

Hydraulic booster

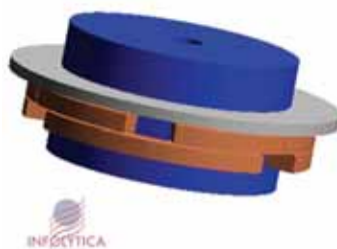
ADVICS' hydraulic brake booster with integrated electronic control unit (HB-Ci) is effective for stabilizing vehicle behavior by improving brake efficiency, rollover protection, and running performance on rough roads. The system is especially



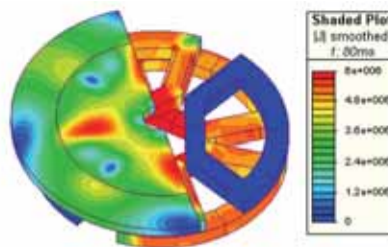
crucial when installed in a heavy vehicle such as an SUV or truck. It features an integrated design for easy installation and routing of pipes and wires, as well as mass and space saving. The hydraulic pump and high-pressure accumulator provide high response time and stable assist power. The switched bore master cylinder improves pedal stiffness and FMVSS brake performance. Vehicles featuring the system include the Toyota Tundra, Tacoma, and Lexus GX470.
Booth 1461

Electromagnetic optimization

OptiNet 2 from Infolytica is the companion optimization software for MagNet, ThermNet, and ElecNet analysis tools, which help designers of electromechanical or electromagnetic devices to increase efficiency and reduce manufacturing costs. The software helps identify device parameters that yield the target objectives within specific constraints. Optimization complexity can vary from a single parameter such as weight, price, inductance, or maximum dimension; or a combination of multiple parameters such as the



maximum power output and the weight. Each solution is classified as improved, not improved, or failed. By comparing different solutions, the modifications made to each vari-



able can be traced indicating their sensitivity with respect to overall performance.
Booth 2614

PVD process

Physical vapor deposition (PVD) plastics surface finishing technology from Preh Automotive can be used for automotive interior applications. The process has been modified from a high-temperature process to meet the low-temperature requirements of plastic parts. Compared to metallic surface electroplating, the PVD process allows laser etching of parts necessary for automotive controls, where buttons and knobs need illumination for nighttime visibility. The process



is environmentally friendly, unlike electroplating. As more stylish vehicle interiors are requested, PVD technology will be valuable for its almost unlimited pallet of metallic

colors. The technology has already been employed to good effect in the HVAC controls of the BMW 5 Series automobiles.
Booth 2207

Data-logging tool

National Instruments' measurement services software, which comes available with every plug-in and distributed data-acquisition device, now includes free VI Logger Lite data-logging software. The software requires no programming, offers data exportation to Excel and DIAdem with a click of a button, and seamlessly integrates with NI LabVIEW graphical programming environment. The package is equivalent to an input/output (I/O) driver software layer, connecting virtual instrumentation software with NI hardware for measurement and control. It includes intuitive application programming interfaces, instrument drivers, configuration tools, rapid I/O assistants, and professional tools to help engineers reduce system setup and configuration time.
Booth 1107

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What's New
from the exhibitors

Power analyzer

The Model WT3000 Power Analyzer from **Yokogawa of America** provides measurement accuracy for demanding applications such as product efficiency testing, engineering and R&D work on inverters, motor drives, lighting systems and electronic ballasts, UPS systems,



transformer testing, and other power conversion devices. The system has a basic power accuracy of 0.02% of reading, and a bandwidth of dc, 0.1 Hz to 1 MHz. High-performance digital signal processors, along with a special digital filtering technique, are used in the input measuring circuits to achieve high-accuracy measurements and high-speed response. The data update rate can be set from as fast as 50 ms, 20 readings per second, to as slow as one reading every 20 s.
Booth 706

Universal testers

Shimadzu Scientific Instruments' Autograph AG-IS Series of Universal Testers ranges from 1 N to 250 kN (0.22 to 56,200

lb) capacity, with optional extended column and wider frame availability. Operation control options include PC control, an integrated touch panel for the MO model,



and the handheld Smart Controller for the MS mode—which permits fine adjustments to the specimen position and aids operation of the crosshead and automatic extensometer. The series features test speeds from 0.00005 to 1000 mm/min (1.9 µin/min to 39.4 in/min), with ultra-high-speed sampling selectable from 1.25 ms to 5 ms. Guaranteed test force measurement for high-precision models is within ±0.5%, up to 1/500 of the load cell capacity. Accessories include grips, extensometers, and jigs. Optional Windows-compatible Trapezium software provides simplified user operation with Wizards and the navigation system.

