, arrived in 2006 with a suggested price in the \$36,000 range.

For 2007 Mazda fitted its popular MX-5 (Miata) roadster with an optional folding composite hardtop, while still keeping its soft top. It managed to retain most of

its trunk space, a rarity in retractables. Volkswagen's new 4-door, 4-passenger Eos's hardtop retracts, and even includes a sunroof. The MX-5 starts around \$30,000, the 2008 Chrysler Sebring at \$35,000 and the Eos, \$37,000.

Creating a convertible, whether soft of hard top, involves more than just chopping the top off a regular car. A solid top contributes much to body stiffness, so a convertible needs extra reinforcing in the body structure to reduce cowl shake and retain crash resistance, which adds weight. Actuating hard tops usually takes up to 30 s, although the MX-5 accomplishes it in only 12 s.

When a new vehicle line which includes a retractable hardtop is being developed, the best approach is to design it as such from the beginning. Including top-system engineers from the start can avoid, for example, having to relocate a fuel filler pipe to accommodate the folding top, which would require a whole new certification crash test. Volkswagen's Eos was designed as

a hardtop convertible from the start.

Designing retractable hardtops that can include up to five panels (more panels fold more compactly) and perhaps a dozen actuators and motors is an intricate and specialized process. That's why many car manufacturers turn to specialty top makers like Karmann, Magna CTS or ASC.

Karmann's Michigan operation designed the Pontiac G6's large top, with engineers from Karmann and General Motors working closely together throughout the development. The top system complete with hydraulics and electronics arrives at the assembly line in modular form, ready to be fitted right onto the G6 body.

With the current trend to retractable hardtops it's likely the days of the fabric topped convertible are numbered, hopefully banishing that horrible term "ragtop" with it.

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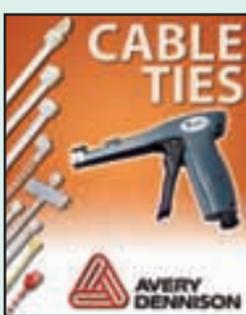


Info Card #126

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## Products: Switches

### Managed switch memory



Memory modules FL IF MEM 2 TX-D from Phoenix Contact are 2-port twisted-pair modules for the Modular Managed Switch. Units store the complete switch configuration, including the management IP address, the password and all switch settings, e.g. the port configuration and the trap receiver. The pluggable memory module provides rapid configuration when installing or exchanging devices without requiring additional tools or software.

phoenixcontact.ca

Info Card 357

### Tilt switch angle sensitive



NKK Switches has announced the DSA01 combination tilt/sensor switch. The unit, which is triggered when tilted beyond  $\pm 10^\circ$  of the horizontal, brings sensitivity to small angle changes to company's DS series of environmentally compatible components. Engineered to replace mercury and pendulum switches, the unit contains no mercury,

is cylindrical, measures 29.3 mm long and has a diameter of 11.5 mm. A PCB adaptor is available to simplify assembly.

nkkswitches.com

Info Card 358

### Emergency stop switches



EAO Switch Corp. has announced Emergency Stop switches available with a variety of options. They include: LED illumination; twist to unlock or key to unlock; protective shrouds; Emergency-Stop switch box enclosures; labels; and, protection of up to IP65. In an emergency, a push of an EAO Emergency Stop actuator releases NC contacts, thus immediately terminating power. The switches are re-activated either by hand twisting the actuator, or by unlocking the actuator with a key.

eaoswitch.com

Info Card 359

### Interlocks for precipitators

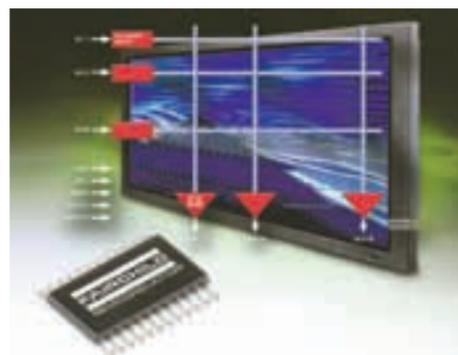


Castell Interlocks Inc. has announced range of heavy-duty interlocks said to guarantee the safety of workers operating electrostatic precipitators by preventing access to live equipment. Castell trapped key interlocks force workers to adhere to a step-by-step process every time internal access to a precipitator is needed. Each step releases a key which in turn permits activation of the next stage in the process.

castell.com

Info Card 360

### Video switch matrix

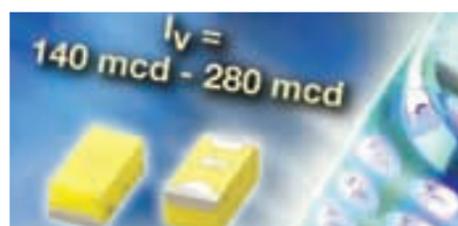


Fairchild Semiconductor has introduced the FMS6502, an 8-input, 6-output video switch matrix. The unit is said to offer more functionality than comparable crosspoint video switch matrices by integrating analog switch capability, input clamps, bias circuitry and cable drivers into a single device. Consuming approximately half the board space of discrete solutions, the switch matrix reduces part count while simplifying designs. The switch accommodates standard-definition (SD), enhanced-definition (ED) and 1080i/1080p high-definition (HD) video signals-and offers selectable 0 and 6 dB integrated cable drivers capable of driving dual video loads.

fairchildsemi.com

Info Card 361

### LEDs provide switch status

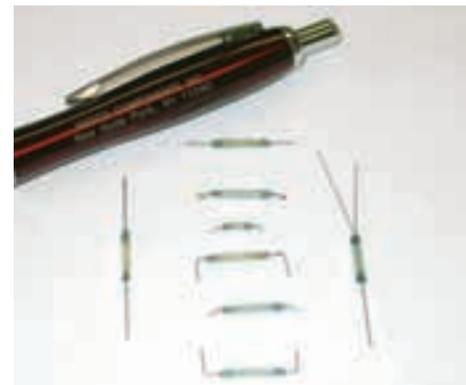


Vishay Intertechnology, Inc. has introduced a series of ultrabright white SMD LEDs that utilize high-efficiency InGaN technology in a 0603 footprint to provide a luminous intensity from 140 to 280 mcd. With dimensions of 1.6 x 0.8 x 0.6 mm, the VLMW1100 series of white LEDs are said to provide cost-effective illumination for applications including backlighting in automotive dashboards, switches, keypads, indicators and equipment.

vishay.com

Info Card 362

### Reed switch RoHS compliant



Hasco Components has announced that all of its reed switches are RoHS compliant. The reeds are meant for applications in liquid level sensors, proximity switches, automotive, security, appliances or for basic on off needs where a regular mechanical switch will not work. Ratings of 250 million cycles can be achieved. Glass length ranges from 8 to 14 mm and diameters range from 1.8 to 2.2 mm.

hascorelays.com

Info Card 363

### Sealed rocker switches



APEM Components has introduced the KR series of sealed rocker switches. Single and double pole models are available in an extensive range of electrical configurations, including ON-OFF, ON-ON, ON-ON-ON and ON-ON-MOM. The switch is rated up to 15 A at 12 Vdc for 10,000 cycles. Additional electrical specifications include initial contact resistance of 10 m $\Omega$  maximum, insulation resistance of 1000 M $\Omega$  at 500 Vdc and dielectric strength of 2000 V<sub>rms</sub> between terminals.

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## Feature: Power Transmission

# Continuously variable transmission breakthrough

Fallbrook Technologies Inc. is a San Diego, CA-based technology development company dedicated to improving the performance and flexibility of transmissions for vehicles and equipment.

Fallbrook's NuVinci continuously variable planetary (CVP) technology is said to be applicable to virtually any machine that use a transmission such as bicycles, light electric vehicles, automobiles, agricultural equipment and utility class wind turbines.

The patented NuVinci technology is functionally analogous to planetary gear sets, and uses a set of rotating and tilting balls positioned between the input and output components of a transmission that tilt to vary the speed of the transmission. Tilting the balls changes their contact diameters and varies the speed ratio.

As a result, the NuVinci CVP offers seamless and continuous transition to any ratio within its range, thus maximizing overall powertrain efficiency, with no jarring or shocks from the shifting process, and improving acceleration, performance and overall vehicle efficiency over conventional transmissions. When compared to traditional CVTs, the NuVinci CVP is less complex, has considerably fewer parts, offers more stable control and scalability across product lines, is better packaged, and is less expensive to manufacture and assemble.

There is a clear distinction between Fallbrook's NuVinci CVP drive and more traditional CVT technologies.

A CVT is a transmission that is infinitely variable between its high and low range, unlike a conventional geared transmission where the number of fixed speed ratios between high and low is limited by the number of gears. The CVT has been called the "holy grail" of transmissions because it eliminates the multiple gears, shifting clutch(es), and many other parts found in conventional transmissions. In place of

gears, most CVTs use one or more cones, discs, balls, belts, toroids, or other shaped devices for gradually changing ratios. These geometric shapes allow the input or output contact points on any particular device to vary in diameter, thus changing the input to output speed.

The use of CVTs has not become widespread due to multiple problems inherent in conventional designs. These problems include shifting control difficulties, packaging problems, scalability challenges, questionable reliability and durability, high cost, increased weight, and other factors.

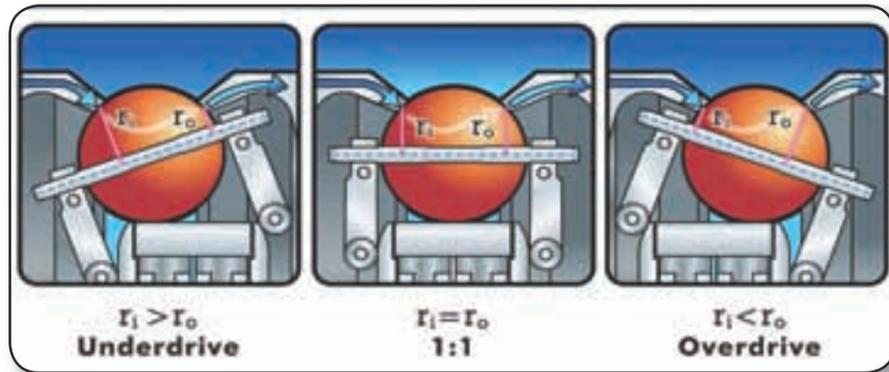
The NuVinci CVP represents a quantum leap forward from other CVTs as well as conventional mechanical transmissions. These advantages include:

- Higher torque density
- Smaller size/weight
- Easily scalable
- Simpler, elegant design
- More adaptable and versatile
- Improved overall performance
- Easy to package (less space required)
- Lower manufacturing and maintenance costs

The NuVinci CVP is continuously variable and infinitely applicable to almost any product using a mechanical power transmission. The technology combines the advantages of a toroidal traction CVT with the time-proven versatility of the planetary gear arrangement.

It uses rolling traction to transfer torque, just as do toroidal transmissions. However, unlike toroidal CVTs, it distributes the transmitted torque over several spheres in an inherently stable configuration, thus lowering total clamping force required and significantly improving durability, control stability and torque density.

This arrangement is said to make the NuVinci CVP the only practical CVT



Rotating and tilting balls positioned between the input and output components of a transmission tilt to vary the speed of the transmission. Tilting the balls changes their contact diameters and varies the speed ratio.

to combine the smooth, continuous power transfer of a CVT with the utility of a conventional planetary gear drive. Torque inputs can be summed or divided, just as in a conventional planetary.

Ratio control is stable, and can be actuated down the centre line of the transmission, which again is similar to the proven planetary transmission. Part shapes are simple and relatively easy to manufacture, and in most applications, there is no need for power-robbing, high-pressure hydraulics.

The NuVinci CVP reduces energy consumption through its continuous speed changing characteristics, allowing the power input prime mover (such as a gasoline engine or electric motor) to operate in its most efficient speed range. Overall, the NuVinci CVP's mechanical and manufacturing characteristics improve performance and reliability while reducing costs over conventional CVTs and stepped transmissions. As a result, the NuVinci CVP can potentially replace the planetary gear automatic transmission in most mechanical devices.

Fallbrook announced recently that it has entered into an agreement with Downers Grove, IL-based Aftermarket Technology Corp. (ATC) to develop a production design for a NuVinci CVP drivetrain specifically for the outdoor power equipment (OPE) market. OPE vehicles include all-terrain vehicles (ATVs), lawn & garden tractors, and utility vehicles, among others. ATC is the world's largest independent drivetrain remanufacturer. It currently manufactures NuVinci drivetrains used in bicycles,

electric scooters and other applications. This article was contributed by Fallbrook Technologies ([fallbrooktech.com](http://fallbrooktech.com)).

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**Feature: CAD**

# Safety product designer keeps pace despite global pressures

*By Mike Edwards*

**P**enSafe, a safety product designer that sells to harness and lanyard manufacturers, was safe – until 2003. The Stoney Creek, ON-based company then had “the five horsemen of the apocalypse show up to lay siege on the business.”

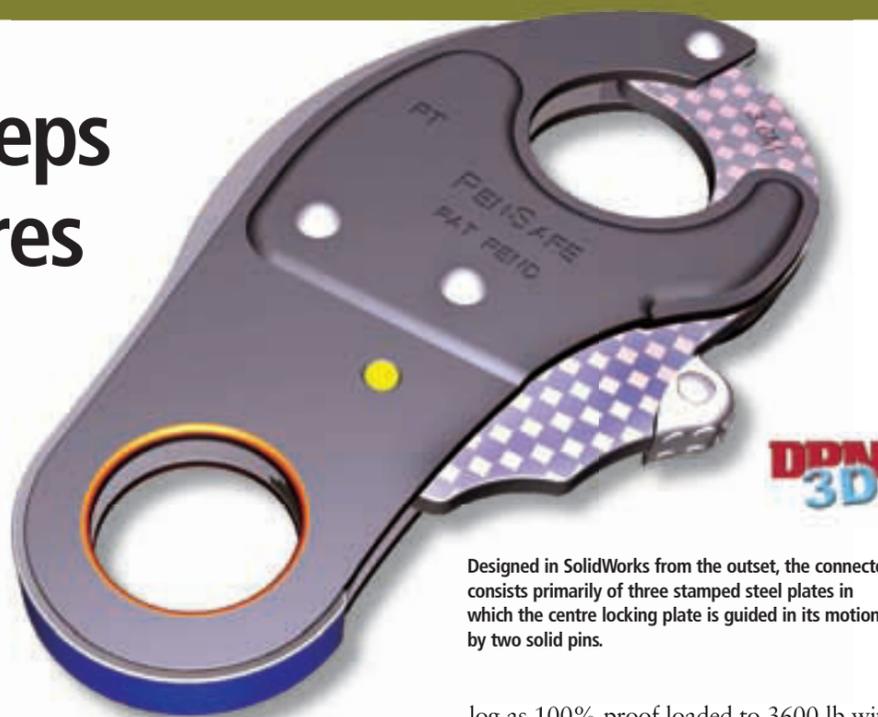
According to its president, John Leavitt, the “horsemen” were: technology, raw material costs, customer requirements, global competition and the Canadian dollar. So how has it stayed in business?

