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MONDAY

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Volvo XC90: Best Engineered Vehicle for 2003

The XC90 was selected *Automotive Engineering International's* Best Engineered Vehicle for 2003 because its engineers focused much of their attention on addressing the safety and environmental criticisms aimed at today's SUVs. In fact, three of the five automotive "world firsts" Volvo claims for the vehicle—a rollover protection system with integrated gyro sensor, an inflatable safety curtain, and seatbelt pretensioners for all three rows of seats—are safety-related. The other two firsts are interior-



Two XC90 interior safety innovations supplied by Autoliv are seatbelts fitted with pretensioners and load limiters for every occupant as well as an inflatable curtain airbag that protects all three rows of passengers.

related: an integrated sliding child booster seat in the center second-row position and the world's first **Dolby** 5.1 Pro Logic II surround sound stereo system. Engineers were also able to develop three engines that combine good power and fuel economy with excellent emissions performance.

Hans Wikman, the XC90 Project Director, agrees with the *AEI* readers and editors in putting safety and environmental compatibility at the top

See *Best Engineered*, Page 3

GM demonstrating "real" technologies

Former SAE President Neil Schilke, stalwart over the past two years in protecting and enhancing the value of the SAE World Congress, sees the event as the left hook that follows the right jab.

"In Detroit, we have a one-two punch of major events every year," he explained. "Punch one is the North American International Auto Show (NAIAS), and punch two is the SAE World Congress. If you want to find out whether the stuff that's introduced at the auto show is for real, then come to the SAE Congress—because if it's not backed up by meaningful presentations on what's under the skin, then chances are it's not real."

GM, for which he serves as General Director-Engineering, is displaying mainly "bridging technologies" that will get it from the current state to a fuel-cell future, he said. Displacement-on-demand, the hybrid powertrain,

See *General Motors*, Page 3

SAE 2002 President reflects on past year

It has been a great honor to represent SAE. SAE is a highly respected organization all over the world. Mobility practitioners worldwide have expressed their appreciation of the energy and vitality of the Society. Some of the respect for SAE rubs off on the President—which helps—and makes representing SAE all the more enjoyable. It has been a great learning experience for me personally. I have interacted with industry leaders, technology leaders, policy makers, educators, and students—those shaping mobility technology.

My message to the mobility community worldwide has been that SAE does not just stand for the Society of American Engineers, but that it is a truly international and inclusive organization. SAE should make every effort to reflect its international character in all aspects of its work.



S.M. Shahed

In my travels and meetings with many industry leaders, I have discussed with them how they can make SAE a formal part of their mainstream work planning process for engineers. The opportunities that SAE offers to develop technical skills by reading and reviewing technical papers, participating in seminars and

courses; to develop leadership and organizational skills by participating in and leading committees to write standards, organize technical sessions, and conferences; to develop future engineers through participation in *A World in Motion* and student design competitions—all of these opportunities can be made a planned part of the mainstream work processes. I have characterized this as a win-win-win situation, meaning the corporation, the individual, and SAE all

See *SAE President*, Page 17

Technology Theater headlines new SAE World Congress

Center stage at the SAE 2003 World Congress is...well...center stage. Occupying a prominent position on the show floor, the center stage (officially called the Technology Theater) will be the venue for almost 20 panels and keynote presentations on a breadth of technological and business topics this week. The fully enclosed Technology Theater has 360 seats, and attendees filling them will be treated to insights from industry heavyweights such as:

DaimlerChrysler Corp.'s Richard Schuam, **Ford's** Jim Padilla, **General Motors'** Ned McClurg, and, and **NHTSA** Administrator Jeffrey Runge. (See page 18 for today's Technology Theater schedule.)



Congress General Chairperson Richard Schuam, Executive Vice President-Product Development and Quality for DaimlerChrysler Corp., is retiring at the end of this month.

Increasing the number of presentations by automotive industry executives is one way in which SAE is trying to reshape the

See *Theater*, Page 17

Today's Congress highlights

- **Thrive or Survive: Engineering Vehicle Systems for 2010**
SAE Technology Theater
8:00-9:00 a.m.
- **Business Opportunities in China (OESA Panel)**
W1-51 Riverview Ballroom
8:30 a.m.-12:45 p.m.
- **How Fast is Too Fast? The Challenge of Rapid Advancement in Automotive Electronics**
SAE Technology Theater
10:00-11:30 a.m.
- **Keynote Address: Hans-Georg Frischkorn, BMW Group "Advanced Electronics-Evolution vs. Revolution"**
SAE Technology Theater
11:30 a.m.-Noon
- **Keynote Speaker: Phil Martens, Ford Motor Co.**
SAE Technology Theater
Noon-12:30 p.m.
- **STS Conference within a Conference**
Room W1-51
1:00 p.m.
- **SAE Annual Business Meeting**
SAE Technology Theater
1:30 p.m.-1:45 p.m.
- **Drive-by-Wire: What will be its Impact on Tomorrow's Vehicles?**
SAE Technology Theater,
2:30-4:00 p.m.
- **17 Million Vehicles Sold: Where's the Profit?**
SAE Technology Theater,
4:00-5:30 p.m.

Best Engineered...Continued from Page 1

of the list of his program's accomplishments. But he is also proud of the vehicle's car-like driving characteristics and interior flexibility. These qualities are made possible, in large part, by a cab-forward architecture based on Volvo's flexible P2 large-car platform, which also underpins the S80, S60, and V70.

While many automakers are designing new cars with long hoods and set-back passenger compartments, Volvo decided to adopt a "cockpit forward design" for the XC90 to maximize passenger space and safety. The approach allowed the company to design a seven-seat SUV within an overall body length of just 4.80 m (15.7 ft).

The design "means that we can provide added roominess within a given footprint, and the XC90 is compact for an SUV," said Wikman. "It is just 90 mm longer than a Volvo V70, and we can seat seven people in a size where most competitors struggle to seat five—with adequate luggage space behind the third row."

The XC90 can be ordered in either a five- or seven-seat configuration. In either configuration, the seats behind the front row can be folded down to create a fairly flat cargo "floor" no less than 1.89 m (6.2 ft) long, 1.13 m (3.7 ft) wide; the cargo space has an SAE volume of 2404 L (84.9 ft³).



Hans Wikman, the XC90 Project Director, says the significant engineering innovations of his vehicle are safety (active and passive), passenger car driving characteristics, flexibility (especially interior), and the meeting of car (rather than truck) emissions levels. He received the XC90 assignment from Volvo Car Corp. management in September 1998.

Volvo says the XC90's unique architecture—using transverse inline engines having more than four cylinders, partnered with an extremely compact gearbox—offers it a competitive edge. "In recent years, this architecture has given us extra legroom in the rear seat of the Volvo S80, more luggage space in the Volvo V70...and now it's time for the XC90," said Wikman. The company cites three major benefits for its new SUV. The architecture makes it possible to maximize interior space. The inline engine can be designed with a "warm" and "cold" side, with the XC90 engine's warm side facing rearwards for one, short flow of exhaust to the catalytic converter for reduced emissions. And, Volvo says, an inline engine is ideal for turbocharging, which aids the low-end torque output needed by an SUV for good takeoff performance.

The XC90's large-car architecture base also helped engineers design-in passenger-car-like ride and road-holding. Compared to other vehicles on the platform, the suspension was beefed up and dimensioned to handle heavier loads and higher ground clearance. Though the XC90 is not intended for off-road driving, the combination of electronically controlled all-wheel drive and 218 mm (8.6 in) of ground clearance makes moderate off-road travel possible.

To read more about the XC90, see the March issue of *AEI*.
Kevin Jost

General Motors...Continued from Page 1

and the continuously variable transmission (CVT) are among the technologies the company is exhibiting at its display near the Technology Theater.

"GM is aimed at the fuel cell and the hydrogen economy," Schilke said. "That's the vision we see as making sense for the company and for the industry, but it will not happen instantaneously. We're also concentrating in the interim on technologies that get us from here to there."

At January's NAIAS, GM announced that it will offer optional hybrid powertrains on several of its most popular models including trucks, SUVs, and midsize sedans starting in late 2003.