Booth 623

High-speed video imaging

The Fastcam-X 1024 PCI high-speed video-imaging system from **Photron USA** includes full megapixel resolution up to 1000 frames per second. It uses an ultra-light-sensitive 10-bit complementary metal oxide semiconductor sensor. Its electronic shutter can operate down to 2 µs, ensuring that high-speed events are captured clearly,



regardless of the speed of the object being recorded. The unit comes with Fastcam Viewer software and has both a C-mount and F-mount lens adaptor. Variable aspect ratios are achieved by user-specified building blocks that are available in 128 x 16 pixels and are automatically configured to any user-selected framing speed. Twenty memory slots provide storage for frequently used speed and resolution settings.
Booth 440



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In its normal position, the integrated child booster seat serves as a seat for adults. It can adjust to securely hold and protect children from nine months to 12 years of age. Separate five-point safety belts for smaller children and lateral head supports provide outstanding safety.



Active Head Restraint

The active head restraint uses either a pyrotechnic device or a spring mechanism. In the event of a rear collision, it launches the head restraint forward in milliseconds – before the seat occupant's head and body are impacted, arriving in a position to meet the occupant's head and prevent whiplash injury.



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Outdoor accelerated testing

Four temperature-controlled EMMA/EMMAQUA outdoor accelerated test services from **Atlas Weathering Services Group** provide static temperature control, dynamic temperature control, night temperature control, and variable irradiance control. The services allow manufacturers to harness



actual sunlight, rather than a simulated light source, to better replicate actual conditions. Static temperature control helps overcome the effects of starting tests at different times of the year by reducing temperature intermittency effects caused by cloud cover or seasonal light source fluctuations. Dynamic temperature control uses a remote sensor to define the "set point" temperature for the controller, enabling natural exposure patterns to be duplicated in the accelerated test. Night temperature control approximates summer nighttime temperatures during winter exposures to counteract the heat-absorbing power of the night desert sky and low winter nighttime sample temperatures. Variable irradiance control enables temperature-sensitive materials to maintain stability in extreme accelerated outdoor weathering concentrators without suffering from elevated temperature effects. The services can be used independently or in various combinations to create accurate accelerated outdoor testing results.

Booth 615

Network analysis

CANLab from **Accurate Technologies** monitors and logs messages and signals on a Controller Area Network. The system was designed using **Microsoft's** .NET technology. It contains all the setup information for channels, devices, databases, loggers, and screens, and organizes



its configuration in what is called a "Workspace." Screens can be arranged via a docking window management scheme. Messages and signals transmitted from any available network channel can be shown and manipulated with various options. The system can also re-send recorded bus traffic. Simultaneous viewing of real-time data and data imported from previous recordings enables in-depth post analysis.

Booth 2403

Electrical cabinet inspection

Hot spots in electrical cabinets can be quickly pinpointed while circuits are energized and under load using the SpyGlass fish-eye lens and Viewport from **Mikron Infrared**. The system encourages frequent examinations of electrical switch gear because, with cabinet doors closed, no downtime is required to de-energize circuits for safety reasons. It is UL-rated and approved for installation at the OEM level or as a retrofit in the field. Suitable for both low- and high-voltage applica-



tions from 480 V and up, it can be installed in 20 min or less on cabinets indoors or outdoors, in either vertical or horizontal position. Booth 232

Data acquisition and analysis

M3 Integra from **BS² Multidata** can not only acquire and analyze data on its own, but is compatible with a range of common data-acquisition software such as MATLAB, LABVIEW, and DASyLab. The package provides further functionalities for users including test-bench applications. Complex analyzing tools for acoustic, octave, and third-octave analysis are included in the software packages as well as a range of new display modes. The software packages also include statistical, classing, and measurement simulation tools. The system contains two new modules: the STG-08-HS for accurate measurement of physical stresses and misuse tests, and the Dual Extended Bus Interface DEB_II that allows data from diverse controllers such as the antilock braking system, electronic stability control, and electronic control unit to be acquired. Different protocols and interfaces including CCP, XCP, CAN (controller area network), and SPI are integrated in one module.