“We are trying to apply curiosity, imagination and learning in four areas,” said Leavitt, “end user requirements, industry standards, outsourcing, and design and engineering.”

Under design and engineering, Leavitt further identifies people, process, technology and R&D as key factors. The software technology PenSafe has adopted is SolidWorks mechanical CAD, CosmosWorks finite element analysis and PDMWorks data management provided by value-added software reseller Javelin Technologies of Oakville, ON (javelin-tech.com).

Last year, PenSafe won Honorable Mention – Consumer Product Design in the Javelin “Cool Design” contest for its entry, “Connector for the Safety/Fall Arrest Industry” designed by Bob Claus at PenSafe.

The product, a connector for the safety/fall arrest industry, is designed to save lives. The design of the connector consists primarily of three stamped steel plates in which the centre locking plate is guided in its motion by two solid pins. The function of the connector requires four very



Designed in SolidWorks from the outset, the connector consists primarily of three stamped steel plates in which the centre locking plate is guided in its motion by two solid pins.

specific yet simple motions to open the gate of the connector. These four motions, initiated by the operators hand against the “thumb grip” on the outer edge of the centre lock plate are to push up, in, down and rotate to the open position.

The design was developed using SolidWorks from the very beginning. CosmosWorks was also utilized to maximize the strength requirements of the product while minimizing the material used to make it.

“Through utilization of these CAD tools, our Product Development Team has created a product that is much stronger than traditional designs but, to the pleasure of end users, is achieved by utilizing thinner and lighter materials,” said Claus.

Leavitt said “prototype dies for a forge cost many thousands of dollars, so it is important to test the design (in software) before cutting to save time and money.

“We can do iterations in hours, not weeks, using software tools.”

Since the contest, the honored design is now available commercially in sheet stamped carbon steel material and is branded the High Strength Connector Model 8280 Pincer. It is rated in the cata-

log as 100% proof loaded to 3600 lb with a minimum tensile strength of 5000 lb and minimum gate strength 3600 lb with a minimum side load strength of 3600 lb. “We knew upfront there were no problems with its strength,” said Leavitt. “Testing was just done to satisfy organizations such as the CSA and ANSI, not the proof of concept.”

PenSafe also uses e-Drawings, the lightweight visualization file format integrated into SolidWorks. “We use e-Drawings extensively, from as early as the concept phase for initial feedback that is often the same day. But even as early as a couple of years ago we had to educate our suppliers about the tool,” said Leavitt.

Under the company’s R&D initiative, it has partnered with a Toronto industrial design firm that also uses SolidWorks. PenSafe products can be used in both industrial equipment and mountain climbing equipment, “so we can still make our product more appealing aesthetically and more user-friendly,” said Leavitt. “And since the ID firm has the same software, we can easily share files.”

Leavitt added that he views Javelin Technologies more as a partner than as a consultant. “They have knowledge we couldn’t afford to maintain. The good ones learn your business and not just provide technical expertise.”

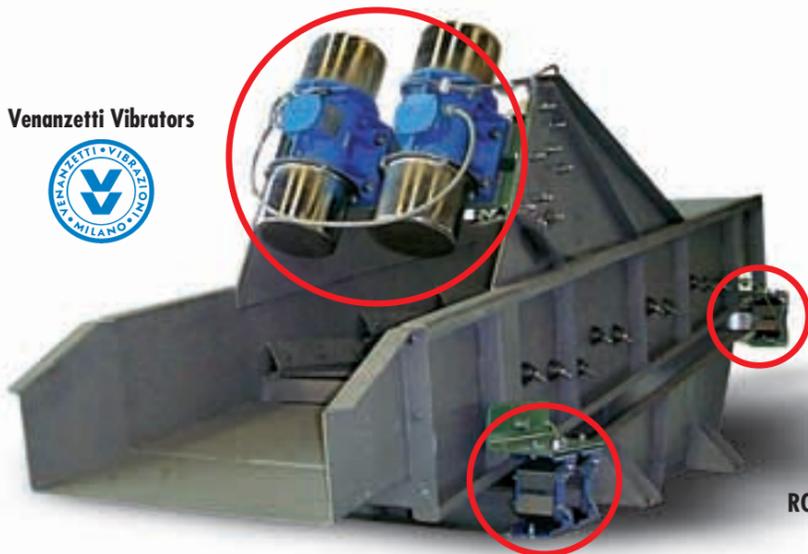
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## Rapid injection molding for fuel cell development

Ballard Power Systems, headquartered in Burnaby, BC, is a leader in the design, development, and manufacture of zero-emission proton exchange membrane (PEM) fuel cells. The company's technology is being deployed in residential fuel cell cogeneration in the Japanese market.

In residential cogeneration, electricity is generated right at the individual home using fuel cells, and heat from the fuel cell is captured to provide hot water for the home. A fuel – natural gas, kerosene and propane are the most commonly used fuels in Japanese households – is chemically “reformed” on-site to make hydrogen. Ballard's (ballard.com) PEM fuel cell then uses the hydrogen to produce electricity. The Japanese government is subsidizing the commercial introduction of residential fuel cell cogeneration systems, including those incorporating Ballard's fuel cell technology. The goal is commercial sales of the systems, without government subsidies, by 2012.

One of the critical steps in commercialization will be reducing the cost of the technology. In pursuit of this goal, engineers at Ballard are closely examining the cost for every aspect of every process. For some parts it has begun turning to The Protomold Company of Maple Plain, MN, which offers a high-quality, low-cost method for making injection molded plastic parts for prototyping and low-volume production. Recently, Protomold produced a part for Ballard's 35 A, liquid-cooled Mark 1030 fuel cell stack, designed for integration into a Ballard partner's system for the residential cogeneration market.

“The Mark1030 fuel cell is actually a number of fuel cells stacked together,” said Ballard senior mechanical engineer Geoff Crocker. “We use Belleville springs to compress graphitic plates in the stack into a single unit to maintain contact and sealing.

“We stack the Belleville springs in various configurations. To keep them aligned during compression, we originally ran a machined metal rod through the holes in the middle of the washers and then shrink-wrapped the stack of springs. But the cost of the machined metal and the shrink-wrapping adds up, and if we want to be commercially viable over the long term we need to lower the cost. We knew we would have to use some high-volume process like injection molding.”

Defining the concept for the alignment device was easy. Its purpose was simply to hold a stack of spring washers in alignment before and during compression. The obvious way to align the washers would be a tube running through the centres of the stack. But to prevent the tube from sticking out past the end of the stack once the springs were compressed, the engineers wanted one that would shorten along with the stack of springs.

Crocker and senior materials engineer Steve Gabrys went to work. Their solution was two opposing bases with walls and flexible locking arms. The walls support the spring while the flexible arms lock the two bases together. Under compression, both walls and arms slide past each other towards the opposing bases. To control costs, they chose to make a single part that could be used for both components.

“We looked at a variety of configurations,” says Crocker. “We used Pro/ENGINEER CAD software to produce 3D models and assembled them on-screen to see how they worked. Between the whiteboard and the computer, we went

through about a dozen iterations. The environment in which the design had to work was fairly benign, but we wanted a wall in the uncompressed state to support the springs. The two parts had to snap-fit together, and the arms and cutouts had to interface properly as the springs were compressed. Fortunately, the normal drafting of injection molded parts would provide the clearance we needed for the parts to slide into one another.”

For their prototype parts, Crocker and



Patent pending Belleville spring holders in green ABS shown in photo were created from Pro/ENGINEER 3D files by rapid prototype service provider Protomold. Inset: Ballard and Tokyo Gas utility typical residential PEM power unit. Inset: The Mark 1030 V3 fuel cell is in alignment with the 2008 Japanese government targets of 40,000 h operation.

Gabrys specified PA66 nylon resin, which had the strength and durability they needed and the flexibility for the snap fit, all at a reasonable price. According to Crocker, at the quantity they ordered, Protomold's injection molded prototypes actually cost less than a similar number of rapid prototype parts would have. Using the nylon parts for functional testing, they verified their design and moved ahead into limited production.

*This article was supplied by The Protomold Company (protomold.com).*

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## Feature: CAD

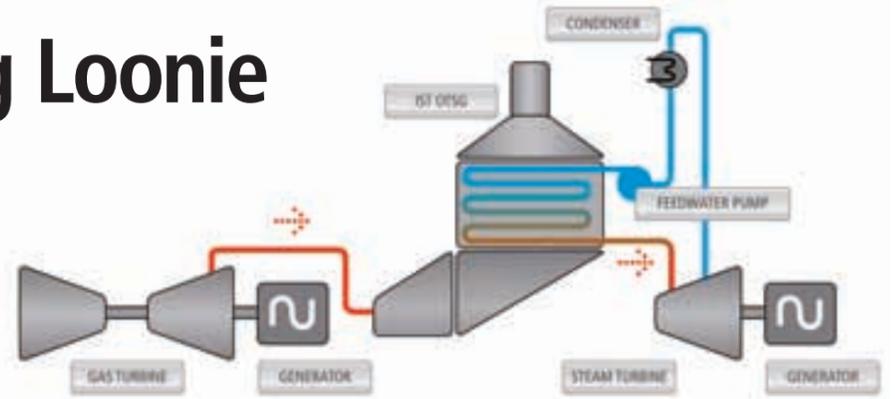
# Meet the challenge of rising Loonie with Engineer-To-Order

By Kerry Saumur

This spring, the Canadian dollar soared over ninety cents U.S. – heights not seen since the 1970s. That's good news to those planning their summer vacations down south, but many manufacturers are bracing for declining margins and profits. With Federal Finance Minister Jim Flaherty urging Canadian manufacturers to be more

productive to meet the rising Loonie, what exactly can be done?

According to the recent Engineer-to-Order in the Canadian marketplace white paper by Technology Evaluation Centers (technologyevaluation.com), Engineer-to-Order (ETO) solutions can drive manufacturing efficiencies while holding the line on costs. Jim McArthur, vice president of Operations at IST, a Cambridge, ON-based manufacturer of Once Through Steam Generators



OTSGs help energy producers recover heat from hot gases to generate steam for process use or power production.

(OTSGs) for international customers like GE and Siemens, sees ETO as a vital tool to meet challenges like the stronger Canadian dollar. His company's OTSGs help energy

producers worldwide generate more money by recovering heat from hot gases to generate steam for process or power use.

Designing and detailing an OTSG can be very time-consuming – requiring from 3000 to 5000 engineering hours over three months for each contract. In the past, design rules had not been effectively shared from project to project, resulting in a slower ramp-up time and repetition of work. Ongoing data entry in multiple applications sometimes resulted in small

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Plant south of Seattle in Centralia, WA, uses IST's Once Through Steam Generators.

errors that could hold up the process and drive up costs. Identifying and ordering all materials could only be done in bulk at the end of the design process, meaning work could not begin until materials arrived and increased costs due to the rush delivery requirements.

Like many of our customers, IST relies on a core engineering team that scales with temporary staff to meet new orders as required. ETO enables standardized design rules to be captured and easily shared, so staff can spend less time on training and integration and more time on product design and development. Knowledge sharing also works the other way around – a project's learning and insight don't leave when the employee's term is up, nor when full-time employees leave to take on other assignments.

IST's goal is to reduce the total average design hours for each Steam Generator project by 60%. To facilitate integration with existing systems and spreadsheets, IST has set up an electronic data interchange (EDI) to eliminate errors and reduce data entry. This bridges the gap between Autodesk Inventor, Autodesk Intent, AutoCAD 2007 software applications, document management, ERP and Excel programs to allow for integrated model creation and provide automatic drawings and bills of materials. Kerry Saumur is National Sales Manager, Manufacturing Solutions Division of Autodesk Canada Co. (autodesk.com).

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# Machinist gets a CAD education the easy way

Calgary-based machinist Westley Chagnon was very familiar with reading technical drawings. For the last 35 years, he performed his trade at Crown Packaging, a Calgary can manufacturer, where he manually machined dies at extremely low tolerances.

“For years I wanted to learn CAD. Every time I talked to somebody about it, they made it seem like rocket science. I thought I needed to get organized about it.” In May of 2006, Chagnon made a concerted effort to learn the raw machine language of CNC, g-code, along with the essentials of computerized drafting.

“I tried out several sample programs of CAD packages. I went through two of them, printing out 500 pages of manuals, but I couldn’t make heads or tails of it. I thought ‘what a trip in futility this was

## Assistance from Alibre turns amateur into professional

going to be.’ I had bought these machines, and now I can’t run them.” For a while, Chagnon set aside his CAD frustration and ran his mill through a g-code controller, which permitted him to cut basic shapes through simple programming. “I thought maybe I don’t have to learn CAD that bad, because I can tell my machine to go up two inches and over one inch, and so forth.”

But once he wanted to do more complex parts, he realized the need for drawn schematics. “One day I had to do a part that had a contour – one radius blending into another. I went to friends who knew g-code to try and write it, but the bottom line was that I needed to know the points of intersection. That’s when I picked up Alibre Design software from Alibre, Inc.

To chart out the geometry of his design problem, Chagnon turned to another sample software he had not yet tried, Alibre Design Xpress. The free download has nearly all the parametric modeling capabilities needed to build, print, or export small assemblies.

“It was a simple question: ‘How do I draw two circles?’” recalled Chagnon. “I called tech support, and Alibre was willing to help me. They showed me a lot of ‘how-to’ examples within the program. I thought that’s pretty great, since I’m using a free piece of software.”