"This is a major commitment to offer consumers three different hybrid propulsion systems on three vehicle architectures, representing more than a dozen of our most popular models," GM President and CEO Richard Wagoner said. "If consumers were to select the hybrid option on all of the models included in our multi-year plan, it could eventually exceed 1 million vehicles."

The hybrid systems vary in complexity and cost, stretching from the "very aggressive" dual electric-motor **Saturn** VUE to the "more practical" combination of electric motor assist and technologies such as displacement on demand and CVT.

The ambitious hybrid program begins with the already announced production of the **GMC** Sierra and **Chevrolet** Silverado hybrid pickups, which start production in 2003 for fleet customers and retail consumers in 2004. The trucks will be able to haul and tow as much as its gasoline-only counterpart while getting 10-12% better fuel economy, with the added benefits of being able to power tools at a construction site or run appliances at a campground. Based on the GMT-800 full-size pickup, the hybrid truck features a 5.3-L Vortec V8 engine and, instead of a conventional starter motor and alternator, a compact electric motor integrated in a patented, space-efficient manner between the engine and transmission. The electric motor provides starting power and the ability to generate up to 14 kW of continuous electric power, which can be stored in a 42-V lead/acid battery pack, used to support onboard electric accessories or employed to operate power tools or other appliances by a pair of ac outlets in the cab and bed. Total available power output is 110 V at 20 A.

The advanced hybrid system in the Saturn VUE combines a four-cylinder engine with twin electric motors for fuel economy gains of up to 50%, improved 0-60 mph (0-97 km/h) and 50-70 mph (80-112 km/h) performance, and a Super Ultra Low Emissions Vehicle (SULEV) rating. The 125 hp (93 kW) of the 2.0-L Ecotec engine is augmented by two 20-kW electric motors for the transverse, front-wheel-drive application. GM says the system's adaptability makes it suitable for a range of future vehicle applications. Production of the hybrid VUE begins in 2005.

The company's "value-focused" belt alternator starter (BAS) hybrid system in the 2006 Equinox is a simple solution to making hybrid-electric powertrain technology available to more types of cars, trucks, and sport utility vehicles. GM engineers developed the BAS for improved fuel economy in stop-and-go driving by shutting the engine off at idle and by enabling early fuel cutoff during deceleration. The system combines sophisticated engine controls with GM's VTi variable transmission, an electric motor/generator, regenerative braking, and efficient charging. Estimated EPA composite fuel economy savings range from 12 to 15%.

Patrick Ponticel and Kevin Jost



Neil Schilke says technologies such as those associated with hybrid vehicles constitute a bridge that will enable GM to realize its long-term vision for fuel-cell vehicles.

XC90 Engineering Highlights

- First rollover protection system with integrated gyro sensor
- First inflatable safety curtain for all three seat rows
- First seatbelt pretensioners for all three seat rows
- First integrated sliding child booster seat
- First automotive Dolby 5.1 Pro Logic II surround sound stereo system
- Three seat rows in a 189-in (4.8-m) vehicle length
- Third-row seating above rear axle for additional rear crush space
- Boron steel B-pillar and roof structure
- Front subframe for car compatibility
- Whiplash protection system on both first and second rows of seats
- Intake and exhaust variable valve timing for gasoline-engine emissions and fuel economy
- Electronic AWD with compact coupling and integrated control
- Interior air quality sensor and hypo-allergenic materials
- Premair "ozone eater" radiator



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Dear Friends:

The State of Michigan welcomes you to this year's Society of Automotive Engineers (SAE) 2003 World Congress. Detroit, Michigan, the automotive capital of the world, is home to 85 percent of all vehicle-related activity with \$13.5 billion spent annually on vehicle manufacturing, supplier production, and research and development. Because such a large percentage of SAE's worldwide membership calls the Detroit Chapter "home," Southeast Michigan is the perfect choice to host the world's premiere automotive technology showcase.

This year's Congress will focus on five core areas of technology: advanced electronics, lightweight materials, advanced propulsion and powertrain, safety and testing, and advanced materials. Already, the modern automobile is the most technologically advanced, mass-produced product in the world. In America and around the world, automobiles in all shapes and forms drive or support nearly every aspect of our modern life and economy. Your five-pronged focus at this year's World Congress will drive the importance of the automotive industry even further forward.

As the automotive industry accelerates toward a more complex business model, the alliances formed between OEMs and suppliers will become even more critical. Nowhere are these alliances more apparent than here in Michigan. Southeast Michigan has the greatest concentration of automotive R&D, technical centers, major suppliers, and OEM parts and assembly plants in the world. Every year, and from every point on the globe, the SAE World Congress pulls together the vast universe of automotive engineers under one roof. It's an honor to host all of you under one roof here, in Michigan.

On behalf of the citizens of Michigan, my warmest wishes for a productive and valuable gathering. I welcome each of you to our spectacular Great Lakes state and to our largest city. Enjoy your stay - we'll anxiously await the exciting new technologies you'll no doubt dream up while you're here.

Sincerely,

Jennifer M. Granholm
Governor

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Technology for technicians

The **Service Technicians Society (STS)**, an affiliate of **SAE International**, will again stage activities at the SAE World Congress with its STS Conference-within-a-Conference taking place today at

1:00 pm in Room W1-51. The conference includes several panel sessions that will focus on areas of interest to service and engineering professionals and include new technologies, linking service

and engineering, and education. The session topics include:

- On-Board Diagnostics (OBDII)—Since the introduction of second-generation onboard diagnostics in the 1996 model year, there has

been a continued refinement of these passenger car and light-duty truck systems. The next phase of OBDII moves it into scan tool emissions tests. The session will cover service challenges, as

well as problems and successes with state emissions inspection programs that incorporate OBDII testing. The organizer of the discussion, which is scheduled for 1-2 pm, is Jerry "G" Truglia of **Automotive Technician Training Services**.

- The Future of Automotive A/C Service—OEMs are changing air-conditioning systems again. How



will it impact the service departments? What will be the needed tools, equipment, and knowledge in the very near future? This session will take place from 2-2:30 pm and will cover CO₂, hydrocarbons, and electric and hybrid systems. It is presented with the cooperation of the SAE Interior Climate Control Standards Committee, and the organizer is Phil Trigiani of **UView Ultraviolet Systems**.

- Educating Future Engineers and Technicians—Technology advances in vehicles are dependent on future engineers and technicians. The current education system is straining to accommodate changes in student learning. This session, scheduled for 2:30-3:30 pm, will focus on current limitations in education and potential solutions for the future. The organizer of the panel is Robert Pattengale, STS President, and planned panelists include Jean Hart, **GM Training**; El Huntington, **Metric-e**; Kathleen O'Connor-Byrnes, SAE, *A World in Motion*; Ro Schilke, Ferndale Public Schools; and Ron Watkins, **Sigma Interactive**.

VTTi OBDCoast/Balboa Instruments is sponsoring the STS Conference-within-a-Conference.

Ryan Gehm

AEI Tech 2003 Awards

Each day, Show Daily editors highlight some of the top products and technologies on display at the SAE 2003 World Congress.