Booth 1642

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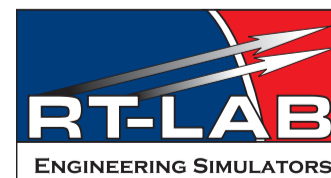


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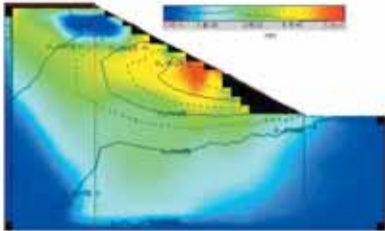
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What's New
from the exhibitors

Partial differential equation solver

InuTech's Diffpack is an object-oriented problem-solving environment for the numerical solution of partial differential equations (PDEs). It provides a high degree of modeling flexibility while maintaining the computational efficiency



needed for demanding simulation problems. The product allows easy modification and combination of all numerical building blocks making up an application. It emphasizes the flexible construction, modeling power, and computational efficiency of the numerical kernel, rather than the specific nomenclature and graphical user interfaces targeting a certain engineering area. Thus it has no inherent restrictions on the types of PDEs that can be solved. One type of problem that can be solved with the software is modeling of a multiphase flow in porous media such as filters, sintered metals, and metal foams. The package is organized as a collection of C++ libraries with classes, functions, and utility programs.

Booth 1633

Hybrid drivetrain

Aisin's two-motor power-split hybrid drivetrain combines the advantages of series and parallel hybrid



systems. The system integrates the ECU and inverter. Maximum output of the traction motor is 65 kW; maximum output of the generator motor is 28 kW. Oil cooling is used for inside circulation, and water cooling provides further motor cooling.

Booth 1461

CAN bus data logger

The **CSM UniCAN Professional** allows data acquisition for long-term control and troubleshooting on two CAN buses simultaneously. The GSM (Global System for Mobile Communications) feature provides remote configuration and remote access to the acquired data. A link between a notebook and the system can be established via Manager software

and standard GSM models. The technician can specify filter and trigger conditions, start time, stop time, and logger or recorder mode from any location and download the acquired results.

Booth 553



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Human-error reduction

Freedom Technologies' solutions eliminate human error on the shop floor at manufacturing and distribution companies. Error Proof and EP Bridge business solutions fit current needs and adapt to business changes over time. A broad portfolio of applications with industry-specific functions provides high flexibility to optimize business operations and compete more effectively. The standard Error Proof application includes a rich set of label printing, production tracking, and automated data-capture functionality as well as a set of verification and validation functions that can be used to perform component part verifications, capture testing data, track part component genealogies (serial and lot traceability tied to each part),



produce serialized part labels or direct part markings, interface with the programmable logic controllers (PLCs), count to container verification, and Earn-a-Label for shipping. The system validates all of a plant's processes using automatic data-collection devices such as PLCs, scales, direct parts-marking systems, and vision systems.

Booth 2608

Metallization system

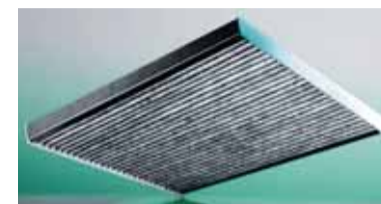
VTD Vakuumtechnik Dresden features a horizontal short cycle system for the metallization, including protective coating, of plastic components. It can accommodate substrate carriers with an enveloping diameter of ca. 500 mm (19.7 in). A usable coating length of 2040 mm (80.3 in) max. can be performed. Charging time for a typical coating process is approximately 4 min. Metallization is effected via a high-capacity sputter device. Apart from the standard target material, aluminum, other metals such as Cu, CrNi, Cr, Ag, and stainless steel can be employed. Further advantages are low space requirements, flexibility compared to small series, and optimized water management. The



metallization system is designed for integration into assembly lines. It is operator-friendly and easy to service, and can be adapted for customer-specific adjustments.
Booth 1429