After technicians at Alibre showed how easy it was to model the shapes he needed, Chagnon committed fully to the application. He purchased the full version of Alibre Design and extra tutorial DVDs. “Their manuals and their training videos are excellent. I started to catch on.”

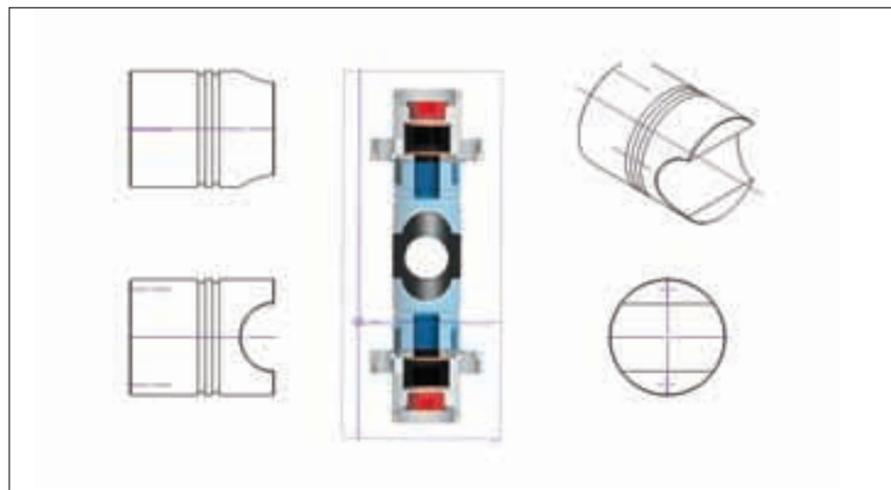
Only a few weeks later, Chagnon was talking with an old friend, Keith Campbell, owner and president of Select Energy Systems, a Calgary manufacturing firm that specializes in coiled tubing for natural gas extraction. Campbell explained that his engineering department was overloaded with projects and he needed technical drawings of a new design. Chagnon offered to help. Campbell drew him rough

sketches of the mechanics he needed – a complete coiled tubing hanging system that would lock the piping in place as it attached a conventional natural gas well.

The next morning, Chagnon dropped off a full set of 2D drawings after modeling the assembly in Alibre Design the night before.

*This article was contributed by Alibre Inc. (alibre.com).*

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Machinist Westley Chagnon quickly learned to create both 2D drawings and 3D solid models in Alibre Design software through instructional videos and technical support from the software developer.

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## Feature: CAD

# Comparing software pays off and helps heating equipment maker

Superior Radiant Products (SRP) of Stoney Creek, ON, manufactures a full range of gas-fired, high and low-intensity infrared space heating equipment for commercial, industrial, agricultural and residential markets.

A typical application for SRP's heaters is a restaurant patio where they create a warm and welcoming environment out of an area that might otherwise be too cold for outdoor dining. But they're also used in indoor settings where they can substantially reduce heating costs.

## Choosing the best CAD rather than the most popular

SRP ([superiorradiant.com](http://superiorradiant.com)) competes in a fairly crowded field of about a dozen other suppliers of this type of equipment in North America. The company ranks near the top but its engineering vice president,

Pat Caruso, is always looking for ways to distinguish SRP and its products from the competition. Part of this involves design innovation, which SRP recently illustrated by winning the first place award for "Most Innovative HVAC Product" at Canada's Ciphex trade show. Another important factor is customer satisfaction,

Welcoming, cost-saving heat for outdoor dining and other activities comes from product designed in Solid Edge 2D/3D software.

which is what led Caruso to upgrade the company's software design environment from 2D AutoCAD to 2D/3D Solid Edge.

"When people called in with problems with our equipment, we could almost always trace the problem back to the installation," Caruso explains. "Yet it was hard to say to the contractors who did the installation, who are our customers, 'You didn't follow the manual.' So we decided to give them a better manual." In doing that, SRP also got a design environment that enhances its

ability to innovate.

Caruso wanted to create manuals that used less text and had nicer graphics than the line drawings or artist's conceptions in most manuals of this sort. He knew 3D CAD geometry could be used for this purpose and set out to purchase a mid-range solid modeling program. Photorealistic rendering functionality was high on his list of must-have features. Sheet metal modeling (with the ability to automatically unfold parts) was also important. Caruso thought he had made his selection after working with a trial version of SolidWorks for a while.

Then he had the opportunity to compare that program with Solid Edge, and the choice became clear. "I saw Solid Edge at a trade show and I'm glad I did," he said. "Its rendering capability is far superior to that of SolidWorks. Solid Edge also had better sheet metal modeling functionality." Caruso also realized that Solid Edge was more intuitive to use. "It knows what your next logical step is, so you're clicking your mouse a lot less. Solid Edge definitely does what we need and more," he adds.

Caruso also noted a difference in approaches the resellers of the two programs took and discovered that UGS, which develops Solid Edge, owns the Parasolid modeling technology SolidWorks uses after being led to believe otherwise. "The Solid Edge reseller, Designfusion, was very professional."

As soon as Caruso got Solid Edge, he had a chance to see what it could do for the manuals. Without any formal training (working from the built-in tutorials), he created a Solid Edge assembly model of a new product that had recently been developed in AutoCAD. Then he taught himself all there was to know about creating photorealistic images in Solid Edge. The results were stunning; some of the sales and marketing staff thought they were photos. They were incorporated into the manual for the new product, the EvenGLO brand patio heater.

Compared to the company's previous manuals and to those of the competition, this one is a contractor's dream. Not only does the quality of the rendered images bring a new level of clarity to the document, Caruso was able to easily position the Solid Edge assembly model to show the most advantageous angles for the installers. "As we get these manuals out for more and more of our products, I think it will elevate our company's image in the minds of the buyers and installers," Caruso added.

The same is true for communications with overseas suppliers. "People understand these images easily and they overcome the language barrier."

*This article was supplied by Toronto-based Designfusion ([designfusion.ca](http://designfusion.ca)).*



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# Software can do in minutes what you did in days

By Tom Lee

An emerging trend in engineering is the realization that not everything in a professional's life is currently automated. In fact, most things in our working lives still seem desperately manual. Last year, Waterloo, ON-based Maplesoft conducted a 2000+ respondent survey on the analytical habits of the modern engineer and to our surprise, the vast majority of us still find pencil, paper and calculator to be the most frequently used tools for analysis and design. And the basic question of "how well are you managing all of those manual calculations?" usually went unanswered.

As the engineering software evolved over the past decades, they established powerful "fiefdoms of automation" where software giants produce powerful tools that fully automate everything within their own particular application space but anything outside is relegated to another software fiefdom or worse yet to the un-serviced software "no man's lands." What we're experiencing is a call for something that could competently crunch a wide range of engineering data and information, as well as help sort out countless little analytical messes that devour so many of those work hours.

One common example we run into these days is in motion control. There are many

## Pencil, paper and calculator still frequently used

excellent tools to help with the controller design and optimization, but what was desperately missing for many was something to sort out the basic math and derivations of the models. Even for standard plants, the time to sort out the model structure, transfer functions, parameters, etc. was non-trivial. But if you wanted to do non-linear systems and the like, you were "toast" for a good two to three weeks.

This is where a general purpose math tool like Maple from Maplesoft can be a god-send. Unlike spreadsheets and other common engineering number-crunching tools, the high-end math systems can directly manage the algebra symbolically and keep all of the math in order. For example, in manipulating the transfer functions of various components in a system, you typically have to grind through a whole range of manual polynomial-crunching operations, usually on paper. Even the simplest task takes about ten minutes, assuming you never flipped a minus sign or remember the rules of partial fraction expansion.

Truth is, every time you reach for a pencil or a calculator to deal with your design math, you risk introducing error and you're likely wasting too much time.

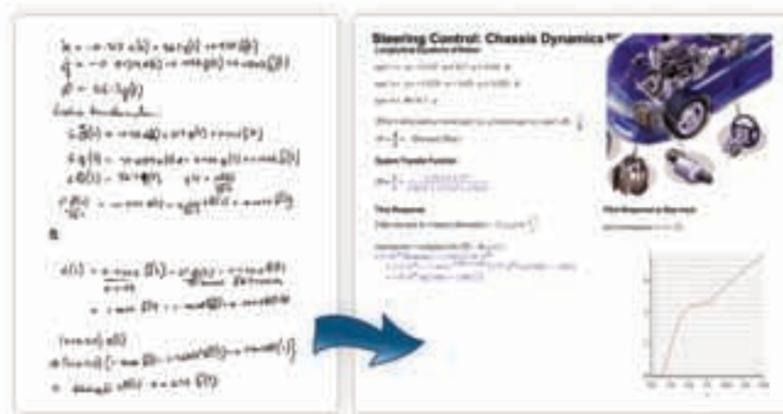
In many ways, this is a basic "motherhood" application. If you can ensure that all your model preparation math is done with a consistent, robust tool that is faster and reduces sources of formula error, your overall project time or project variability is bound to decrease significantly.

Another thing that these math tools do for an engineer is that they amplify his or her mathematical ability. For example, tools like advanced symbolic differential equation solvers, or matrix manipulation rou-

tines can help you sort out the math that are presented in research papers or advanced application reference books. For example, an engineering group at an aircraft company found that using a standard surface modeling package required so many shape control points that any change would take weeks of tedious manipulation. Working with Maple, they quickly applied a special blending technique and an adjustment in shape went from weeks to hours.

Tom Lee is Vice President of Market Development, Maplesoft ([maplesoft.com](http://maplesoft.com)).

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## Feature: Data Acquisition

# The ten most common designed experiment errors

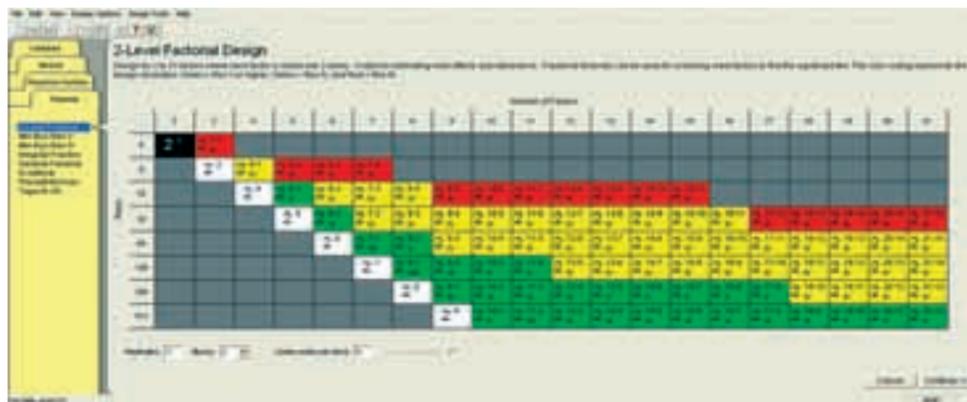
By Jeff Hybarger

When I first learned about designed experiments in 1986, I really liked the fact that using these techniques I had the potential to solve production problems from the quality department.

My first experiment was a very expensive failure. I spent one day to run samples, two weeks to measure, and two weeks for manual analysis. I definitely bit off more than I could chew.

The important thing was that I analyzed my failure and found that planning is everything with a designed experiment. If the planning is done properly, you will learn something. Let's take a look at ten tips for avoiding the most common designed experiment mistakes.

1. Get good software and learn to use it properly. I've tried about half a dozen different programs of all price ranges. Some will actually help you pick the wrong factors and some do not have residual analysis included.
2. Make sure that the equipment the experiment is going to run on is calibrated and all preventive maintenance is up-to-date. It's frustrating to optimize a process only to lose it after calibration. You need to start from scratch and can't make assumptions from the first experiment.
3. Do not run too narrow of a range from low to high for your factors. If you do, it will appear as if key factors do not affect the process. In reality, they do not affect the process in the range you selected.
4. Do not run too wide of a range from



Design for 2 to 21 factors where each factor is varied over 2 levels. Good software and methods yield good results.

low to high for your factors. If you run too wide a range, you may find that some combinations of factors do not yield usable results. Before the experiment review the matrix and find the two worst cases by using

subject matter knowledge. Run these samples first. If there are problems, tighten up the ranges of the factors. In injection molding, I like to run ranges just inside of shorting or flashing the parts.

5. The sample size for each run and the number of runs needs to be large enough to detect the size of part changes you think are significant. If you do not use large enough samples, you will not detect changes that really occurred. There are formulas that assist in determining the optimum number of samples.
6. Factors that are not included in the experiment's matrix can't be touched during the experiment. Changing anything that is not in the matrix adds factors that are not accounted for. Stay on the production floor to keep a close eye on the machine settings.
7. Experimental design run orders are not the easiest order to run the experiment in. It would be easier for the people running the experiment to change the order. Again, keep on the floor and keep an eye on things.
8. I've experienced two kinds of measurement error in experiments that can lead to poor results. The first is gage error. Gage error studies need to be complete before running the experiment. Error should be under 20% to give good results. The second is having more than one person measure a dimension or rate attributes.
9. Data entry is always an issue. I always have the inspectors enter the data in a spreadsheet. Standard deviations from all runs can be compared. If any standard deviation looks significantly higher, check for obvious data entry and measurement error. If the parts were numbered by run and part, the individual part can be re-measured and entered into the spreadsheet.
10. After analysis, verification run(s) need to be completed. Do not ever base tool work off of predicted software values. Run the optimized process and worst case runs if applicable, measure the parts and then make tooling changes.

If these tips are followed, a good 90% of designed experiment failures can be avoided. The important thing is to learn from the successes and failures of each experiment.