Metal extrusion

Textron Fastening Systems' metal extrusion system combines stamping, deep drawing, and cold forming to produce complex, fully integrated, and durable automotive components. The system integrates all parts into one engineered system that increases joint strength and process efficiency. Fasteners become part of a single component, eliminating the need for weld nuts, stamp-in nuts, and self-piercing nuts. The system



more than doubles the thickness of walls of base metals, allowing applications with high stress loads

such as suspension systems, drivetrains, and seatbelt anchors. No heat treatments are required to strengthen the metal. A 2000-ton stamping press is equipped with computerized controls that adjust instantly to 100 different component designs. One component is complete with each stroke of the machine, which has a capacity of five million parts per year. Booth 2938

Optical sensing

Automotive Technologies International Inc.'s optical occupant-sensing system, shown here, has numerous motor vehicle applications. For "smart" airbag applications, optical sensing, in combination with neural network pattern recognition technology, can estimate occupant height and size and adjust the amount of gas fed into the airbag and/or the size of the vents, which control the outflow

of gas from the airbag. In the event of an accident, it can provide emergency service personnel information about accident severity. The distribution of heat and air-conditioning can be controlled automatically if seat occupancy is known, and acoustic engineers can use seat-occupancy information to improve sound quality from the entertainment system. Other applications include mirror

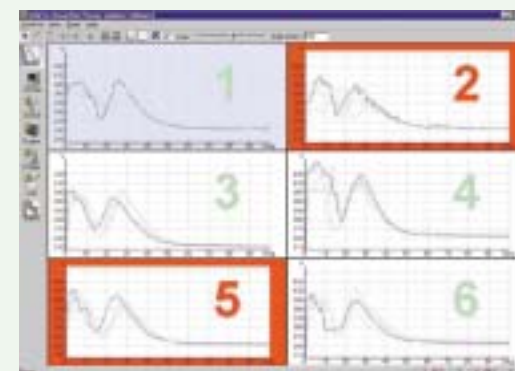


adjustment, selective darkening of mirrors and windshield, drowsy-driver or driver-distraction detection, and driver identity. Booth 1939

Ignition system

Adrenaline

Research Inc.'s SmartFire Ignition System has knock calibration capability. According to the company, it is the only ionization-based dynamometer instrumentation tool commercially available



today. The system provides direct knock calibration without the time and expense of modifying the cylinder for pressure sensors. Cylinder pressure sensing requires water-cooled sensors that are both expensive and require intricate machining to install. Using ordinary spark plugs and specially designed pencil coils, the system can detect knock directly from the combustion process. The individual cylinder timing control, accessible through the WinFire PC interface, means that the dyno operator can complete a knock calibration accurately in a matter of hours. The WinFire PC interface allows for easy setup on any engine from one to 12 cylinders. SmartFire's individual cylinder approach allows engineers to better understand the variability and sensitivity to knock-limited timing, thus allowing for power increases while ensuring engine reliability and durability.

Booth 1715

High-speed cameras

Photron's ultima 512 and ultima APX high-speed cameras use two new and totally different CMOS sensors to answer different issues currently being experienced in sled and barrier testing. Both cameras are tested to withstand 100 g for 10 ms

and use a remote head configuration with the 16-ft (5-m) cable, permitting the lightweight compact camera head easy access to remote locations. Camera systems can be easily upgraded to incorporate new or different communication cards

such as FireWire or Ethernet, as well as other functionality unique to the individual companies using them. Both the 512 and APX incorporate enhanced functionality with features such as over-exposure protection that enables users to set exposure

limits for all pixels; dual-speed recording, allowing the change of a recording speed during image capture; 10 "GoTo" event markers for immediate access to key points of interest; and partitionable memory to enable multiple (up to

64) recordings to be made before needing to download stored images. The system provides live video output (color or monochrome) at all times, multiple record modes, and rugged and reliable design and engineering. The ultima 512 offers 512 x 512 pixel operation to 2000 frames/s and reduced resolution operation up to 32,000 frames/s. The ultima APX uses a 1024 x 1024 pixel sensor at full resolution up to 2000 frames/s, and as fast as 120,000 frames/s by reducing the resolution.

Booth 316

Electric thermostat

INZI Controls' Adjustable Electric Thermostat (AET) provides new ways of optimizing vehicle coolant temperature control systems in all engine operating conditions, reducing engine friction pressures and improving the reaction



kinetics in the combustion chambers. The results are seen in benefits including a reduction in fuel consumption of 2-3% based on FTP 75; a reduction of emissions (HC by 15% and CO by 4%, also based on FTP 75); increased engine power by 8%; improved interior heater performance; and improved engine durability. The AET operation is based on an increase in coolant temperature and the use of an integral electric motor in the thermostat, controlled by the engine control unit. By controlling the electric motor, the volume of the wax element is changed, achieving new dilatation functions. In the unit, the wax element is fixed in the thermostat housing. Consequently, the AET does not move and the same thermal dynamic and flow dynamic exist in all engine conditions. This characteristic is important for coolant temperature control accuracy and functional safety. The device needs the same package area as conventional thermostats, can be used in both inlet and outlet temperature control systems, and is suitable for both gasoline and diesel engines.

Booth 2918

What's New from the exhibitors

The SAE 2003 World Congress provides industry suppliers the opportunity to showcase their products, services, and technologies to the global automotive community. Show Daily editors review what some exhibiting companies are displaying this year.

CFD software

CFX-5.5.1 from **Computational Fluid Dynamics** Software and Services provides significant new capabilities. The addition of stage and transient rotor/stator models for multiple frames of reference enables the investigation of various rotating machinery component interactions.



This ranges from the efficient analysis of multi-stage gas compressors using one blade row per component with the stage interface, to full dynamic machines simulated using the transient rotor/stator option. In multiphase, the number of phases in an analysis is unlimited, so that fluidized beds and particle separators with multiple particle sizes can be simulated. A surface tension model is also available for free surface flow calculations. This capability is expanded to include a bulk energy equation, low-speed variable density, fluid-specific additional variables, and fluid-specific multi-component fluids. These extend the applicability of free surface models to include mold filling and contaminant dispersion.

Booth 453

Analyzer tool

Dearborn Group Inc.'s Hercules is a high-performance analyzer tool that supports CAN and LIN



protocols, in addition to supporting single-wire CAN (J2411) and CAN (ISO 11898). The latest version of the software application tool features graphical display of signals, ISO 15765 full support, decoding of CAN ID (user specified), CAN remote frame support, and improved database structure. Using this 32-bit Windows-based application in conjunction with the firm's Gryphon hardware interface, users can monitor, receive, filter, transmit, and edit CAN frames over a variety of communication links.

Booth 1747

Powertrain study

"The Future of Heavy Duty Powertrains," a study by the **Global Automotive Group** is a follow-up to the study of light-duty on-highway powertrain technologies. This study of on- and off-highway engines from 100 to 750 hp (75 to 560 kW) assesses the prospects for the diesel and its competitors in mobile applications. It takes a look at the factors that are forcing the diesel to evolve, what powertrain performance objectives can be met within the 2020

time frame, the likely future viability of alternative sources of power as they attempt to gain market share, and the likelihood that alternative means of transport will be able to compete with on-highway trucks for the movement of most of the goods needed for economic vitality.

Booth 1574

Tactile pressure measurement

The I-Scan system from **Tekscan** uses thin-film array sensors for pressure distribution measurement. The system includes software, a data-acquisition handle that performs analog to digital conversion, and an interface that brings the data into



the computer. The array sensors are available in various sizes and shapes for different applications, and have pressure ranges from 5 psi (34 kPa) to 30,000 psi (207 MPa). Automotive applications include wiper blades, brakes, airbags, tire beads, tire footprints, gaskets, fuel cells, seating, crash studies, catalytic converters, and door seals. I-Scan System for Brakes uses sensors that are inserted between the friction pad and brake rotor or clutch plate to indicate the evolution of pressure distribution between these mating surfaces as they come together. I-Scan System for Fuel Cells allows users to ensure good contact between adjacent thin fuel-cell plates.

Booth 741

Calibration board

Messring's Type NA33-86-00 calibration board provides static and dynamic calibration of any data-acquisition system. The calibration procedure is freely programmable and fully automatic. It runs with CrashSoft 3 under Windows NT. Eight analog channels as well as 16 digital channels can be calibrated simultaneously. The system generates arbitrary signal waveforms including sine, triangle, and pulse with 0 to 10 kHz and 0 to ± 5 V or 0 to ± 0.05 V at 16-bit resolution. It is a plug-in board for the NA33 data-acquisition system.

Booth 445



Wheel torque transducer

The Model WFT-6 wireless wheel torque transducer from **Soltec Corp.** measures six components simultaneously with real-time data output. Designed for public and off-road automotive testing, it operates



without slip rings and protruding portions, allowing the wheel to look and function normally. The transducer uses a thin, lightweight sensor mounted directly onto the wheel rim along with an angle detector to acquire data for three orthogonal axis forces and three moment forces around each axis. Data sampled at rates up to 1 kHz are transferred via a wireless PCM telemetry transmitter to an on-vehicle data-acquisition processor that performs functions including editing data, reproducing data, histogram analysis, arithmetic calculations, and statistical processing. A large-capacity memory allows the system to collect data over a long period of time (2 hours/wheel).