Hydrocarbon adsorption

Mann+Hummel's Pleatsorb traps evaporative emissions, allowing vehicles to meet current LEV II, SULEV, and PZEV emissions regulations. When the engine is turned off, hydrocarbon molecules are attracted



to the adsorption element. After restarting the engine, fresh intake air flows through this element, and the difference in concentration between the fresh intake air and the adsorption element causes desorption of the molecules. The intake air transports the hydrocarbons to the combustion chamber, where they are consumed in the combustion process. The system captures the airborne hydrocarbon emissions in the intake system throughout the vehicle's lifetime, up to 15 years or 250,000 km (150,000 mi). Availability of two types of HC adsorber elements (full flow and bypass) provides flexibility to adapt to various air-cleaner designs.
Booth 1726

Visual inspection system

The **TechnoPack X** remote visual inspection system from **Karl Storz** incorporates laser-measuring technology. When the system is turned on, it instantly projects the laser through the scope onto the workpiece. Following user setup of



two points on the screen, everything else is automatic. Measurement data is displayed and can be stored with the images. All measuring is done on full-screen images. No special tips or adapters are required. The system features Clearview Technology with Instant Recognition that identifies the connected videoscope or camera (used with fiberscopes or borescopes) and automatically adjusts for optimum resolution. The technology also maximizes the resolution of fiberscope images by eliminating interstitial (pixel) patterns. Images and measurements are displayed on a high-resolution 12-in-diameter Super VGA screen.
Booth 281

Acoustic pressure sensors

Series 103B ICP acoustic pressure sensors from **PCB Piezotronics** measure pulsating, transient, and turbulent acoustic phenomena on vehicles. The low-profile, high-sensitivity sensors are suitable for



applications such as wind-tunnel testing and aerodynamic testing and analysis. They feature built-in signal-conditioning microelectronics to produce clean, low-impedance voltage output signals and are offered in three configurations: pigtail wire solder connection, 10-32 top connector, and 3-56 side connector. Each configuration comes in sensitivities of 500 or 1500 mV/psi (70 or 220 mV/kPa) and ranges of 10 or 3.3 psi (70 or 23 kPa), respectively.
Booth 827

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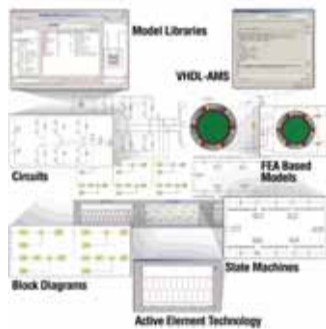
Slow-motion video camera

Photron USA's ultima APX-RS slow-motion video imager captures 3000 frames per second (fps) at 1024 x 1024 pixel resolution, up to 10,000 fps at 512 x 512 pixel resolution, and 250,000 fps at reduced resolution. Its high-speed complementary metal oxide semiconductor sensor with true 10-bit monochrome (30-bit color) fidelity has good anti-blooming properties and variable (square or rectangular) aspect ratios. The camera can be controlled by either FASTCAM Viewer software or the handheld control keypad, which permits camera setup and image viewing without a computer. For operating multiple cameras, the software enables full camera control, video replay, and image-download capabilities via PC.
Booth 440



Multi-domain systems

SIMPLORER from **Ansoft** is a software tool for design and analysis of complex, multi-domain systems that may include electrical, mechanical, thermal, and control components. The software can be used to design systems such as electric motors and drives, powertrains, power systems, and hybrid-electric propulsion systems. It offers multiple standard modeling methods (VHDL-AMS, circuits, block diagrams, state machines, and C/C++) that can be used concurrently. It also employs the concept of "natures," allowing components of different engineering domains to interact. A transient coupling capability with the Maxwell 3-D electromagnetic field simulation tool facilitates design of electromechanical components, controls, and power electronic drives. Other features include a scripting interface; enhanced optimization and statistical analysis tools; development wizards for creating models and component dialogs; and an add-on library of sensor models with 276 elements.
Booth 2214