Jeff Hybarger is a DOE practitioner with many years of engineering experience in manufacturing (hybargerconsulting@charter.net). It first appeared in the December 2006 stateaseer newsletter from Stat-Ease, Inc. (statease.com).










































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## Products: Data Acquisition

### 16-bit analog modules



IDEC Corp. has announced two analog expansion I/O modules for its MicroSmart and MicroSmart Pentra PLCs that offer 16-bit resolution. An 8-channel 0 to 10 Vdc/4 to 20 mA input module, as well as a 2-channel -10 to 10 Vdc/4 to 20 mA output module are available. The modules snap-on to the right side of MicroSmart CPU modules without extra cables.

idec.com

Info Card 368

### Inspection sensors for parts



Cognex Corp. has announced the Checker 200 series of inspection sensors. The inspection sensors offer built-in lighting, variable working distance, and high-speed inspection capability at rates faster than 6000 parts/min. Even on the fastest production lines, Cognex says, Checker can inspect multiple part features and deliver reliable, precisely timed, pass/fail results. The sensors can detect parts by finding an actual feature such as a product graphic and check features that other sensors cannot, such as a code printed on a label.

cognex.com

Info Card 369

### Mini PCI fieldbus cards



Beckhoff Automation has released Mini PCI fieldbus cards for PROFIBUS, CANopen, DeviceNet and Ethernet networks. When using Ethernet Mini PCI cards, industrial PCs contain a third available Ethernet port with 10 Mbit/s, 100 Mbit/s or 1000 Mbit/s communication. While the 100 Mbit/s Ethernet port offers optimum performance for all EtherCAT control tasks, a gigabit port is can also connect to higher-level networks.

beckhoffautomation.com

Info Card 370

### Smart HMI with display

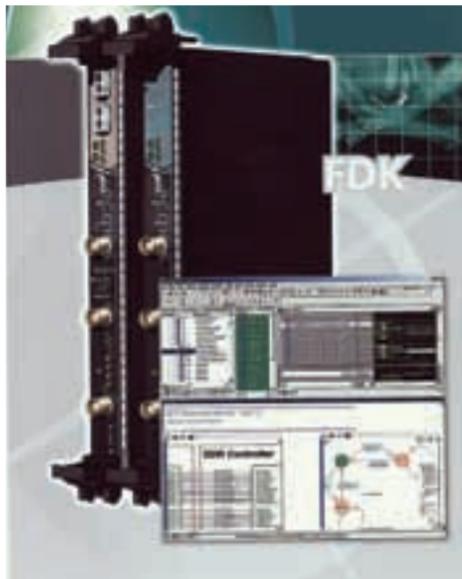


The ifm efector PDM 360 Smart Human Machine Interface (HMI) with graphic display is a user interface designed to display system messages in mobile machines. The 2.5 in. integrated graphic display (128 x 64 pixels) is capable of displaying both text and visual elements associated with an application program. Twelve back-lit function keys are used for data entry and handling. The diecast-zinc housing is rated IP67 and is suitable for surface or panel mounting in outdoor applications and vehicle cabins.

ifmefector.com

Info Card 371

### Firmware development kit



Acqiris, an Agilent Technologies company, has introduced a firmware development kit that is said to simplify application development on the embedded FPGA of the company's SC240/210 streamer analyzers and AC240/210 signal analyzers. The FPGA design kit expands the capabilities of Acqiris streamer analyzers and signal analyzer cards, which are targeted for real time signal acquisition and processing applications such as radar, electronic warfare, lidar, industrial process control and physic beam control.

acqiris.com

Info Card 372

### LabVIEW SignalExpress



National Instruments has announced NI LabVIEW SignalExpress, an extension of the LabVIEW graphical system design platform, for acquiring, analyzing and presenting data without programming. SignalExpress is interactive measurement software with a drag-and-drop environment to manage measurements and signals from more than 400 stand-alone and modular instru-

ments. The extension is said to eliminate tedious off-line analysis with real-time analysis, which engineers can accomplish while acquiring data. Users also can publish measurement and analysis results in customized reports.

ni.com/signalexpressaval

Info Card 373

### Flow rate monitoring



Compact MS6-SFE modular flow sensors from Festo can operate as a stand-alone device or in combination with the service units of the MS series using the company's V-clamp system. An LCD display provides absolute flow data and threshold values, as well as a convenient means of adjusting the switching point. Measuring range is from 200 to 5000 L/min.

festo.com

Info Card 374

### Embedded Internet control

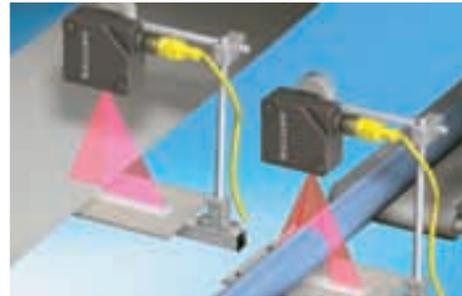


Omega has introduced a line of instruments for DIN rail mounting. The compact iDR series signal conditioners and PID controllers and can connect directly to a LAN and can serve Web pages over the Internet. The devices are configured with a handheld programmer iDRP, or from a computer with an Ethernet, RS-232, or RS-485 connection. The universal signal input covers 10 thermocouples, 100 and 1000 ohm RTDs with 2, 3, or 4 wire connections, process (dc) voltage, current, and strain gauge inputs.

omega.ca

Info Card 367

### Photoelectric line sensor



The BOL 27K measuring line sensor from Balluff can detect product width, edge detection, hole location and web loop tension. With both discrete and analog outputs, the retroreflective photoelectric sensor projects a measuring line of light on to a strip of special reflective tape which it uses to measure and locate key attributes of an object. For objects that are more than 150 mm wide, two units can be used in concert to provide the measurement. Resolution is to 0.15 mm.

balluff.com/linesensor

Info Card 375

### Safety position encoders



Heidenhain Corp. can supply encoders with an EnDat 2.2 transmission component (a digital, bi-directional interface) in order to be a part of a safe drive. With this encoder/interface combination, the company says, machine and plant manufacturers can now have all the benefits of serial data transfer, such as optimization of costs, diagnostic possibilities, automatic commissioning and rapid formation of the position value in safety-related applications.

heidenhain.com

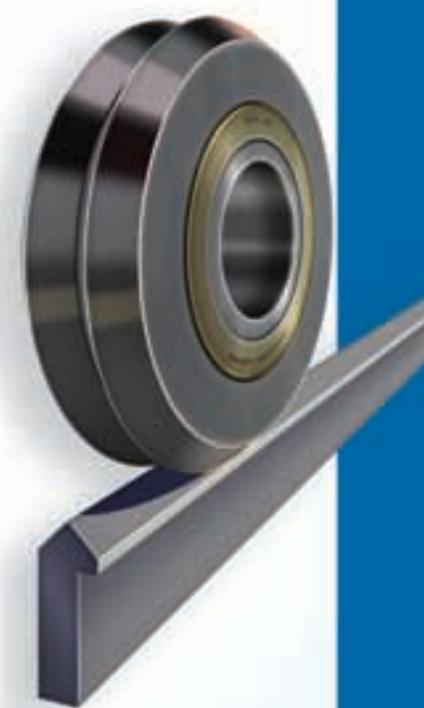
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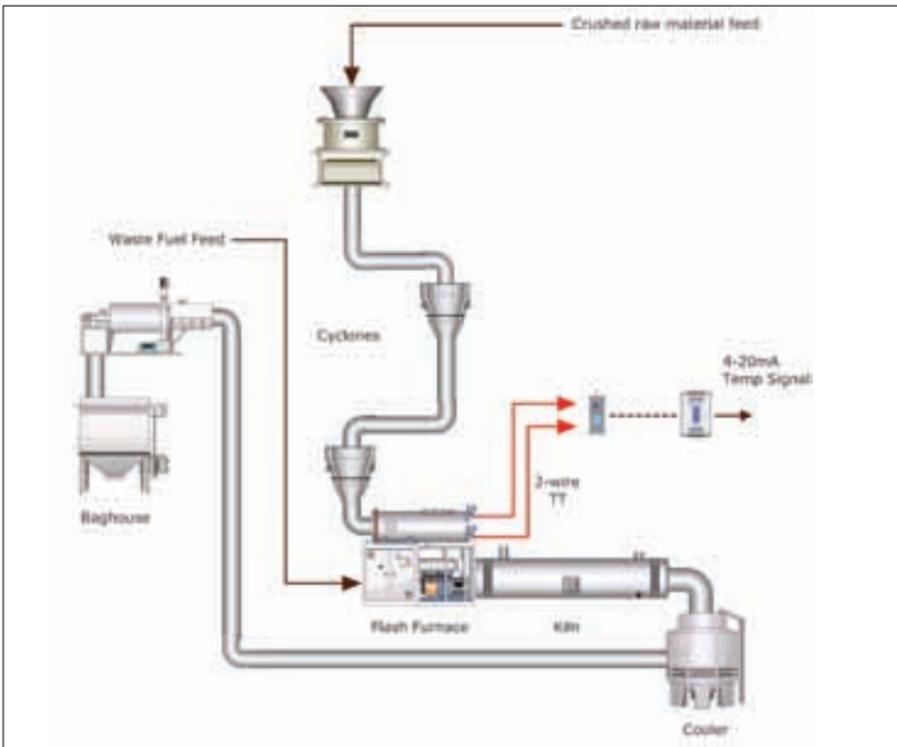
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Info Card 39

Motion Without Limits™

**Feature: Data Acquisition**

# Wireless technology helps make better cement



Lafarge, the world leader in building materials, is also the number one cement producer in the world. The company operates in 75 countries and employs over 75,000 people.

Producing cement is much like baking a cake. In order to produce the optimum batch of cement at the lowest cost, certain ingredients are required in specific amounts. These ingredients must then be mixed in a specific manner in the

plant's raw feed mill and heated at exact temperatures in the pre-heaters and rotary kiln. Gypsum and other ingredients

are then added to the cement mixture. If the ingredients are mixed too little or too long, or if the temperature is too low or high in the rotary kiln, the resulting batch may have

## Reliable signals obtained for measurement

imperfections. It also may have been more expensive to produce than necessary.

One challenge that Lafarge Cement ([lafargenorthamerica.com](http://lafargenorthamerica.com)) had in making this process more efficient was getting reliable temperature measurement of its outside rotating kilns. Thermocouples in the kiln connected to indicators via slip rings gave poor performance as the slip-rings became dirty and worn. Maintenance costs and down-time of the kilns were high.

Lafarge solved this problem by using

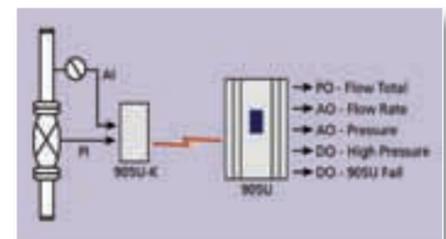
A schematic of the Lafarge cement kiln using the ELPRO Technologies wireless I/O units.

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Schaeffler Canada Inc.



The 905U-K is designed for ultra-low power consumption. The information is then transmitted to a 905U-1 which recreates the 4 to 20 Ma signal for use in Lafarge's process control equipment.

ELPRO's battery powered 905U-K wireless I/O units. The solution bypassed the problem slip-rings completely. The thermocouple connected to the 905U-K as an analog input via a local 2-wire temperature transmitter. The 905U-K is designed for ultra-low power consumption. The information is then transmitted to a 905U-1 which recreates the 4 to 20 Ma signal for use in Lafarge's process control equipment. The user configures how often the wireless unit energizes its analog loop to take a measurement and transmit the value wirelessly. Lafarge designed their system for a 12 month battery life and change out the batteries (6 AA alkaline batteries) at every scheduled maintenance shut-down.

ELPRO Technologies ([elprotech.com](http://elprotech.com)) is a supplier of industrial wireless products worldwide and was the first wireless supplier to introduce a Lifetime Warranty. Since 1983, wireless solutions from ELPRO are deployed in industry sectors such as petrochemical, oil and gas, steel, pulp and paper, manufacturing and water wastewater and power utilities.

Weidmuller is now the exclusive master distributor of ELPRO industrial wireless products in Canada, offering the line to existing Weidmuller customers, and supporting existing ELPRO distributors who will continue to sell the ELPRO product range. The cooperative effort between the two companies will bring added value to the end-users by providing local support and service to customers across the country.

This article was supplied by Weidmuller ([weidmuller.ca](http://weidmuller.ca)).

**Products: Editor's Choice**

**Wallmount/floor enclosures**



The FlatBox enclosure line from Rittal Systems is delivered as a flatpack, thereby optimizing transport and storage capacities, the company says. Given their symmetrical design, FlatBoxes can be arranged in lines or stacked one on top of another. The parts snap together without the need for any tools. Units can be supplied in heights between 6 and 21 U, depths of 400 and 700 mm and widths of 600 to 700 mm. For 12 U and higher, leveling feet are supplied to use when mounting on the ground.

[rittal.ca](http://rittal.ca) Info Card 386

**ADA-compliant handrails**



Kee Industrial Products has introduced the Series 500 ADA Railing System to build handrails for stairs, ramps, walkways and other areas where it is necessary to conform to the requirements of the Americans with Disabilities Act (ADA) and other applicable state and local building codes. Series feature a new range of Kee Klamp structural, slip-on pipe fittings.

[keeklamp.com](http://keeklamp.com) Info Card 388

**Cooling for large enclosures**



The Dual Cabinet Cooler System from Exair Corp. is said to keep electrical enclosures cool with 20°F air. The cooling capacity up to 5600 Btu/h is suitable for large electrical enclosures and high heat loads. Cabinet Coolers incorporate a vortex tube that cools ordinary compressed air to 20°F without the use of refrigerants. They mount through a standard electrical knockout while maintaining the NEMA 12, 4 or 4X rating of the enclosure.

[exair.com/dualcc.htm](http://exair.com/dualcc.htm) Info Card 390

**Micron positioning**



Voice coil stages with up to 50.8 mm of travel have been introduced by H2W Technologies. The direct drive, zero backlash stages have an encoder resolution as low as 0.1 micron, acceleration up to 98 m/s<sup>2</sup>, and no moving cables. Voice coil stages ratings range from 0 to 222 N continuous force and 667 N peak force. The closed loop voice coil stages require a linear servo amplifier which is available as a system.

[h2wtech.com](http://h2wtech.com) Info Card 392

**Line of current sensors**



AutomationDirect has announced the Acu-AMP series of current sensors. ACT series current transducers, available in split-core and fixed-core models, have jumper-selectable current input ranges and industry standard 4 to 20 mA or 0 to 10 Vdc outputs. ACTR series current transducers combine a current transformer and a True RMS signal conditioner into one unit. Available with 4 to 20 mA output, ACTR current transducers utilize True RMS technology. ACS150 series current operated switches combine a current transformer, signal conditioner, and limit alarm.