Booth 343

Condenser microphones

Series 130 microphones are prepolarized, array, and precision condenser microphones from the Vibration Div. of **PCB**

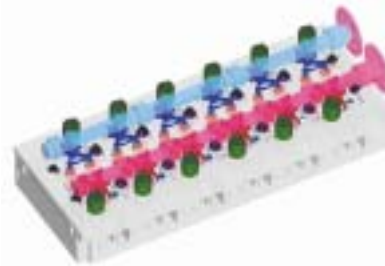


Piezotronics. Prepolarized pressure and free-field units are available in both 0.25 in (6 mm) and 0.5 in (13 mm) sizes. Prepolarized random incidence models are available in a 0.5 in (13 mm) size. The firm's prepolarized microphones operate from ICP sensor power and are designed for applications including sound power testing, engine noise, outdoor noise monitoring, and acoustic chamber testing. Series 130 array microphones will function with any ICP sensor power supply for large-channel-count sound pressure measurements. A system can be assembled using the 130 Series microphones with a multi-channel, simultaneous sound pressure data-acquisition system consisting of 16 or more channels. The external free-field microphones have low sensitivity to severe humidity and temperature conditions.

Booth 901

Variable valve actuation

Version 2.2 variable valve actuation from **Jacobs Vehicle Systems** is an integrated design using parts contained in the cylinder head instead of a separate housing. By electro-hydraulically using lost motion to



modify valve lift, timing, and rate of opening and/or closing, engines will realize many benefits including increased fuel economy, lower emissions, and higher performance. Just as fuel injection systems have evolved from mechanical to electronic controls, engine valvetrains will follow this trend over the next 5 to 10 years, and the company is ready to provide innovative solutions.

Booth 1338

LEDs

The Luxeon LED from **Lumileds Lighting** is available in all colors and in three different radiation patterns. It is claimed to offer the highest flux per LED family in the world. It is a reliable, life-of-vehicle light source that is



suitable for any automotive lighting application, including forward lighting. The firm's Luxeon V LED offers up to 120 lumens per LED and up to 60 times the output of competitive devices. A white Luxeon 5-W produces 120 lumens; green, cyan, blue, and royal blue Luxeon 5-W packages deliver luminous output ranging from 30 lumens for blue to 120 lumens for green and cyan.

Booth 2268

What's New from the exhibitors

Climate chamber

The Micro Climate test chamber from **Cincinnati Sub-Zero** is a stackable 1.2-ft³ (34-L) benchtop chamber used for testing small components and products. Each



chamber simulates a range of temperature conditions from -73 to +190°C (-99 to +374°F). Standard features consist of a programmable controller, RS-232 computer interface, and a 2-in access port. Benefits include a small footprint for floor space savings, easy installation with no special electrical connections required, and ability to run on a standard 115-V and 15-A circuit.
Booth 811

Battery monitoring

Midtronics' inGEN EV is an engineering evaluation unit of the inGEN platform. It provides vehicle and electrical system designers an ability to view and assess the advanced features of inGEN technology on any 14-V lead-acid automotive battery.



These features include continuous voltage, current, temperature, and conductance measurements that enable real-time state-of-charge and state-of-health diagnostics to provide advanced warning of battery problems. The diagnostics can also enable deliverable energy, charge acceptance, and state-of-life calculations for advanced electrical and charging systems in 14-, 24-, 42-V, or EV/HEV applications. InGEN technology can also be used to optimize the charging system and prioritize electric loads, providing improvements in fuel economy, customer satisfaction, and system costs.
Booth 2115

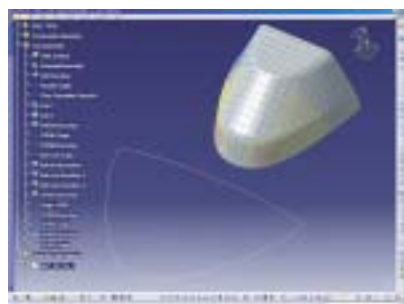
Engine design and optimization

Automated Design with Virtual Engines from **Optimum Power Technology** takes the established engine simulation technology of Virtual Engines and combines it with advanced optimization methods and parallel processing to create an expert system for engine design. OEMs, Tier 1s, and motorsports teams using the product will achieve better engine designs faster and increase their competitive advantage, according to the firm. The process begins as a base engine model is created. Then, an engineer

selects which parts of the engine can be changed in the search for improved performance. Running simulations in parallel, Automated Design creates new engines and compares the solutions. It uses built-in intelligence to assess which direction to move within the design space to create a better engine. Many engines can be evaluated automatically using the system.
Booth 1618

Composite part development

VISTAGY, Inc.'s FiberSIM 4.0 software, which creates a specialized CAD-integrated environment for designing and manufacturing composite parts, is available for the CATIA V5 platform. FiberSIM tools automate the design process, assess the producibility of a composite part, and generate manufacturing information including documentation, flat patterns, and data to interface with laser projectors, automated cutters, and fiber placement machines. It allows users to drive all aspects of preliminary design, analysis, detailed design, and manufacturing from within a single CAD master model, providing a complete digital product definition of a composite part. The software incorporates XML tools to share composite data with other applications throughout the enterprise, such as software for procurement, quality assurance, and manufacturing. This latest release has a new user interface with the look and feel of **Microsoft** Windows on PCs and Motif on UNIX systems.



Booth 2218

Pedestrian impact testing

Aries Ingenieria Y Sistemas, S.A.'s P-1N is a flexible system for performing pedestrian impact testing in accordance with test protocols by EEVC WG17 and EuroNCAP. The impact form is launched at free flight.

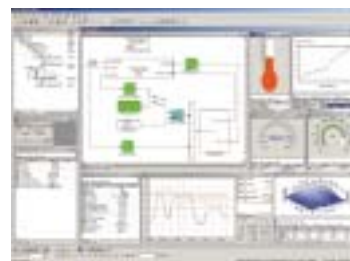


The complete pre-test sequence considers the type of impact form, impact form mass, launch angle, impact angle, local angle of impact location, impact speed, and free flight distance. The system can launch the impact forms at angles between -5 and +90°, and between 300 and 2300 mm (12 and 90 in) in the vertical position and ±1000 mm (39 in) in the x- and y-axis directions. When launching the headforms, care is taken to the target location geometric and underlying structure to determine the point of first impact.

Booth 436

Powertrain development

Accurate Technologies Inc. (ATI) and **The MathWorks** have partnered to develop a powerful rapid-prototyping and calibration capability for powertrain design. Vision-RP provides an integrated tool for rapid prototyping and calibration, allowing users to acquire data from electronic control unit (ECU) software and Simulink diagrams simultaneously using the same Vision graphical user interface. By configuring xPC TargetBox, the MathWorks industrial PC hardware system for rapid prototyping of embedded control systems, with the Vision-RP universal vehicle/ECU calibration and data-acquisition system, powertrain engineers are provided with seamless integration between the calibration and rapid prototyping capabilities. Thus, engineers can calibrate and acquire data from base ECU software, ECU strategy data items, and Simulink bypass models, while the control system is running in real time. A high-speed ATI communications I/O card within xPC TargetBox provides various target ECU connections using standard ATI hardware.



Booth 3047

Vision guidance

Braintech, Inc.'s eVF is designed for developing, operating, and supporting vision-guided robotics that perform complex assembly operations. Working closely with **Ford's** Advanced Manufacturing Technology Department, the firm has successfully deployed robots guided by eVF vision software to perform complex and precise engine assembly tasks such as loading/unloading engines from dunnage bins and engine head decking (shown). These deployments resulted in significant gains in quality of assembly and equally significant reductions in labor-related injuries by removing workers from dangerous and injury-prone operations and relocating them to other positions.