Vision-inspection platform

The **CATPRO 6000D** from **Image Labs International** is designed for continuous multiple vision inspections of ceramic or steel catalytic substrates and diesel particulate filters for extrusion, monolith coating, and canning operations. The cabinet houses the inspection camera, lights, and vision processors with inspection resolution up to 10,000 pixels across the product width. A fully automated and illuminated conveyor system accommodates monoliths up to 14 x 14 in (355 x 355 mm) with a possible throughput of one per second. Pro-CS Software V 4.0 provides centralized data collection for defect detection, extrusion failure, or shrinkage during firing as well as factors including plugging, edge and surface defects, and the presence/absence of ceramic coating or separating/laminating defects in metallic foiling. Measurement data for nonconformance to specifications can be collected after extrusion and before/after firing to detect cell shrinkage, variations in wall thickness, and other standard measurements. An interface system provides ease of setup, configuration, and report generation without affecting the inspection.
Booth 2246



Catalysts

Haldor Topsoe's catalytic system is a lightweight fiber-reinforced ceramic structure with high mechanical strength. The catalysts target diesel engines and can be delivered as SCR (selective catalytic reduction) catalysts or oxidation catalysts. They can be provided as sleeved catalyst units with a flexible diameter, with the benefit of only one monolith for a large, heavy-duty engine. The SCR catalyst's active metals are vanadium oxides and Tungsten



oxides on a carrier of titanium oxide. The catalyst is a full-body type, which offers a high nitrogen oxide conversion, long service life, and good removal of hydrocarbon and particulate matter. It is selective, ensuring a maximal use of injected area and low urea consumption. The firm's DOXCAT catalyst is a full-body oxidation catalyst whose active materials are based on a base metal catalyst promoted with a low level of precious metals. It is designed with a high activity for removal of hydrocarbons, particulate matter, and NO² in heavy-duty diesel engine exhaust. The catalyst can operate at low catalyst temperatures (at idle or low loads). It features a low activity for SO² and NO oxidation and is resistant to poisoning by sulphur compounds, which allows operation with any sulphur level and greatly improves the local environment.
Booth 1809

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High-speed camera

The **MotionXtra HG-TH** from **Redlake** offers a multi-head, high-speed digital-imaging solution. The small, tethered camera heads fit into hard-to-reach locations such as under seats and in foot wells, or onto mounting surfaces. The system features one to four camera heads, and 2 to 8 GB of memory for up to 19.2 s of record time. Each camera head includes 752 x 564 maximum resolution at 1000 fps, and 1000Base-T Ethernet for fast downloads. The controller and cameras withstand forces up to 100 g (3215 ft/s²), making them suited for automotive crash, including rollovers, and component safety testing.
Booth 620

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Hardware/software simulation

Synopsys' Saber product line is enhanced with technology for hardware/software co-simulation with **Matlab's** Simulink. The interface allows efficient non-conserved, control system level design of complex systems. Co-simulation between these products offers improved capacity and throughput for simulating mixed-signal designs. Saber also supports standard modeling languages including VHDL-AMS in addition to the MAST language to aid rapid model exchange and simulation in the automotive supply chain.

Booth 1301

Hydrocarbon fluid loss

A fuel-permeation test setup for **SAE J1737** from **Akron Rubber Development Laboratory** determines hydrocarbon fluid losses through tubes, hoses, and fittings. The practice uses a temperature-controlled cabinet for fluid and plumbing components to maintain a consistent test temperature. Independent regulators and recirculation pumps provide fuel and carrier gas pressure and flow control. Via a recirculating system, hydrocarbon liquid and vapor transported through component walls and joints are collected by a controlled flow of nitrogen gas and adsorbed by a

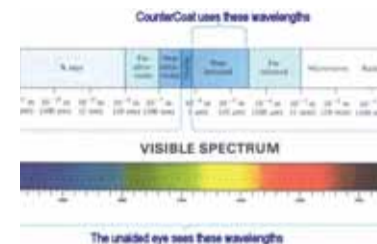


series of activated charcoal filters. The method is effective for measuring permeation of fuel components greater than 8 g/m² (0.02 oz/ft²) per day.