[automationdirect.com](http://automationdirect.com) Info Card 387

**Sanitary conveyors**



Dorner Manufacturing has announced its AquaPruf line of sanitary conveyors come with an option for frame integrated side tables up to 10 in. wide. Stainless steel side table can be formed out of the frame on either one or both sides of an AquaPruf conveyor. The conveyors can be completely disassembled for cleaning, without tools, in less than a minute. Additionally, AquaPruf conveyors come in straights or curves and can be made to a variety of lengths.

[dorner.com](http://dorner.com) Info Card 389

**Valves Class I, Div 2 approved**



The Red Hat Next Generation line of solenoid valves from ASCO Valve have Class I, Division 2 approval for use in hazardous locations. The valves also meet all NEMA Types 1 through 4X requirements for water-tight and dust-tight operation. The valve accepts both ac and dc voltages and its 2 W power consumption is said to achieve the same performance as a 17 W ac solenoid valve. The valves include 2-, 3- and 4-way models.

[ascovalve.ca](http://ascovalve.ca) Info Card 391

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## Hannover Messe 2007

# Innovative technologies make splash at Hannover Messe

By Mike Edwards

Hannover Messe is a showcase for cutting-edge technologies right across the industrial spectrum. And it's not just a matter of showing the latest products – there's a strong emphasis on industrial technology as a series of integrated systems, where individual products work together as parts of a greater whole.

The Hannover Trade Fair provides a complete overview of new technologies and their place in the end-to-end industrial process chain, according to Wolfgang Pech, Deutsche Messe senior vice president. "It used to be more of a general industrial show but now more themed with different target groups of engineers."



The trade show "Motion, Drive and Automation" at Hannover Messe, which takes place once every two years, is a good example. It covers electric, mechanical and fluid power transmission in a display that embraces every aspect of industrial automation. Pech maintains that engineers still need to attend shows like the one in Hannover: "the Internet isn't good enough – it is important to talk to exhibitors for systems solutions and to find referrals to other technologies at the fair."

More than 6000 exhibitors at Hannover Messe occupy 200,000 m<sup>2</sup> of display space, with over half of the exhibitors originating from outside of Germany, said Pech.

Below are few snapshots of just a few of the new technologies that were on display at Hannover Messe 2007.



1.



4.



5.

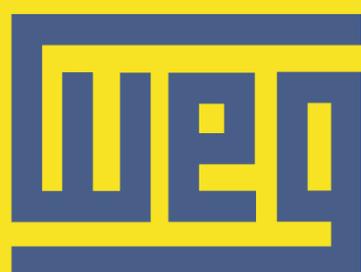


2.

1. SEW-Eurodrive premiered its new series of industrial gear units, the X series (see also cover story). The helical and bevel-helical gear units come in the torque range from 58,000 to 175,000 Nm with unit weights of one to four tons. The gear units are available with two, three or four stages and cover a gear ratio range of  $i = 6.3$  and  $i = 400$ . Even higher ratios of more than  $i = 1000$  can be achieved in combination with a primary gearmotor.
2. The Application Park Production Line featured the IT-Powered Automation exhibit. Vendor participants included Phoenix Contact, Rittal, Bosch Rexroth, Festo, Kuka Robot Group, Pepperl + Fuchs, SICK AG, Trumpf, SAP and Brady.
3. Visitors to the IT-Powered Automation exhibit could order their own personalized coffee cup at a PC outfitted with signature recognition. The cup was then produced, custom-printed in a laser station, quality tested, packaged in a box, stored in a depot and output by entering an individual RFID number.
4. Siemens Automation and Drives (A&D) introduced a new range of IEC low-voltage motors with aluminum housing. The new motors of the 1LE1 series are offered in the efficiency classes EFF1 and EFF2. The energy-efficient EFF1 motors achieve their high efficiency through the use of copper rotors.
5. With its new MTpro software, Bosch Rexroth simplifies professional planning, layout and procurement of components and complete modules for assembly technology. Designed with user workflows in mind, the software includes an electronic product catalog, extensive CAD tools and a display of all essential ordering information.



3.



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## Hannover trade show Rittal displays 'Fascinating Future'



Rittal Systems Canadian president Oliver Obermeier (left) demonstrates the benefits of Rittal's Top Console system.

### By Mike Edwards

HANNOVER, Germany – Rittal outlined the company's "Fascinating Future" initiative at the recent Hannover Fair 2007, in addition to introducing a host of new enclosure product technologies.

At Hannover Fair 2007, Rittal dedicated a third of its display space to future technologies (fascinating-future.com). As the theme name suggests, the initiative focuses on the future: digital factory; augmented reality; intelligent rack technologies with RFID; hygienic design solutions; and autonomous energy supplies and solutions inspired by bionics.

In collaboration with universities and research facilities, the initiative has been used, for example, to set up successful projects with various Fraunhofer Institutes and universities in Siegen,

Giessen, Freiburg and Darmstadt. The collaborations with universities have helped develop a range of new technologies for the Rittal product portfolio.

Under the name iRack, Rittal has is developing automatic detection and monitoring systems for subassemblies in enclosure systems using RFID (radio frequency identification). This technology uses radio signals to enable contact-free detection of units. In this case, Rittal uses RFID technology in conjunction with cutting-edge logistics management right into the rack. Subassemblies

inside a rack can be recorded, and assembly work during replacement and conversion, for example, can be monitored seamlessly. iRack monitors and keeps inventory of a complete server rack using RFID.

Another of Rittal's future concepts is the intelligent light, integrated LED surface lighting for glazed enclosure doors. This technology can be used to identify events in a rack – e.g. normal operating state, temperature exceeded – by the color of the glazed door. This way, the glazed door takes on the functionality of a traffic light.

Another development is the acoustic rack. Rittal and Darmstadt Technical University have joined forces to demonstrate how noise can be actively reduced for IT network and server enclosures. Piezo actuators counteract the resonance of enclosure parts, and their active attenuation can be used to reduce airborne and structure-borne sound by several dB(A). In other

words, Piezo elements combat the noise directly at the source, thus reducing the noise development of the installed equipment.

Other key announcements by Rittal in Hannover included:

- **Top Console system.** A modular, three-part design – the pedestals, desk units and consoles can be combined according to customer requirements. Overall, the new console systems are much more "streamlined" than their predecessors. At the same time, Rittal has increased the usable mounting surface. For example, the desk units provide 10% more mounting surface in the cover, which means there is significantly more space for components than in earlier models. In addition to the 800, 1200 and 1600 mm widths, Rittal now also offers a compact version with a width of 600 mm.

- **Ri4Power.** Rittal's integral system solution for fast and straightforward installation of low-voltage switchgear and for reliable operation of machinery and systems. The form-separated low-voltage distribution system Ri4Power Form 2-4 is the latest innovation to be added to the company's portfolio. This type-tested innovation creates much faster, more reliable, IEC-compliant switchgear with form separation up to form 4 and busbar

systems up to 1600 A.

- **AdvancedTCA (Advanced Telecommunications Computing Architecture).** Said to be the first comprehensive standard for previously proprietary platforms in the telecommunications sector. The new RiTCA generation of products includes complete standard system solutions for ATCA and MicroTCA in 2, 3, 4, 5, 12 and 13 U including shelf management, backplane (Full Mesh, Dual Star) and ventilation concept. For the micro-computing chassis, Rittal also offers the PicoTCA series.

- **Hygienic Design.** The Hygienic Design range from Rittal meets the requirements of the European Hygienic Engineering & Design Group as set out in Guideline 13. The new stainless steel housings are fitted with a forward-sloping roof set at an angle of 30° for fluid run-off and designed with no crevices or outer hinges where bacteria and other micro-organisms can take hold and multiply.

- **Global Service Power.** The name of Rittal's new strategic business unit announced by Rittal president Norbert Müller. The Herborn, Germany-based company is using its international network concept to take service to a new level. Müller explained the strategic concept: "We want to ensure integral customer benefits, in other words 'total benefit of usership.' This will allow us to expand our range of products quite considerably. Moreover, it will enable us to provide our customers with products and services in all phases of business development - on a global scale."

Info Card 330

### Hygiene, telecom lines featured in exhibitor's booth



Heinz Schmitt, general manager, Rittal Food & Beverage Line, with the Rittal Hygienic Design range of products.

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- Standard parts install into sheets as thin as .030"/0.8mm.
- Flush mounted on both sides.
- Minimal space requirements.
- Can be installed blind into bottom sheet (panel 2).
- Can join dissimilar metals (which otherwise can not be welded).
- Can be concealed with paints and powder coatings.
- Can be used as single flush-mounted pivot point.

Self-clinching fasteners maintain their shape when pressed into place. Sheet material is displaced during installation, securing the fastener permanently into the panels.

In a single fastener use application the fastener can serve as a pivot point for panel 1.

#### Average Head Diameter



Patent applied for.

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Info Card 45

## Medical Engineering

# Devices make sense of body functions

By Mark Sunderland

Nowadays, and to a much larger extent than ever before, information concerning the condition of our bodies can be retrieved externally and passively, and without the need to open us up and look inside.

Devices that can achieve this are known as biosensors. A biosensor is, basically, an analytical device that converts a biological response into an electrical signal.

Probably the most common example of a commercial biosensor is the blood glucose biosensor. By using an enzyme to break down blood glucose, an electron is transferred to an electrode and converted into a measure of blood glucose concentration. The canary in the cage to warn coal miners of gas is, in its own way, a biosensor and arrays of many different detector molecules have been applied to what is known as machine olfaction, the automated simulation of the sense of smell.

Many of today's biosensor applications are similar in that they use organisms which respond to toxic substances to warn us of their presence. This, as maybe imagined, is a technology that has a far wider reach than a medical application.

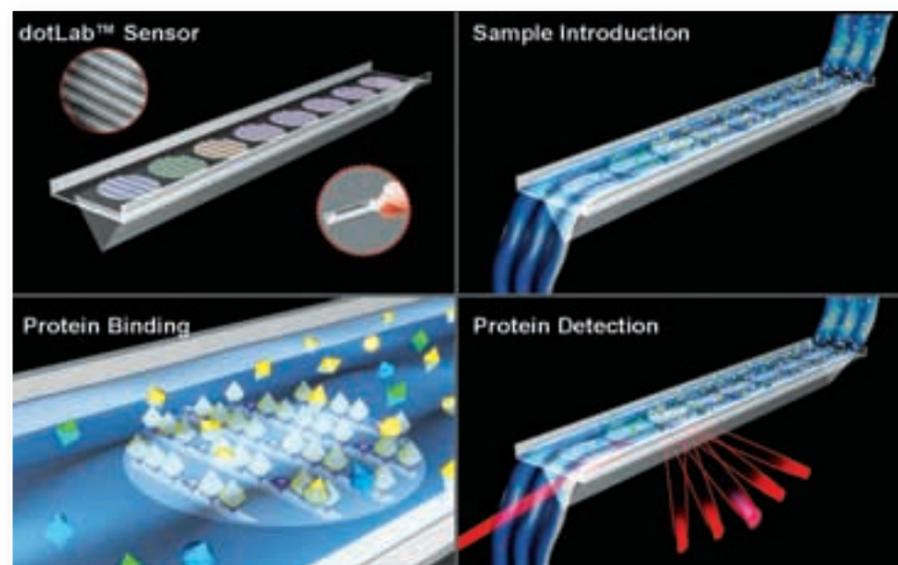
A Canadian company that is leading the way in biosensor research, design and production is Axela Biosensors Inc. With expertise in diagnostics and life science commercialization, photonics engineering, surface protein attachment, micro-pattern deposition, and biosensor consumable manufacturing, Axela ([axelabiosensors.com](http://axelabiosensors.com)) is expanding a new dimension in medical and diagnostic science. Located in the heart of downtown Toronto, the company has immediate access to some of Canada's foremost academic and health researchers. Some of the technology is based on original research at the University of Toronto.

Axela's core product line is based on their proprietary Diffractive Optics Technology – or “dot” – that combines two proven technologies, the diffraction of light and immobilized capture surfaces to provide

a simple, sensitive, and cost-effective technique for the real-time detection of disease-related protein biomarkers and development of immunoassay. An immunoassay is a biochemical test that measures the level of a substance in a biological liquid, typically serum or urine.

interactions translates to higher confidence in assay results.

Protein-specific capture molecules are immobilized on the dotLab sensor surface in eight distinct locations, or assay spots. The capture molecules within each spot are not randomly distributed, but are immobi-



The four technology steps in the dotLab biosensing system developed by Axela Biosensors Inc.

The “dotLab” system was designed with the bench researcher in mind because monitoring protein interactions and developing assays can be a very complicated process and more often than not it has been difficult to find the tools to simplify it.

The system is a cost-effective platform that has the format flexibility to provide a quick and simple solution to both assay development and routine analysis. Scientists can determine protein levels and characterize protein interactions at their bench.

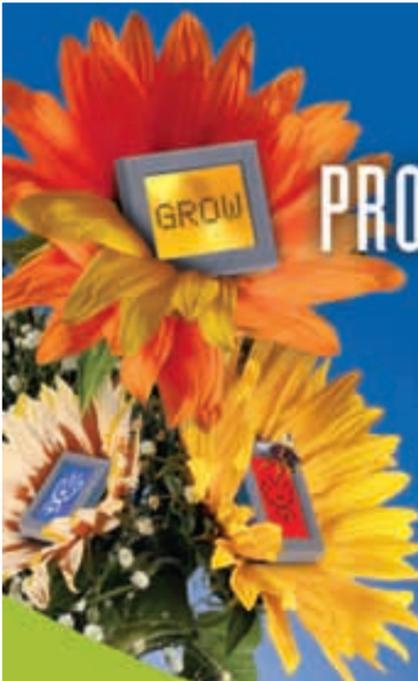
Real-time binding data are generated at each stage of the assay process, eliminating the need to extrapolate from endpoint results, which is often the case with traditional methodologies. Armed with the entire picture, researchers can accelerate iterative development, leading to more accurate investigative decisions. A thorough understanding of the complex

lized in a series of parallel lines that produces a specific diffraction pattern when illuminated with a laser.

The sensor surface forms the base of a low-volume flow cell so when a flowing stream of sample is introduced, target molecules bind to the assay spots, resulting in an increased diffraction signal. The dotLab system uses the intensity of the diffraction signal to generate real-time binding curves. The illumination and detection beams never pass through the sample, making the system suitable for the detection of proteins in complex biological samples such as serum and plasma.