Booth 2172

High-speed imaging

The Phantom v7.0 from **Vision Research**, Inc. is built upon the firm's proven SR-CMOS high-speed sensor technology. It offers a full frame resolution of 800 x 600 pixels with image quality that is comparable with pin-registered

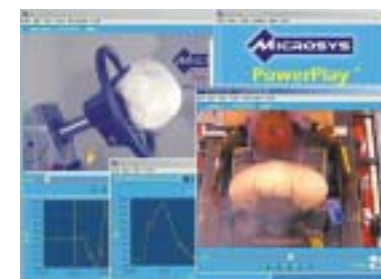


16- and 35-mm film cameras. High recording speeds make it the first true digital replacement option for 16-mm rotating prism film cameras. Recording rate is 4800 pps at full resolution, and over 10,000 pps when windowed to 512 x 384 pixels. The unit is small and rugged; it is equally suited to onboard vehicle crash tests, fixed camera positions, or troubleshooting manufacturing problems on the production floor. A real-time streaming output option enables transfer of image data to an external storage system for extended recording times. Software provides camera control and playback functions, on-site image analysis, and compatibility with previous camera models.

Booth 523

Analysis toolkit

PowerPlay Version 5 from **Microsys Technologies** is a data analysis toolkit used in analyzing airbag deployments and high-g



sled data. In addition to the standard Microsys TST test format, the following file types may be opened: TIF/TIFF, BYR, BMP, JPG, GIF, and AVI. The displayed image may be sharpened or softened to improve its appearance. Other features include an enhanced linear measurement function, AVI creation flexibility, and greater zoom capability.

Booth 340

What's New from the exhibitors

Sound/vibration analyzer

Brüel & Kjær's

Pulse Lite is a low-cost, entry-level sound and vibration

analyzer that comes in three different models: two-channel basic FFT analysis,

four-channel basic FFT analysis, and two-channel CPB analysis. The Basic FFT Analysis packages can perform FFT analysis (up to 6400 lines), impact testing, correlation analysis, and waterfall capability for transient analysis. The Basic CPB Analysis package measures true, real-time 1/1 or 1/3 octave bands (to all ANSI, IEC, and DIN standards), calculates overall Zwicker Loudness, and also includes a waterfall capability. Both FFT and CPB packages include the Spectra View capability, which allows the user to measure the overall level vs. time and in real-time show the spectrum (either FFT or CPB) at any instance in time. Users can upgrade easily from Pulse Lite to Pulse Pro. Booth 433



Auxiliary power unit

The U.S. Army TACOM **National Automotive Center** is showcasing an auxiliary power unit (APU) that uses fuel cells to generate power for a class 8 truck, in addition to 42-V electrical systems, and an omnidirectional inspection system (ODIS) robot for homeland security. The NAC, with partners **Ballard** Power Systems, **Freightliner**, and the **University of Alabama**, has developed a prototype heavy-duty truck APU

for onboard electronics and appliances. The APU produces 5 kW of electricity with an onboard power-management system that delivers electricity to the truck's system, and can export electricity off the vehicle as standard household power. The current APU requires a mixture of methanol and water as fuel; future systems will run on common commercial or military fuels such as diesel or JP-8.

Booths 627 and 1301

Amplifiers

Amplifier Research previously introduced a Class A, VSWR-tolerant amplifier with a frequency range of 100 kHz to 250 MHz. The Model 10000A250



delivers 10,000 W with the increased longevity and reliability only available with solid-state construction. The company has produced a modified version of the device with a frequency range of 100 kHz to 100 MHz. This unit has been delivered, installed, and is operating successfully at **General Motors**. GM technicians are said to be pleased with how quietly the device runs, since it dissipates up to 40 kW (54 hp) of primary power in its quiescent state. Booth 2527

stop by booth 600
to see our latest technologies

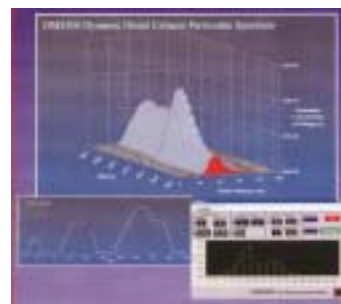


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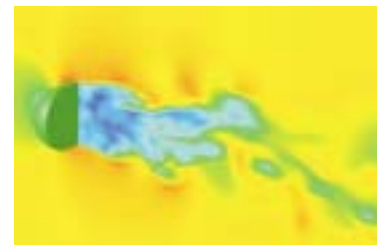
Particulate spectrometer

The DMS500 fast-response instrument from **Cambustion** Ltd. is designed to yield particle size information and is based on the principle of electrical mobility classification. The unit can measure particles in a single size range of 5 to 1000 nm (0.2 to 39 µm) with a 10-90% response time of 200 ms; it may be used for transient particle size measurement on existing CVS dilution systems and drive cycles. Identification of nucleation mode (liquid-based) and accumulation mode (solid) particles can be discerned with information useful for diesel particle filter size calculation and optimization of other engine control parameters.
Booth 649



CFD simulation

Fluent Inc.'s Fluent 6.1 computational fluid dynamics software expands the automotive applications for CFD simulation. It offers dynamic mesh technology, bringing new modeling capabilities for an array of applications



including fuel injectors, IC engine modeling, and valves. Other enhancements include efficiency gains in the surface-to-surface radiation model and inclusion of a volumetric macro-based heat exchanger model, expanding the applicability of CFD for underhood thermal management analysis. It offers dynamic coupling with WAVE—in addition to GT-Power, a new cavitation model—a crevice model and a spray-wall interaction model for IC engine simulations, and a built-in capability to compute discrete Fourier transforms of time series data.
Booth 2517

FPGA programming

National Instruments' LabView FPGA Pioneer System is an integrated development system that extends the graphical development environment to field programmable gate arrays. Measurement and control engineers now can use LabView to create custom applications that run on NI FPGA-based reconfigurable I/O hardware. Engineers can define their own chip-level hardware for a wide spectrum of measurement and control applications. LabView integrates reconfigurable hardware logic with data acquisition and analysis, image acquisition, and motion control. By defining I/O and measurement functionality with LabView and running applications in hardware, engineers can make custom measurements and take advantage of onboard processing. They can build custom discrete and analog control applications for manufacturing and scientific research such as dynamometer or motor speed control, simulation applications for development of electronic control units, and other applications requiring tight timing and control.
Booth 927



Engine downsizing

Downsizing is a major way to improve the fuel-consumption levels of spark-ignited engines while maintaining the advantage of low-emissions capability of the three-way catalytic system. The **IFP** downsizing approach with turbocharged applications is mainly fuel-economy-oriented due to innovative, dedicated solutions. For example, IFP has realized a prototype engine on a 1.8-L, turbocharged, 4-cylinder, direct-injection gasoline engine concept. The engine allowed engineers to take advantage of the high knocking limit of this approach to replace a 3.0-L naturally aspirated engine and thus to have a fuel consumption benefit of more than 15% with at least the same acceleration performance. At full load, the specific fuel consumption is less than 300 g/kW·h (0.5 lb/hp·h) over the entire engine speed range with a BMEP of 20 bar (2000 kPa) below 1500 rpm and a power density of 82.5 kW/L (110 hp/L) with a fixed compression ratio over 10.
Booth 1731



Brake pad attachment

Feintool's FeinGrip brake pad attachment system meets the highest OEM specs for strength and dimensional tolerances, as well as aftermarket needs for affordability and quick manufac-



ture. The system's steel brake plate features an array of integral, precisely angled teeth that lock pad to plate when friction material is molded and cured around the teeth. The system provides inside/outside ear-to-ear tolerance of ±0.03 mm (0.001 in), flatness of 0.02/25 mm (0.0008/1 in), edge perpendicularity of 0.05 mm (0.002 in), and consistent tooth height. It is available in OEM and aftermarket versions.
Booth 643

What's New
from the exhibitors**Engine pressure sensor**

Kistler's 6052B engine pressure sensor offers a high performance level for R&D measurement applications. Compensation for passive acceleration effects is among the latest refinements for this miniature piezoelectric sensor. This advancement enables accurate data from high-revving and high-performance engines when high vibratory test sequences are encountered. Other advances include a modified diaphragm that reduces thermal shock. A special cut of the crystal element improves sensitivity. The sensor may be used in temperatures to 400°C (750°F) and yet displays minimal thermal sensitivity shift.