Booth 821

Infrared read-through paint

A bar code, serial number, or identification marking can be put on an object and then painted or covered over with a coating using **Ferro's** CounterCoat technology. The coating or covering appears



completely opaque when viewed in the visible spectrum of light, but is transparent in the near-IR at wavelengths of approximately 700 to 1250 nm. The object appears to be a normally painted or covered object to the naked eye, but with the use of a specialized IR reading system, the hidden marking can be detected easily.

Booth 1033

Dynamometer testing

SAKOR Technologies' DynoLAB PT engine and powertrain test cell control system supports **National Instruments'** compactRIO platform. Applications include performance evaluation, drivetrain and component durability testing, road-load profiling, in-use simulation, quality control, and catalyst performance and aging studies. The system features a reconfigurable signal-conditioning hardware interface based on field programmable gate array technology. With this technology, functions normally requiring a separate digital signal processor can be configured and executed at the hardware gate level, thus reducing system cost and complexity. CompactRIO's high-speed ethernet connectivity and ultra-compact, envi-



ronmentally hardened form factor allow DynoLAB systems to perform in test cell environments previously considered too hostile for cell controller hardware. The DynoLAB PT integrates external devices including all types of dynamometers, throttle actuators, spark and fuel controllers, combustion-analysis systems, emission analyzers, and other smart I/O devices.

Booth 1100

Clamping systems

Band-It Tie-Lok and **Junior** stainless-steel clamping systems from **Band-It-Idex** replace welds on exhaust heat shields to solve the pings, rattles, and warranty issues caused when attachment welds break. Band-It Junior clamps

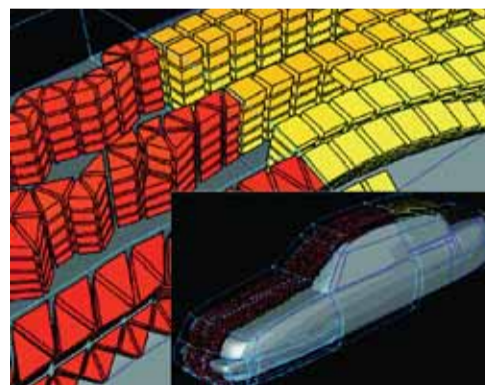


feature a 50% diameter reduction, the strength to reduce SKUs, and offer the security required for years of service. Both systems include various clamp lengths, widths, and diameters to allow a range of fastening strengths and diametric reduction. Single-wrapped Tie-Lok ties, supplied flat and unwound, can be threaded through or around objects where a looped clamp cannot be installed. Preformed, double-wrapped Junior clamps provide increased strength and convenience. Annealed stainless steel allows both clamp styles to conform to irregular shapes as well as provide the strength and corrosion resistance to meet demanding automotive applications.

Booth 1852

CFD meshing

Gridgen Version 15.06 CFD (meshing) software from **Pointwise** features a port to the Mac OS X operating system and a capability for mesh-extrusion techniques. It contains extended extrusion methods for generating prism and hex layers. Complex surface mesh topologies consisting of structured and unstructured (tri) surface meshes can be extruded simultaneously into hexes and prisms. Additionally, existing surface grids can be used as the boundary condition for a new extrusion. Adjacent extrusions can differ in height, but still match point-to-point along their common boundary. Taken together, these two additions expand the scope of geometries for which extruded layers can be generated. The software also runs on Linux, Unix, and Windows; it interfaces with CFD solvers such as Fluent, Star-CD, and CFX as well as neutral formats such as CGNS.