Mark Sunderland is president, Biomedical Industry Group, Ottawa ([mark@biomed-group.com](mailto:mark@biomed-group.com)).

If you found **Medical Engineering** interesting, please fill in Info Card 344.



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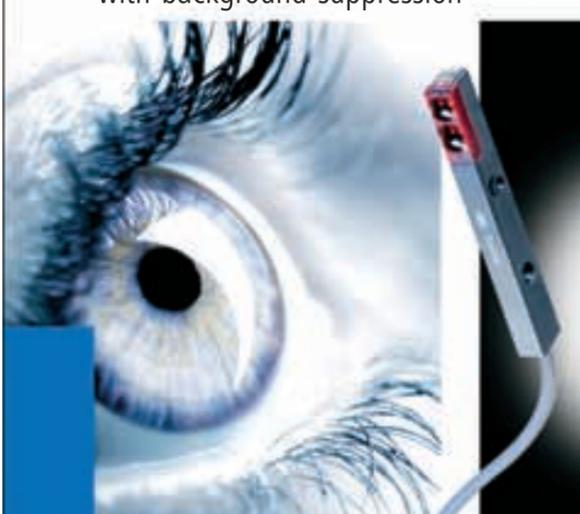
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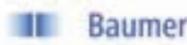
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Info Card 46

## Products: Power Transmission

### One-piece shaft collar



Amacoil/Uhing has introduced the U-Clip, a one-piece, hand-installed shaft collar said to slide on easily and lock in place when released. In machinery or for static applications, quick release U-Clip shaft collars hold reels and tools in place whether on hardened or non-hardened shafts. The collars have a holding force of 55 to 80 lb depending on the U-Clip size. Six sizes are available for metric shaft diameters: 10, 12, 15, 16, 20 and 22 mm. Imperial sizes are available only in large quantities.

[amacoil.com](http://amacoil.com)

Info Card 306

### Servo planetary gearheads



The inline alpha planetary gearhead from alpha gear drives, Inc. is packaged in an aluminum case and is suitable as a component for servo and stepper motor applications. Technical specs include: low-backlash in 4 sizes (40, 60, 80, 115); 5 reduction ratios (1-stage 5, 10/ 2-stage 25, 50, 100); 95% efficiency; cyclic and continuous operation; and, service life of 20,000 h.

[alphagear.com](http://alphagear.com)

Info Card 307

### Belt driven stages

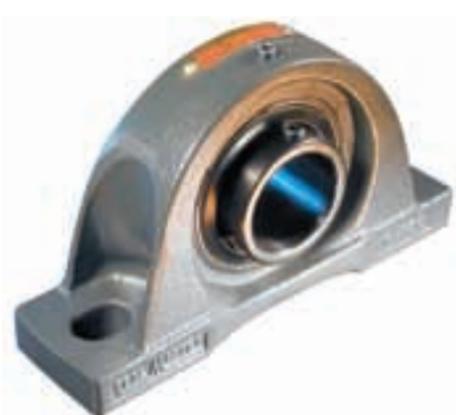


The 180 series belt driven stages from LinTech are designed to handle large loads at very high speeds. The linear rails are mounted to an extruded aluminum base, which offers a rigid support over the entire travel of the table's carriage. The drive system uses two pulleys, along with a steel reinforced polyurethane belt, which provides 90 mm of linear movement per revolution of the input shaft. NEMA 23 & 34 motor mounts, or gearhead mounts are available as well as planetary gearheads.

[electromate.com](http://electromate.com)

Info Card 313

### Mounted bearings line



The Sealmaster mounted bearing line from Emerson Power Transmission is said to offer reduced maintenance with efficient lubricant circulation to eliminate the need for regular service intervals. The bearings feature a surface that is tapered in a radial direction toward the bearing race so that lubricant is re-directed back to the raceway.

[emerson-ept.com](http://emerson-ept.com)

Info Card 312

### Linear guide systems

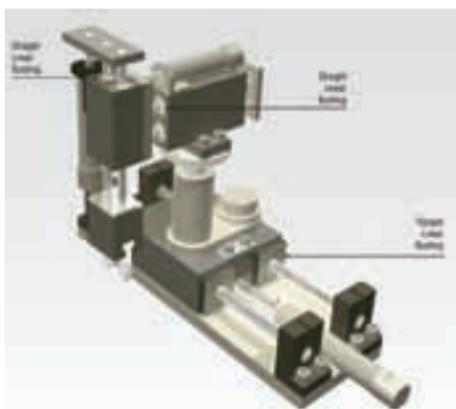


Two series of linear guide systems, Speed Guides, have been introduced by LM76. The Speed Demon OSG type and Speed Demon SG type linear guide systems are designed for speeds up to 10 m/s, accelerations to 50 m/s and loads up to 5600 N. The OSG systems are available in five rail and block sizes. Each OSG rail features pre drilled mounting holes, dual RC60 steel shafting in lengths up to 4 m, and can be ordered cut to size. The SG type linear guide systems are available in seven rail sizes and 19 block designs in seven sizes. Each SG rail features pre-drilled mounting holes, dual RC60 steel shafting in lengths up to 4 m and can be ordered cut to size.

[lm76.com](http://lm76.com)

Info Card 318

### Linear ball bushings



Misumi offers 259 types of linear ball bushings with varying shape, length, material and surface finish combinations. The bushings are made with either 52100 bearing steel or 440C stainless steel, with electroless nickel plating offered as an optional surface treatment for 52100 bearing steel. Compatible spacers, stopper plates and mounting housings are also offered.

[misumiusa.com](http://misumiusa.com)

Info Card 305

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Info Card 47

## SKF's energy efficient bearings

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For detailed information on SKF's new energy efficient bearings, please email [marketing@skf.ca](mailto:marketing@skf.ca) or visit [www.skf.ca/dpn](http://www.skf.ca/dpn)

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Info Card 48

## Products: Power Transmission

### Planetary B/BL gearmotors

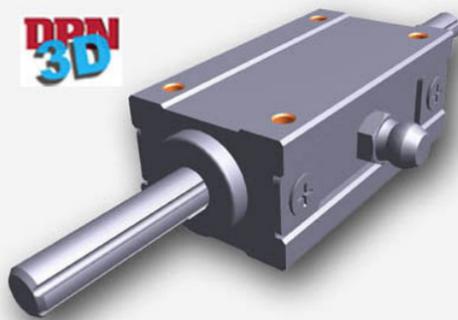


Source Engineering has introduced planetary brush and BL gearmotors available in ratios from 3:1 to 3729:1. The 22 to 56 mm diameter gearmotors can be supplied with 3 to 36 Vdc motors, plastic, powder metal, or cut metal gears, and 2/3 channel quadrature optical encoders. Designed for input speeds up to 6000 rpm continuous, rated torque goes to 392.0 kgcm and maximum torque is typically 3x rated torque.

sei-automation.com

Info Card 317

### Ball splines remove backlash



NB Corp. ball splines have recirculating steel balls on the side of the outer race that

are designed for high speed rotation and to eliminate backlash. Units come in 16 standard and customizable shaft sizes with diameters from 4 to 100 mm. There are 7 different nut (the outer cylinder that retains the ball elements) styles. The large surface area of ball contact with grooved shaft is said to result in high load capacity. Material options include Martensite stainless.

nbcorporation.com

Info Card 314

### Planetary gearboxes



ADR-Series planetary gearboxes from Apex Dynamics have a design suitable for continuous or cyclic duty operation. Output torque ranges from 14 to 2000 Nm. Ratios in a 1-stage unit are 4/5/7/10/14/20 and in a 2-stage unit are 20/25/35/40/50/70/100/140/200. The spiral bevel gear right-angle units feature a backlash from 2 to 9 arc min, depending on the configuration, and low noise due to a helical planetary gear design.

boschrexroth.ca

Info Card 311

### Type 316 shaft collars



Ruland Manufacturing Co. has introduced smooth bore shaft collars in 316 stainless steel, suitable for medical, food processing and pharmaceutical applications. Resistance to chloride corrosion makes the shaft collars suitable for marine applications as well. The collars are available in one- and two-piece clamp-style designs with bore sizes from 1/8 to 2 in. and 3 to 50 mm.

ruland.com

Info Card 308

### Monogram motor



Baldor Electric has announced a certified API Standard 547 Monogram motor. Features include: an oversized conduit

box which accommodates stress zones; the Reliance Electric APEX paint system for protection from corrosive elements and UV rays; low noise fan and fan cover design to provide 85dba operation; horizontal-foot mounting; constant level oilers with sight glass; IP55 bearing protection on sleeve bearings; Stainless Steel hardware; and, the SolidSeal Insulation System (a two cycle VPI process capable of passing a water immersion test).

baldor.com

Info Card 316

### High thrust rod actuator



The Type CRES high thrust rod actuator from THK is said to produce maximum operating efficiency, while a low voltage dc motor (12 V±15%) contributes to reduced energy consumption. The IP55 unit provides a maximum stroke of 130 mm, making it suitable for packaging machines, automatic seat positioners, panel operating mechanisms, positioning systems, height adjusters and opening/closing mechanisms. Nominal speed ranges are from 15 to 55 mm/s, with a nominal feeding force of 196 to 490 N.

thk.com

Info Card 310

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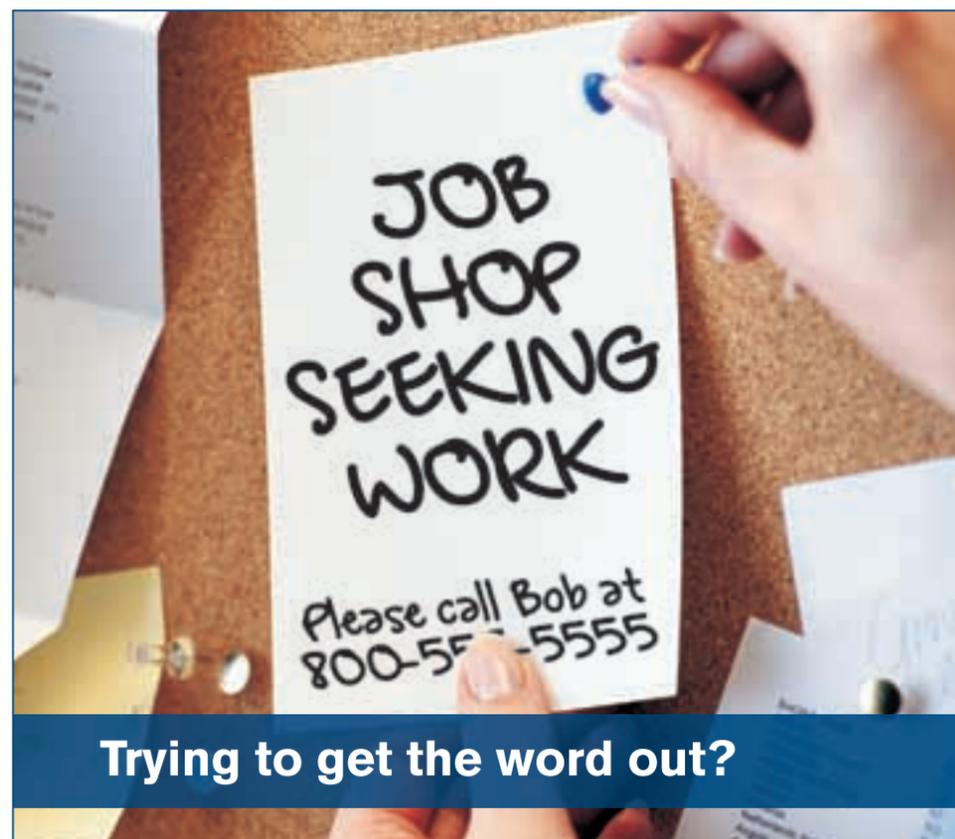
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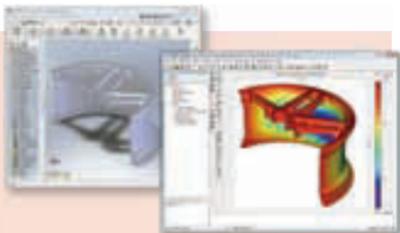
# CAD Chronicle

## Simulation tie-in for SolidWorks

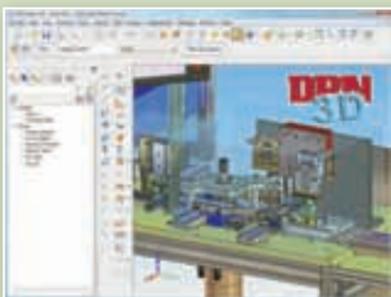
SolidWorks has named multiphysics simulation software developer COMSOL as one of its select Solution Partners. The program provides SolidWorks 3D CAD users with access to integrated products and services that can further boost productivity. In this case, COMSOL Multiphysics includes a feature in the CAD Import Module called the SolidWorks Live Connection, a bidirectional link that allows users to modify geometry in the CAD environment and automatically transfer these changes to a linked multiphysics model based on that geometry.

comsol.com

Info Card 334



## Large assembly design

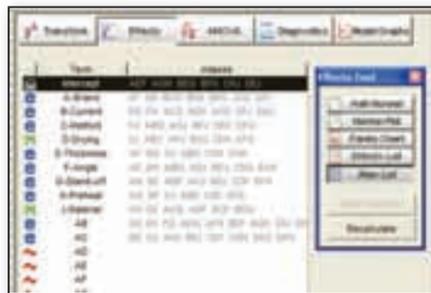


UGS Corp. has announced Version 20 of Solid Edge software, its 3D CAD product. V20 improves supply chain collaboration through integration with the new Teamcenter Service Oriented Architecture. V20 also introduces new translators to help users transition from AutoCAD to Solid Edge, collaborate with CATIA V5, and read the STL file format. A Zones feature has been added to its assembly modeler, as well as Part Feature grouping.

solidedge.com/v20

Info Card 333

## Design of experiments



Stat-Ease, Inc. has announced Design-Ease, Version 7.1. The software sets up and analyzes general and two-level factorials that identify the critical factors for improvement of products and processes. New in Version 7.1 is an upfront power calculation for factorial designs, "Min-Run Res V" designs available for 6 to 50 factors, bookmarks for reports with a toolbox to facilitate selection, display grid lines on 3D-graph backplanes, and, the ability to save graphs to files in enhanced Windows metafile (EMF), PNG, TIFF, GIF, BNP, JPEG, and encapsulated Postscript (EPS) formats.