Booth 407

**Light-measurement tools**

Labsphere provides measurement systems to the lamp and lighting industries with products to simplify light-measurement requirements. The firm continues to broaden its product scope with the introduction of the OPTRONIK series of goniophotometers, which are designed to serve the needs of the automotive industry with a large range of motion and fast index speeds. The OptoCAN-Bus technology allows users to network these systems easily and quickly transmit data. The line of goniophotometers starts with the compact SMS-10μ, with two rotational axes, suitable for testing indicator lamps and LEDs. At the other end of the line is the SMS-10h system incorporating two rotational stages and three translational axes. All OPTRONIK systems include an integrated laser for optical alignment and powerful OPTO software for fast, simple measurements. There are five goniometric measurement systems from which to choose, each of which can be configured to specific needs.

Booth 454

**Road load**

At the **Institute of Internal Combustion Engines and Vehicle Engineering (IVK)** of the **University of Stuttgart**, the systematic split-up of the road load into its components is investigated theoretically and by measurements. Besides test bench



measurements, the determination of the single parts of the road load in track tests is important. A special testing method for track tests was developed at IVK. It is based on driving torque measurements to determine the total road load in combination with rolling resistance measurements, performed with a rolling-resistance measurement trailer, designed and built at IVK. In addition, road load components such as ventilation losses or friction in wheel bearings and brakes are determined in test-stand measurements. Using this method, the track tests can be performed under a steady-state condition that is comparable to the condition of test-stand measurements. The rolling-resistance measurement trailer offers the chance to investigate the rolling resistance of a tire under real driving conditions on real road surfaces. The wheel alignment parameters for a special vehicle can be reproduced, and the effect of changing parameters can be investigated on the road.

Booth 2246

Refrigerant circuit

The Mobile R744 (CO₂) refrigerant circuit from **Imtech Deutschland's** Environmental Simulation/Test Bed



Engineering Division is equipped with safety measures for high-pressure systems. The compact system is built as a mobile, low-noise unit for comfortable operation in laboratory environments. A separate stand-alone brine supply module supplies the gas cooler. The following control loops are integrated: R744 (CO₂) compressor speed control, gas cooler outlet temperature, suction temperature, suction pressure, and expansion valve intake pressure.

Booth 537

Helium leak detector

MKS Instruments, Inc. has developed two portable helium leak detectors: the battery-operated PICO Sniffer and the PICO Vacuum. With a mass of only 17 lb (7.7 kg), the units are easily transported to industrial work settings. The Sniffer has a sensitivity of 1×10^{-7} atm cc/s and can operate up to 3 hr before recharging. The Vacuum leak detector detects helium leak rates as low as 1×10^{-10} atm cc/s. It includes a robust

Booth 2710



CAM software

FARO Technologies' CAM2 Measure version 3.9 supports both the Platinum FaroArm and the FARO Laser Tracker. It introduces a dynamic measurement environment where the software accommodates any change the user makes, such as taking additional points on a feature or modifying the alignment, by recalculating the entire measurement job automatically. The operators can consider multiple fitting-and-analysis scenarios, or correct an error, without having to re-measure the whole job. The part-analysis options for the user are updated and expanded. The system adds deviation "whiskers" on every measured point that differs from the exact part specification. It shows not only where the problem is, but also indicates how far out of tolerance the feature is.

Booth 3013

Chassis dynamometer

The LABECO division of **Renk Corp.** has completed a flexible chassis dynamometer system for medium- and heavy-duty trucks, supplied to the **Environmental Protection Agency** for use at its facility in Research Triangle Park, NC. The test system will be used to develop emissions standards and specific test procedures for medium- and heavy-duty trucks scheduled to be introduced in 2007, with a gradual phase-in to be completed by 2010. In addition to the new emissions standards, lower-sulfur-content fuels are scheduled to be required beginning in June 2006, with a gradual phase-in to be completed by 2009. Key criteria for the chassis dynamometer included capacity to test a wide range of trucks, within a simulated inertial range of 5000 to 80,000 lb. Additionally, the capability to apply a variable load to the fifth wheel from 1000 to 40,000 lb was required. The dynamometer was designed to fit within the existing structure at the facility, attaching to steel beams.



Engine torque simulation

A dynamometer system from **Schenck Pegasus** enables virtual engine realization in powertrain and FEAD (front-end accessory devices) testing. The company has taken a proven set of math models of the combustion process and developed software that runs in real time with any change in input speed or simulated throttle position. An adaptive, closed-loop (with measured feedback), real-time controller takes the calculated torque demand that produces the IC engine torque signature and realizes it at the shaft of an ac dynamometer within a few shaft revolutions. Closed-loop control on dynamic torque assures accurate, repeatable, and reliable reproduction of torque in a wide range of frequencies. By delivering the Engine Torque Pulse from a Simulation (ETPS) of a combustion engine, the firm has realized the virtual engine in the laboratory.



Vehicle component simulator

Southwest Research Institute (SwRI) engineers have developed a test apparatus capable of simulating vehicle powertrain operations in the laboratory. The apparatus uses hardware-in-the-loop technology and a software-controlled simulator to determine how a powertrain or related component would perform if it were integrated into a vehicle.

The engineers designed and constructed a test system that simulates the operation of a transmission under a wide range of real-world conditions. (The image shows a portable cold box being used to test a transmission under low-temperature conditions and varying grade angles.) Similar test systems can be developed to test engines, electric motors, hybrid-vehicle battery packs, and other equipment under a variety of road and environmental conditions. Using the RAPTOR VSM powertrain simulation software, researchers can perform numerous driving cycles to simulate driving conditions and eliminate some fleet testing. The apparatus can simulate stop-and-go traffic, roll and grade angle, heat rejection, aerodynamic drag, varying temperatures, and other parameters.

Booth 2227



Exhaust measurement

AVL North America's DVE-150 direct vehicle exhaust measurement device completes an AVL-developed system for the collection and analysis of exhaust emissions, particularly in



ultra-low- and super ultra-low-emitting vehicles. Along with the AVL BMD-150 Bag Mini Diluter and the GEM-150 control software, the unit provides an accurate analysis of the mass flow rate of exhaust emissions. This compact device can be seamlessly integrated into the BMD system, in a footprint 70-80% smaller than a traditional CVS (constant volume sampler) system. The U.S. **EPA** and the **CARB** have recommended the use of BMD sampling systems for future low-emissions measurements.

Booth 701

Electric linear actuator

The RE-1266 linear actuator from **REAC AB** (an **Opcon Group** company) replaces the traditional cables used for tasks such as sterndrive and throttle operations. The unit is specially designed for drive-by-wire applications with high



requirements on speed and accuracy. It forms an intrinsic part of the automatic control system, and it can be automatically positioned to within ± 0.1 mm (0.004 in). The actuator is designed in a modular fashion so that it can fit most customers' requirements. It is entirely made from anodized aluminium and stainless steel. An efficient dc motor drives the spindle. This transforms the rotary movement into a linear motion via a nut. The result is low noise and a long life expectancy due to the durable, low-friction material. The actuator has a max force of 700 N (157 lb), combined with a maximum speed of 100 mm/s (3.9 in/s). Strokes can be selected in the range between 50 mm (2 in) and 250 mm (9.8 in). Power supply is either 12 or 24 V dc.