Booth 726

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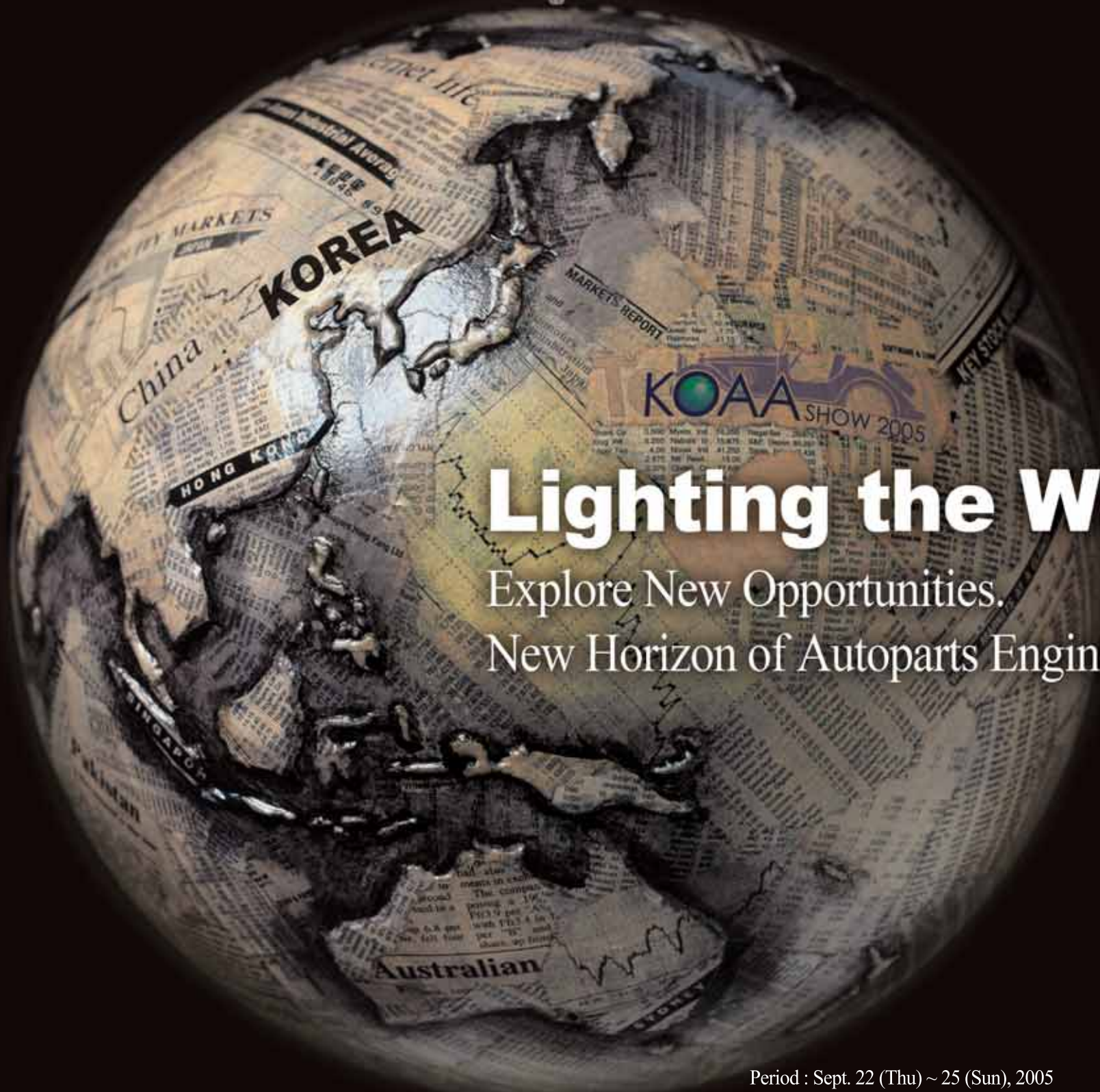
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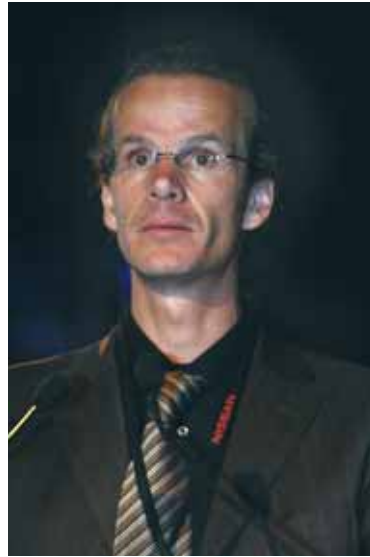
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**Focus
on people**



Rich Schaum, SAE Automotive Vice President, speaks to D. Mark Ratliff, President and CEO of Virtual Services, during Monday's TARDEC luncheon.