statease.com

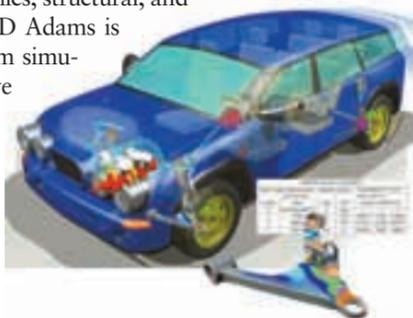
Info Card 335

## Mechatronics analysis integrated into simulation

MSC Software Corp. has released MD Adams, an addition to its MD Solutions suite, in order to add integrated multi-body dynamics, structural, and controls systems simulation capabilities. MD Adams is said to enable powerful extensions to system simulation including component flexibility, active control systems and frequency response prediction. The simulation capabilities are said to result in fewer physical prototypes and faster design cycles thereby enabling time to market and right to market.

mcssoftware.com

Info Card 337



## Shape-based searching



The latest release of CADSEEK Polaris, shape-based CAD search engine from iSEEK Corp., is said to have enhanced its core shape algorithms for greater accuracy and speed, and extend the technology to hunt down similar individual parts from an assembly. The software is able to keep track of components that comprise an assembly. A user can highlight a single part within an assembly and initiate a CADSEEK search, locating replacement parts.

iseekcorp.com

Info Card 336

## Bidirectional CAD-ERP



Elmo Solutions has introduced Agni Link, software designed to ensure synchronization between CAD/PLM and MRP/ERP data. It is usable with a variety of CAD platforms, including: SolidWorks, Autodesk Inventor, AutoCAD, AutoCAD Electrical, Mechanical Desktop and AutoCAD/Mechanical. When any component, subassembly or assembly is processed, Agni Link determines where appropriate metadata is sent, and updates it accordingly.

elmosolutions.com

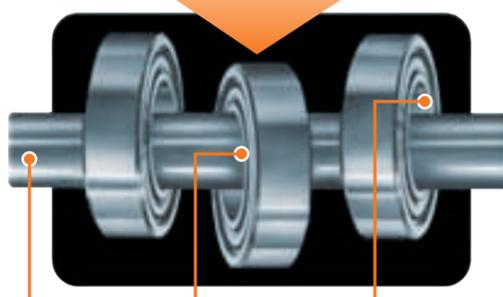
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## Technical Literature

**Ethernet-compatible ac drive.** Baldor has published a 28-page guide to an Ethernet-compatible 3-phase ac drive series for higher power machinery applications. The catalog details the drive's architecture and introduces the Ethernet Powerlink protocol.

[baldormotion.com/br1202](http://baldormotion.com/br1202) Info Card 420

**Rapid prototyping.** Brochure describes Dimension 3D printers distributed by BRT Solutions that generate working models from CAD files in ABS plastic. Colors available are white, red, blue, green, gray, yellow and red.

[brt-solutions.com](http://brt-solutions.com) Info Card 421

**Antennas, transformers.** Pulse, a Technitrol Company, has announced the *Pulse 2007 Product Catalog*. The catalog features antennas for consumer and automotive applications, automotive coils and transformers, plus unfiltered connectors for networking and telecommunications infrastructure and consumer products.

[pulseeng.com](http://pulseeng.com) Info Card 422

**Power transmission.** The *Power Transmission Distributors Association (PTDA) 2007 Membership Directory* is a resource for locating providers of all types of power transmission/motion control-related systems, products and support. A fee applies.

[ptda.org](http://ptda.org) Info Card 423

**Bearings.** The Timken Company has announced a 1300-page bearing catalog in print and electronic versions, which includes the company's full range of bearings recommended for design applications.

[timken.com/catalogs](http://timken.com/catalogs) Info Card 424

**Screw jacks.** Trans-Quip Inc. has release of the latest edition of the Joyce/Dayton screw jack catalog. Included are electric cylinders, 750 lb linear actuator and a variable speed positioning system.

[trans-quip.com](http://trans-quip.com) Info Card 425

**Switches.** NKK Switches has announced the 850-page electromechanical *Switch Guide*. The guide has clearly identified four-color sections organized by actuator type.

[nkkswitches.com](http://nkkswitches.com) Info Card 426

**Manufacturing management.** Reference books from J. Ross Publishing cover manufacturing management topics from *Lean & Six Sigma* to *Innovation & Product Development*.

[jrosspub.com](http://jrosspub.com) Info Card 427

**Structural fatigue analysis.** Brochure from Safe Technology describes the Verity software mesh-insensitive structural stress method, recognized as a breakthrough in the fatigue analysis of welded joints for finite element models.

[safetechnology.com](http://safetechnology.com) Info Card 428

**Metric gears.** Metric gears from Quality Transmission Components are featured in the 528-page product catalog, *Q420: The Handbook of Metric Gears*.

[qtcgears.com](http://qtcgears.com) Info Card 430

**Surge arresters.** EPCOS has published the *Surge Arresters and Switching Spark Gaps Product Profile 2007*. This 64-page guide provides photographs, schematics and ordering information for 2-electrode arresters, 3-electrode arresters, and switching spark gaps.

[epcos.com](http://epcos.com) Info Card 431

**Timing belt drives.** A series self-guiding Conidrive timing belt drives from Stock Drive Products features the N10 belt and pulley system in catalog *DN10*.

[sdp-si.com](http://sdp-si.com) Info Card 432

## CAD Industry Watch

# Maple 11 math software really adds up

By Bill Fane

Because of the limitations of spreadsheet programs, software developers have come up with programs aimed specifically at the mathematical computation market. One of the early leaders in this arena was Maplesoft, and over the years they have continued to develop their Maple product to maintain its position on the leading edge.

## NASA might have avoided the Mars probe disaster

Maple 10 introduced a very radical change in the user interface with their WYSIWYG (What you see is what you get) approach. It is no longer necessary to create complex macros or esoteric representations to set up your calculations. You now work just as you would with paper and pencil, using standard mathematical annotations and interspersing them with textual notes to explain what you are doing. Better yet, if you change input values within the document then everything updates, including graphical representations of the results.

With Maple 11, Maplesoft continues to develop and improve its interface, its computational engine, and its connectivity capabilities. As with most releases of software these days, its "what's new" list runs well over a hundred items. I won't bore you with all of them, especially because many of them are written in a foreign language

("New command for computing hypergeometric solutions of a linear difference equation with hypergeometric coefficients"), so here are some of the high spots.

The three main areas of interest in Maple 11 are the document interface, the computation engine, and its connectivity capabilities.

Let's start with the interface. The interesting one here is self-documenting context menus.

Like most writers I'll show a trivial example, mostly because like most writers I don't understand the complex ones.

$$\frac{2}{3} + \frac{5}{7} = \frac{29}{21}$$

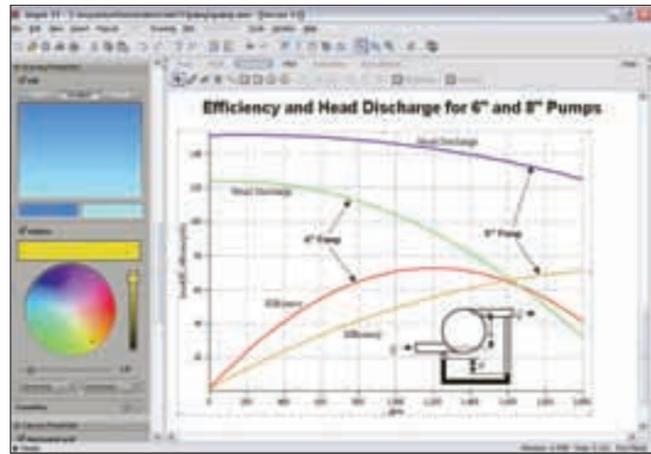
To create this, all I had to do was to type 2/3, press the right arrow key, type 5/7, and then press Ctrl-=.

Now comes the cunning part. I simply right-clicked on the answer, and then selected Approximate 20 from the context menu to produce the following:

$$\frac{2}{3} + \frac{5}{7} = \frac{29}{21} \quad \text{at 20 digits}$$

$$1.3809523809523809523$$

Maple 11 converted the fraction to a decimal and automatically added the annotation



Maple software can transform dynamic equations into real-world mechanical problem solving and even machine designs.

tion to indicate that it is a 20-digit approximation of the true value. You can select 5, 10, 20, 50 or 100 digits.

Maple 11 now includes the Back-Solver Assistant. With it, you can find the value of any variable in a formula, given the values of the other parameters.

Another new documentation feature is the ability to turn a Maple 11 document into a slide show. No more boring static presentations, because things like buttons and sliders are still active during a slide show.

Bill Fane ([bill\\_fane@bcit.ca](mailto:bill_fane@bcit.ca)) is a software reviewer and mechanical engineering instructor at BCIT in Burnaby, BC.

If you found CAD Industry Watch interesting, fill in 347 on the Info Card.

## Go figure with PTC Mathcad 14.0

Contrary to what you might expect from its name, Mathcad has very little to do with computer-aided drafting (CAD). Its primary focus is on performing complex mathematical computations and analyses.

This has changed a bit recently, however, because Mathsoft has been acquired by PTC. They are the people who produce ProEngineer and Wildfire design software, and accordingly Mathcad 14.0 includes enhanced links to these products. You can thus set up calculations in Mathcad that can be used to drive the model parameters in Wildfire and vice-versa. As your calculations change so do your models, while a change to the model can automatically re-calculate the numbers.

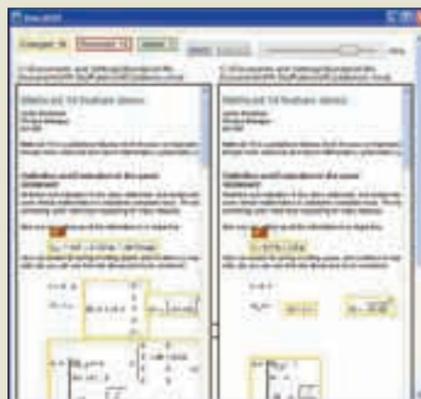
A further benefit of this acquisition is that Mathcad users now enjoy 24/7 technical support.

Now let's look at some of the other new and enhanced features in Mathcad 14.0.

The first is foreign-language support, followed by full Unicode support, meaning your worksheets will look the same no matter what the operating system or language. This means that Asian, Cyrillic, Hebrew, Arabic and many other special characters can be used within a worksheet.

Speaking of the appearance, Mathcad 14.0 now supports single-line definitions and results. For example, entering  $x = 2 +$

$2 =$  will not only generate and display the resulting value like this,  $x = 2 + 3 = 4$ , but it also defines the variable  $x$  and assigns it the current value of 4. This is not only a real space-saver in documents that can run to tens or hundreds of calculations, but it can also make it much easier to see



Mathcad 14.0 delivers improved calculation power and clarity through new worksheet analysis functions, inline numeric evaluation enhancements, and enhanced symbolics.

the logic and flow of your calculations. As usual, changing the value of the inputs will re-define the current value of the variable.

Obviously this functionality is not limited to the trivial sort of operation that I have shown, but can also be used with

vectors, matrices, the output of complex calculations and definitions involving intermediate functions and terms.

A new feature that can aid in analyzing problems within a worksheet is the Compare function. With it you can compare two similar worksheets and quickly identify differences between them, including added, changed, or remove sections.

Mathcad 14.0 also uses the Adams-Bashford method of solving ordinary differential equations (ODE) to accommodate both smooth and stiff ODEs. You can also enter linear systems of ODEs in a discipline-correct statespace notation.

Mathcad 14.0 is fully units-aware, so that entering an equation like  $\text{mass} = 5.234 \text{ kg} + 15.309 \text{ lb}$  will produce the correct result of 12.178 kg. If Mathcad 14.0 had been available to NASA some years back then they might have avoided the Mars probe disaster that was caused by one team using metric units and the other using Imperial. Basically, they tried to put a satellite into orbit some distance below the surface of Mars.

PTC also has a Calculation Server program available. This allows you to post a worksheet to the Web. Outside users can access it with a generic Web browser, modify the variable values including using sliders and buttons, and then see the results.

**Products: Editor's Choice**

**Adjustable frequency drives**



Danfoss has introduced a high power platform for its VLT 5000 series, VLT 4000 series and VLT 8000 series variable frequency drives. The platform replaces the three largest units in the 380 to 600 Vac range in each series and adds an adjustable higher horsepower unit to the program. The high power VLT drives offer up to 550 hp from the VLT 5000, up to 650 hp from the VLT 4000 and VLT 8000AQUA. The drives provide a 98% operating efficiency. [daviscontrols.com](http://daviscontrols.com) Info Card 393

**Corrosion resistant joints**



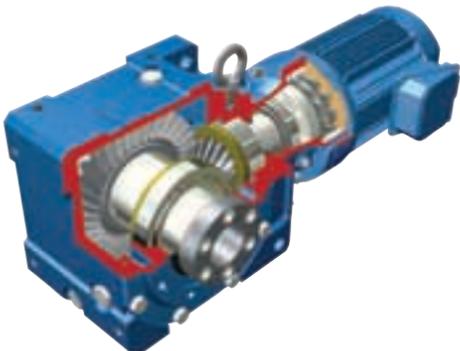
Belden Inc. has announced corrosion resistant universal joints and drive shaft assemblies for the packaging and conveying industry. The single universal joint design can be modified to make double butted or double universal joints as well as complete drive shaft assemblies with a telescoping feature for simplified on/off installation. Needle bearing universal joints provide precise positioning and can operate continuously at high speeds. Hub materials are available in various grades of stainless steel including 303, 304 and 316. Bores can be customized to attain a blind configuration. [beldenuiversal.com](http://beldenuiversal.com) Info Card 394

**Small precision ball bearings**



SPB-USA has announced what it calls the world's smallest ball bearings manufactured by Sapporo Precision Inc. under the EZO-SPB brand name. Each bearing has an inside shaft diameter of .06 mm or .0236 in. and OD of 2.5 mm and a width of 1.0 mm. Each ball is said to be precision ground to ensure long life at operating speeds of between 142,000 and 160,000 rpm. [spb-usa.com](http://spb-usa.com) Info Card 397

**Speed reducer/gearmotor**



The Cyclo 888 speed reducer from Sumitomo Drive Technologies has a spiral bevel gearbox output. The modular design is also said to provide a compact, torque-dense product with the most flexible range of output speed and torque combinations available. Patented Taper Grip bushing systems provide self-aligning, backlash-free torque transmission. Cyclo 888 reducer and gearmotors are available from 1/8 to 40 hp and ratios from 11:1 to >26,000:1. [sumitomodrive.com](http://sumitomodrive.com) Info Card 395

**Electrohydraulic brake valve**



MICO, Inc. has announced the S12 series Electrohydraulic Brake Valve (EBV), which is said to provide more than 3x the flow capacity of a traditional EBV. In large, spring-applied, hydraulic release brake applications, it has been able to replace two standard electrohydraulic brake valves operating in parallel or an EBV and relay valve. The series uses a patented auto-relieving feature to get more travel and flow capacity out of the proportional solenoid valve. [mico.com](http://mico.com) Info Card 398

**Axial piston pump**



The series 32 axial piston pump A10VSO from Bosch Rexroth is said to combine a 3 dB(A) audible reduction of noise level with superior efficiency, enhanced reliability and higher flexibility. The redesigned pump covers sizes 71 to 140. The nominal pressure amounts to 280 bar with a permissible peak pressure of 350 bar. [boschrexroth.ca](http://boschrexroth.ca) Info Card 401

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## Products: Editor's Choice

### Transaxle motor drives



The Model 425 Transaxle from Imperial Electric is a medium-duty, self-contained traction drive axle, including motor, double reduction gearbox, differential and wheel hubs. It is powered up to 1.5 hp by a permanent magnet, bi-directional dc motor. Ratings of 24, 36 or 48 V are available to provide output speeds between 85 to 225

rpm with a load capacity up to 1800 lb. Wound field dc motor options are also available.