Booth 2626

Headlamp adhesive

Köramelt 107 headlamp adhesive from **ADCO Products**, Inc. is a hot melt moisture cure product that provides a wide adhesion spectrum, high strength values, and low application temperatures. The material offers rapid green strength



development that enables customers to remove work-in-process capital, free up plant space, and deliver a more reliable pressure-tested product to the market. Available in cartridges, pails, or drums, the adhesive is easily applied using a variety of processing equipment. Booth 2341

Multi-technology simulation

Ansoft Corp.'s SIMPLORER 6.0 simulation software for the digital prototyping of multi-technology



systems is used by engineers at **GM** to design power electronics and drive systems for electric and hybrid-electric vehicles. The software is built on a powerful co-simulation technology, which enables engineers to model systems comprised of analog, digital, mixed-signal electronics, mechanics, hydraulics, controls, and other technologies accurately without having to choose between proprietary modeling languages. The package allows all of these technologies to operate simultaneously, delivering expanded power and flexibility for virtually simulating complex systems. VHDL-AMS is the IEEE standard modeling language for analog mixed-signal design. The software allows the language to be mixed freely with its other modeling languages (circuits, state machines, and block diagrams), creating a flexible design environment. Other features include a hydraulics library with models for powertrain and other hydraulic applications, and an automotive library with models for extensive electrical system analysis including battery and fuel-cell models. Booth 2121

2003 SAE Annual Business Meeting notice

The Annual Business Meeting of the members of SAE will be held today from 1:30-1:45 p.m. in the Technology Theater. During the meeting, 2002 SAE President S.M. Shahed will deliver the Presidential address, the election of the 2003 Board of Directors will be announced, and the SAE Annual Report will be presented.

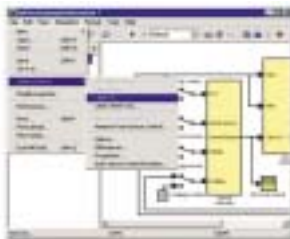
More information regarding this meeting is available in the SAE 2003 World Congress Final Program.

Simulation speeds ECU development

Sophisticated electronic control unit (ECU) systems are required to achieve optimal performance in electric vehicles, especially in the areas of charge management and climate control. The Automotive Group of **Motorola** (Booth 3139) recently developed an ECU that controls and manages the heart of an electric vehicle: the battery.

The team concluded that they would have been unable to meet the project delivery dates if they had used traditional methods of paper designs and hand coding instead of using Simulink and Real-Time Workshop Embedded Coder from **The Mathworks** (Booth1814). They were confident during development that the final product would meet the customer's specifications because of the ability to simulate the performance early on.

The vast majority of feature tests were performed in the simulation environment well before the embedded code was generated. If requirements or design defects were discovered during system testing, the conditions from the test bench could be quickly recreated in the simulation environment using log files from the test environment as inputs to the Simulink models.



Motorola used the Mathworks Source Control Interface for configuration management in the development of an electric vehicle battery ECU.

The Motorola team is now interested in implementing system tests using other MathWorks products, including xPC Target and xPC TargetBox, for future automation of system validation and software bench tests. xPC Target allows a Simulink and Stateflow model to drive outputs on an external PC that can then be fed into the ECU system, simulating the effect of actual system inputs in real time. This would provide a more complete model-based design, implementation, calibration, and test environment throughout the full ECU development cycle.

David Alexander

Did you know?

The first SAE Congress, held in 1906 at the New Grand Hotel in New York City, was attended by 32 members and guests. The meeting (some years later adopting the name Congress) consisted of three technical papers, a business meeting, and a banquet. The Big Apple was host to the event, which coincided with the New York Auto Show, until 1924, when it moved to Detroit. It has been held at Cobo Center since 1961, SAE records indicate.

The three papers at that first meeting were "Materials for Motor Cars," "Ball Bearings," and "Some Requirements for Carburetor Design."

SAE Foundation Contributors Lounge

All SAE Foundation contributors wearing a Foundation VIP ribbon are invited to visit the SAE Foundation Contributors Lounge located in Congress Central (W2-60), adjacent to the SAE Member Lounge. A relaxing environment with comfortable seating, refreshments and telephones will be available to contributors Monday through Thursday from 8 a.m. to 5 p.m. In addition, a special demonstration of *A World In Motion* challenges will take place tomorrow from 10 a.m. to noon in the Lounge.

Diesel emissions control papers to be presented this morning

Today during Part 1 and 2 of the "Diesel Exhaust Emission Control" technical session starting at 9:00 a.m. in room D3-19, researchers from **Cummins**, **Argonne National Laboratory**, and the **Department of Energy** will present the results of

including NOx adsorbers, catalyzed particulate filters (CPF), and sulfur traps, in conjunction with active reductant injection—were investigated and designed for emissions control subsystem integration and development. NOx adsorber

increased exhaust gas residence time on active catalyst sites, and an understanding of the various factors that cause deactivation of the catalyst.

Fuel reformulation concepts were investigated to increase the activity of the hydrocarbons introduced into the catalyst systems. Even with the availability of 15-ppm sulfur fuels, the development of a sulfur management scheme is critical to prevent catalyst poisoning and deactivation. The application of a sulfur trap that can be regenerated offline or periodically replaced was explored.

PM emissions were addressed via the development of the CPF. The key areas of development included creating catalyst formulation with improved low-temperature performance, exploring synergies between PM and NOx aftertreatment strategies, and determining the need for supplemental heating, which may be required to help the CPF get

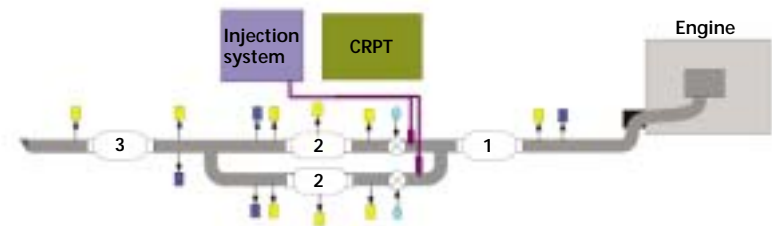


According to researchers from Cummins, Argonne National Laboratory (ANL), and the Department of Energy, one way to reduce the fuel penalty associated with NOx adsorber regeneration is to reduce O₂ flow during regeneration, accomplished via a full bypass system.

a diesel exhaust aftertreatment testing and analysis done under the FreedomCAR program.

Because of their enhanced fuel efficiency, reliability, and durability, compression-ignition, direct-injection (CID) engines have been used extensively to power "almost all highway trucks, urban buses, off-road vehicles, marine carriers, and industrial equipment," according to the researchers. CID diesel engines burn 35 to 50% less fuel than gasoline engines of comparable size, and they emit far less of the greenhouse gases implicated in global warming. Although the emissions of CID diesel engines have been reduced significantly over the last 10 years, there remains concern about nitrogen oxide (NOx) and particulate matter (PM) emissions.

Under this study, various aftertreatment technologies—



The performance of the integrated aftertreatment system designed for a light-duty vehicle was evaluated on the chassis dynamometer at ANL.

technology relies on removal of NOx from exhaust under lean conditions by adsorption. The step is followed by periodic regeneration of the adsorbent along with reduction of the released NOx under rich conditions. The areas of NOx adsorber development included catalyst formulation for high conversion over an increased catalyst/exhaust gas temperature range, catalyst structure for

through those portions of the duty cycle where temperature is too low to achieve the high rate of PM burning to prevent soot accumulation.

The improved aftertreatment components were integrated and configured in a system developed for a light-duty application. The full bypass NOx adsorber system with exhaust injection was fitted to a **Mercedes A170**.

Jean L. Broge

Visual ergonomics simulation

Faster, safer, and more reliable transportation has seen tremendous evolution over the last 20 years. However, ergonomics simulation in the industry is currently limited to "reach" studies, and visual ergonomics remains at the level of design and styling. Over the years, car and aircraft manufacturers have become conscious of how important human perception is, and that new simulation tools are required to help eliminate misinterpretation under differing lighting conditions.

Optis has just released a visual ergonomics and visibility analysis solution, SPEOS, which is based on a physical approach to light as well as new technology taking into account the behavior of the human eye. Optis, known for its optical design and lighting prediction software, has developed a specific technology that takes into account real light emissions, exact instrument geometry, and 3-D environment inside and outside the cockpit, in true spectral colors, as well as analyzing human eye behavior.