"The end consumer is also important to the supply world because even though they're not a direct client who is paying [us], they are the only ones at the end who are injecting money into the industry and deciding if a certain idea, concept, or product will be successful," said Andreas Wlasak, VP of Industrial Design for Faurecia.



Part of the kickoff Monday morning for the SAE 2005 World Congress was an unveiling of artist John Glover's three-piece canvas piece commemorating SAE's 100th anniversary. 2005 SAE President J. E. "Ted" Robertson (left) gave opening remarks. SAE Executive Vice President Raymond Morris (second from left) and 2004 SAE President Duane Tiede (second from right) took the wraps off the work by Glover (far right).



"We need a road map if we're going to produce systems that view safety as a complete vehicle, not a number of individual systems," Robert Rivard, Vice President of Technology and Product Marketing at Bosch, said in an afternoon panel session, *The Next Generation of Automotive Safety Systems*.

Under the carbon-fiber skin of the next Z06

General Motors engineers revealed technical details of the next ultimate Chevrolet Corvette, the 2006 Z06, in the FEV Technology Innovation Forum on Monday. The nearly daylong session focused on the design and development of the powertrain and chassis as well as the involvement of suppliers of the car's exclusive aluminum spaceframe, co-developed with Alcoa and Dana, and carbon-fiber structural composite body pan-

els produced in conjunction with **Molded Fiber Glass Research**.

The car picks up from the previous-generation Z06 model, which gave greater urgency to the second half of the previous-generation Corvette C5's life span with a model for the "extreme performance enthusiast." Now, the Corvette team has combined the many attributes of the sixth-generation C6 Corvette with technology derived from the C5-R racing program to take the



Beneath the 2006 Z06's new carbon-fiber body panels is a new aluminum-intensive chassis.

See **CARBON-FIBER SKIN**, Page 17

Grammer offers whiplash protection

Whiplash injuries cause physical as well as economic pain for more than 270,000 people who spend a combined \$7 billion annually on vehicle-related neck injuries, according to statistics from the **National Highway Traffic Safety**

Administration (NHTSA) and the **Insurance Institute for Highway Safety** (IIHS).

Two vehicles sold in the United States, the BMW 5 and 7 Series, offer whiplash protection via the first generation of an active head restraint manufactured in Europe by Grammer AG-Automotive. SAE 2005 World Congress attendees, however, can see the next generation of the product at the Grammer exhibit (Booth 1537).

"In the [second-generation] version, two coil springs push the headrest forward once there's a signal from the vehicle control unit," said Dr. Gerd Truckenbrodt, Design Engineer for Grammer AG-Automotive, adding, "A U-shaped locking spring is triggered by a magnetic switch, activated by a sensor." The

activation time following a rear-end vehicle collision is 50 to 55 ms, faster than a typical airbag deployment that takes ±120 milliseconds, according to Truckenbrodt.

The second-generation product uses two coil springs, a plastic headrest housing, an electromagnetic activation plate, and wiring. Patents cover the coil-spring mechanism in terms of "the way in which it works in this application," said Truckenbrodt. A prime difference between the first- and second-generation active head restraint is that the first-generation product employs a pyrotechnic method for deployment.

Government safety-related initiatives played a significant role in the development of active head restraints. "One of the factors driv-

ing our development of the active headrest systems was the anticipation that FMVSS 202a would result in larger/taller/closer headrest designs that will likely be seen by consumers as being less comfortable, more intrusive, and cause rear and/or side vision problems," said Conrad Zumhagen, Executive Director of Business Development for Grammer. "The active headrest allows for a smaller, less intrusive, and comfortable design that will provide equal or better occupant safety in the event of a rear collision."

In addition to the electronically activated headrest display, Grammer's exhibit also features its integrated child booster seat as well as various consoles and armrests. *Kami Buchholz*



Grammer's second-generation active head restraint technology will be available in the 2006 model year.

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