[eucliduniversal.com](http://eucliduniversal.com)

Info Card 399

### Single or dual camera vision



DALSA has introduced the IPD VA3X to its line of machine Vision Appliances. Housed in DIN mountable enclosures, the VA3X products are said to provide quick user setup, factory friendly wiring and sup-

port for one or two cameras with choice of sensor resolution. Available in two versions, the VA30 comes with iNspec software, while the VA31 version also includes Sherlock machine vision software.

[dalsa.com](http://dalsa.com)

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### Sercos III I/O chip controller



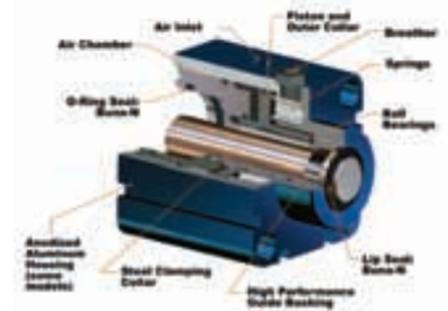
Sercos International has introduced Easy-I/O, free IP core software for low-cost

FPGA chips, which is said to allow SERCOS III to be integrated into basic I/O slave devices with minimal development and integration effort. Typical target applications of Easy-I/O are encoders, measuring sensors, valve clusters, 24 V digital I/O and analog I/O.

[sercos.de/easy-io](http://sercos.de/easy-io)

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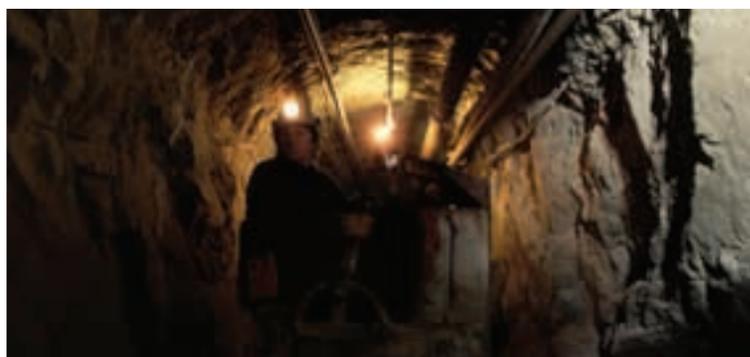
### Linear holding/locking



The Nexen RLSS series of linear holding/locking devices provide rod locking with spring-engaged, air-released technology to supplement air cylinders and guide rods for holding in poweroff/e-stop situations. High clamping forces are said to ensure positive holding with minimal air required for release. Units are spring-engaged, so they operate even in power-off situations to promote safety for operators and machinery. Rod lock seals are IP67 rated (anodized models exceed NEMA 4X rating).

[nexengroup.com](http://nexengroup.com)

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### Special Features

*Crowned rollers provide lower friction and smooth operation through even load distribution.*

*Case carburized steel enhances long life operation and improves shock loading capabilities.*

*Optimized roller/rib interface promotes lubrication and lowers bearing running torque*

*Honed raceways ensure low friction for miles of trouble free operation.*



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### A Case for NTN Tapered Roller Bearings

Preferred by leading manufacturers, NTN tapered roller bearings are renowned for their ability to operate reliably in some of the world's harshest environments. NTN tapered roller bearings are ideally suited for heavy duty applications ranging from rail to aggregate and mining equipment, where marginal lubrication, vibration and impact loads are considered the norm. NTN tapered roller bearings are made to meet or exceed industry standards and feature case carburized steel. Carburizing hardens the steel from the surface to the proper depth, leaving a relatively soft core, improved durability and longer life. These results make the material ideal for shock loading and extreme conditions. Like all NTN products, our tapered roller bearings are backed by knowledgeable technical support from our engineering and technical service team, competitive pricing, 24/7 service and unmatched inventory capability.

### Better Support Makes a Better Bearing

As an integral part of after-sales service and support, NTN provides an engineering and service staff across Canada to assist customers in gaining maximum service from the life of their bearings

[www.ntn.ca](http://www.ntn.ca)

- In depth bearing failure and machine troubleshooting
- Bearing (re)selection and machine redesign to prolong bearing life and up time
- Liaison with original equipment manufacturers and third party suppliers
- Preparation or review of maintenance schedules and procedures
- End user in-house training seminars
- Accurate part number crossover to one of NTN's complete range of products

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### HMI with touchscreens



Exor Electronic R&D has released two versions of its "high-end" eTOP panels, the eTOP20B and eTOP21 B. The units are HMI devices with a resistive touchscreen interface and 7.5 in. TFT and STN color graphic displays. Support for 64K colors in the TFT display and VGA (640 x 480) resolution is provided.

[electromate.com](http://electromate.com)

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### 3U CompactPCI GB switch



ACT/Technico has introduced a 3U CompactPCI gigabit Ethernet switch with an on-board processor. The 661x series of switches, which use GB switch technology, is designed with low power and thermal monitoring. The non-blocking, full wire speed switches offer nine auto-sensing ports including Quality of Service (QoS) with 4 traffic classes, IPv4 and IPv6 Layer 2/3 protocols. The series also provides network management that can be accessed from a browser, PC, console or SNMP.

[acttechnico.com](http://acttechnico.com)

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# Tired of the hype?



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Industrial housing

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ifm's inspection sensors O2D220 and O2D222 offer the right combination of performance, price and simplicity. To schedule a demo, visit [www.ifmefector.ca/response](http://www.ifmefector.ca/response) or call 800-441-8246.

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## NEW! Clippard 10 mm & 15 mm Solenoid Valves

Clippard's new compact valves offer many features for design flexibility especially in applications with limited space. Available in 2-way or 3-way configurations, as Normally-Open or Normally-Closed, flow rates from 0.5 to 3.0 scfm are available dependent on the orifice size. Other features include highly-visible LED indicator light and manual override, quick response time, and multiple mounting and voltage options. For easy installation and versatility, select from five connector styles.



This all-new line of solenoid valves offer many possibilities for pneumatic applications that require a lightweight, cost-effective miniature valve.

Call Clippard today at 513-521-4261 or visit [www.clippard.com/catalog-b](http://www.clippard.com/catalog-b) to request a free catalog.

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## EXPANDED! Clippard Push-Quick Fittings

Clippard's Push-Quick Fittings speed tube insertion for assembling pneumatic circuits. The fittings provide a simple method to connect pneumatic components and accept both flexible hose and rigid tubing. Many configurations, thread options and tubing sizes offered.

### Thread Sizes

#10-32, M5, 1/8" NPT, R1/8, 1/4" NPT, R1/4, 3/8" NPT, R3/8" and 1/2" NPT

### Tube Sizes

1/8", 5/32", 6 mm, 1/4", 5/16", 3/8" and 1/2"

Visit [www.clippard.com/catalog-b](http://www.clippard.com/catalog-b) to request a free catalog.

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## Clippard Brass Valves

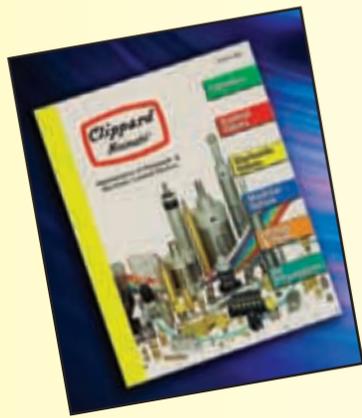


Clippard offers poppet or spool designs; 2-, 3- or 4-way functions, in sizes from #3-56 and #10-32 through 1/8" NPT ports; and for pressures up to 300 psig. They are available with solenoid, air pilot, manual and mechanical actuators. Mounting styles include inline, panel mount, manifold mount or clearance holes for mounting screws. When you are looking for a valve, Clippard's minimatic line of valves provide a complete range of sizes and styles.

Call 513-521-4261 to request a free catalog.

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For more information, fill in the Info Card



## NEW! Clippard Full-Line Catalog

Clippard's new 388-page full product line catalog, with technical information, product applications, and more is now available. It includes features, specifications, color photographs, and technical drawings for over 5,000 standard products. It's your complete source for miniature fluid power products. Request your free copy today!

Call Clippard today at 513-521-4261 or visit [www.clippard.com/catalog-b](http://www.clippard.com/catalog-b) to request a free catalog.

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## NEW! Clippard Maximatic® Solenoid & Air Pilot Valves



Clippard all-new Maximatic 3-way, 4-way, single and double solenoid, 3-way and 4-way air piloted valves are available in many sizes and variations for a wide range of applications. Specified, tested and backed by Clippard, these quality manufactured imported valves are available in sizes from #10-32 to 1/2", and pressure ranges from 0 to 150 psig, depending on the valve and model.

The Maximatic line offers a comprehensive valve series that maximizes flow, are competitively priced, and will provide Maximum Value and Maximum performance.

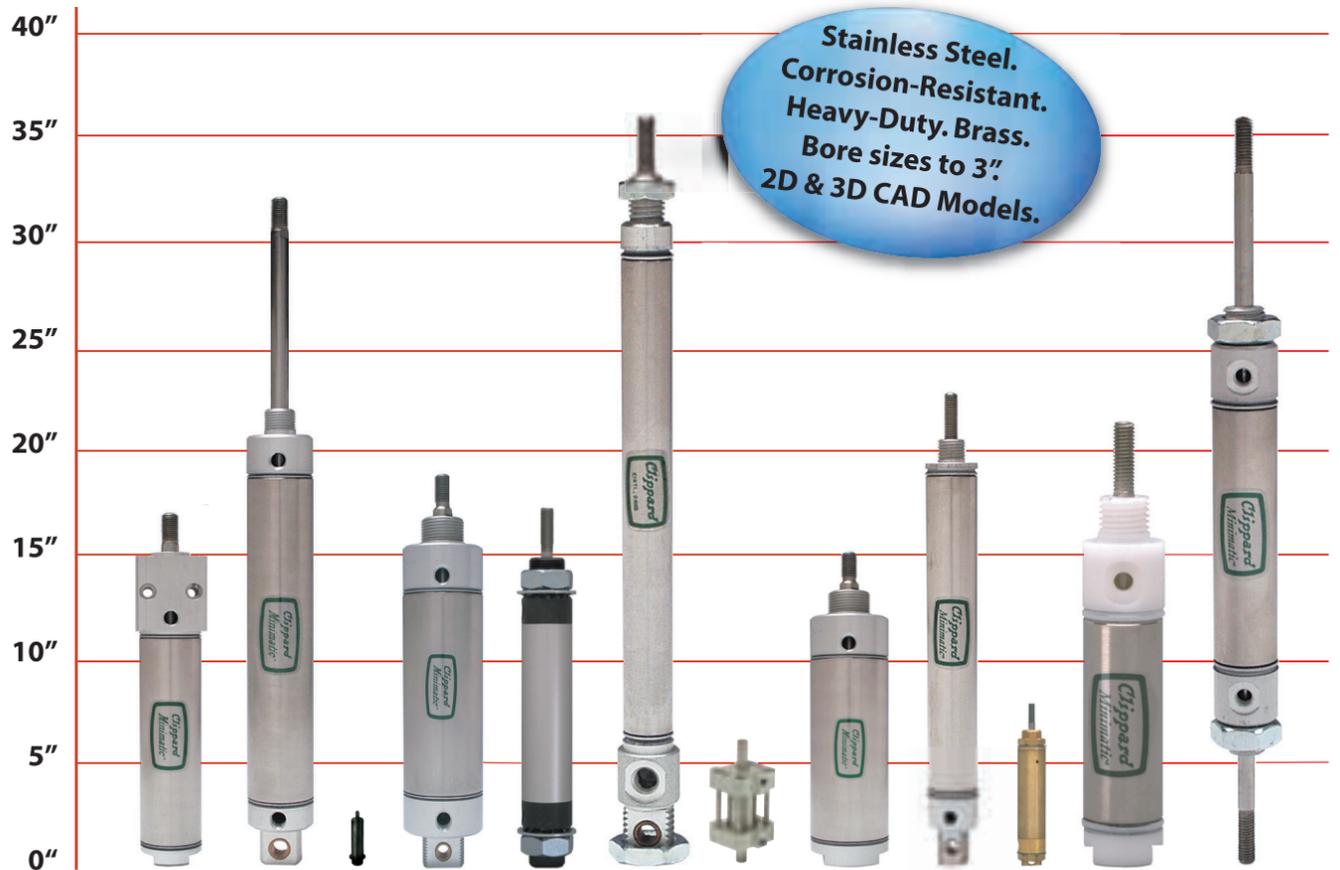
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# air cylinders

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