When it comes to realism in visual simulation, it is important to differentiate between what is seen on the computer screen and what the eye would perceive when looking at a real-life system. The software includes an eye model based on physiological effects, and handles the eye response to light level, color, contrast, and ambient luminosity according to the spatial response of the retina.

David Alexander



SPEOS software from Optis can analyze the readability of instruments under many different lighting situations.

Theater...Continued from Page 1

Congress. While technical papers and the exhibit retain their high value, the heretofore minimalist "executive perspectives" element of the Congress is a rapidly growing one that figures to rival in importance other executive forums that offer little, if anything, in the way of technical papers and displays. About 40 industry leaders of vice-president-or-higher rank will take the Technology Theater stage Monday through Thursday to address technology and business trends. Many others at the director and manager levels will address technology and business issues too, and more than a dozen other executives and managers in the non-technical side of the business will address issues such as business conditions in Mexico and other countries.

Schaum, the Executive Vice President—Product Development and Quality for DaimlerChrysler Corp. who is serving as Congress General Chairperson, will be among the first, if not the first, to stand behind the Technology Theater dais. He and many of the other executives will find time before or after their Congress speaking engagements to meander through the exhibit. Schaum laments the recent trend of Tier 1 suppliers pulling out of the Congress and instead conducting private technology previews at OEM engineering offices.

"What is lacking in that approach is the efficiency with which an engineer can look at a broad perspective of technology," he said. "And that's the role the Congress exposition fills. It's a chance for engineers, particularly among the OEM engineering community, to walk the floor and get an overview of the various technologies being developed. In just an afternoon, you can really learn a lot."

There figures to be a lot of OEM engineers walking the show floor: DaimlerChrysler, Ford, and General Motors each will conduct engineering staff meetings at Cobo Center during Congress week.

In an SAE Congress first, the Big 3 will have advanced vehicle technology displays situated close to the Technology Theater. Engineers and/or executives from each OEM will be on hand at the large displays to show off and talk about their latest technology triumphs.

Though not filled to absolute capacity as it was during the heyday of Congress of a few years ago, the exhibit hall at Cobo Center is still an enormous smorgasbord of innovation with more than 900 companies demonstrating their products and technical capabilities over 190,000 ft² (18,000 m²) of floor space.

The exhibit opens daily at 8 a.m., two hours earlier than it did last year.

The show floor and the technical session program are closely linked—another SAE 2003 World Congress innovation that makes it easier for attendees to zero in on the specific types of sessions and displays they want to visit. Both the sessions and the exhibit are categorized according to engineering domain:

- Advanced propulsion/powertrain
- Advanced electronics
- Safety/testing
- Lightweight materials
- Emissions/environment.

The Technology Theater is linked in a similar way, with each day's presentations focusing, for the most part, on one of the domains listed above. Each days Technology Theater presentations are being sponsored by a company:

- Monday: Advanced electronics (sponsor: **Panasonic**, displaying an H2)
- Tuesday: Advanced propulsion/powertrain (sponsor: **SiemensVDO**, static display)
- Wednesday: Emissions/environment (sponsor: **Eaton**, displaying a hybrid vehicle)
- Thursday: Lightweight materials and safety/testing (sponsor: **Trade Partners UK/Invest UK**)

Patrick Ponticel

SAE President...Continued from Page 1

win in the process. This message has been very well-received, and I hope it will soon begin to reflect itself in the work of SAE.

My interaction with SAE student members has been by far the most enjoyable experience. I am comfortable that, with this great pool of engineers coming up, the future of SAE is in good hands. We should assert every effort to make this young talent feel welcome and prepare them to take over the organization and its leadership.

There is still much for those of us entrenched in the automotive and aerospace industries to learn. Our industries often change as does the technology. The automobile may be 100 years old, but its technology is far from mature. In the near future, 40% of the value of an automobile is likely to be in electronics and controls. SAE is well-positioned to welcome this new group of technologists as major shapers of mobility products.

In that same vein, I would also like to mention another message that I have carried with me throughout my travels this past year as SAE President, which is that SAE is also the Society of Aerospace Engineers. As I mentioned, with the increasing role of electronics in ground mobility vehicles, this technology provides an excellent opportunity for both air and ground mobility technologists to make full use of synergies. The history of such synergies is rich and includes the work of Orville Wright in strengthening SAE.

SAE has been through a tough year, as has been the economy and the automotive and aerospace industries. The staff has been through a major reorganization adjusting to reduced revenues. With a refocused and revitalized

organization, SAE is well-poised to serve all four of its customer groups—members, government, industry, and academia—and, at the same time, respond to the growth opportunities ahead of us.

For me, representing you as SAE President has been an honor and a privilege that stands far above any

other experience of the past 32 years. It has also been enjoyable. I want to make sure to thank all of you again for giving me this great opportunity—clearly a major highlight of my career. I look forward to continuing my service to SAE in the years to come.

S.M. Shahed

Career development opportunities

If you're looking to hire or be hired, the SAE 2003 World Congress offers several ways to help you to network to find the right company or professional to meet your needs.

Stop by the Career Development Center and network with recruiters and employers, post your resume, and browse the many job postings available on site. Located in the Wayne Hall Exhibit, the Career Development Center includes employer recruitment booths, a business center, meeting space, and information on career-assistance programs. Those wishing to display their resumes should bring 50 copies directly to the Center, open Monday–Wednesday, 8 a.m. to 4:30 p.m. and Thursday, 8 a.m. to 3 p.m.

On Tuesday, March 4, from 1:00 to 3:00 p.m., in room O2-35/36, Cobo Center there will be a Career Development Session held. Learn about succeeding in the automotive industry at the SAE Career Development Session. Hear valuable tips from featured speakers Norm Irish, Manager of Career Development for DaimlerChrysler, Keith Marshall, President, Solution Matrix, and a third presentation on networking in the automotive industry presented by professionals from Management Recruiters of Oakland County.

Stop by the SAE Bookstore for your copy of the Worldwide Automotive Supplier Directory
Special Congress Price \$179
— Save over 50%

The SAE Technology Theater is an important new component of the SAE World Congress. Its sessions, featuring industry leaders from around the world, will be open to all SAE World Congress attendees including those registered for the exhibit only. The SAE Technology Theater will be located on the exhibit floor adjacent to special technology displays from major Original Equipment Manufacturers. If you have a question for a speaker, send it via e-mail to theater@sae.org.

Thrive or Survive: Engineering Vehicle Systems for 2010 8:00-9:00 a.m.

This Kickoff Session & Grand Opening of the Technology Theater will set the stage for the week by focusing on the technology challenges facing auto industry engineers as well as some of the possible opportunities and solutions being developed.

Richard O. Schaum, Executive Vice President, Product Development, DaimlerChrysler Corp., and General Chair of the SAE World Congress – Moderator

Kwame Kilpatrick, Mayor, City of Detroit

James Padilla, President, North America and Executive Vice President, Ford Motor Co.

How Fast is Too Fast? The Challenge of Rapid Advancement in Automotive Electronics 10:00-11:30 a.m.

The rapid pace of electronic systems development has opened the door to a huge range of new features and benefits in today's vehicles. The challenge to automotive engineers is how to integrate technology that will be obsolete in two years into vehicles with more than a 10-year life cycle. Speakers will answer the questions, "How much is too much? How fast is too fast?"

Bernard I. Robertson, Senior Vice President - Engineering Technologies & Regulatory Affairs, DaimlerChrysler Corp., presenting the challenge to the OEM and recapping Convergence 2002 - Moderator

Doug Patton, Senior Vice President, Customer Support Division, Engineering, DENSO International America, Inc.

Kregg Wiggins, Vice President of Powertrain, Siemens VDO Automotive

Jacqui Dedo, Vice President and General Manager, Worldwide Market Operations, Automotive, Communications and Electronic Systems, Motorola

Herbert Hanselmann, President and CEO, dSPACE

Keynote Address: Hans-Georg Frischkorn

Senior Vice President, Electric/Electronics, BMW Group
Advanced Electronics – Evolution vs. Revolution
11:30 a.m.-Noon

Keynote Address: Phil Martens

Vice President, Vehicle Product Development and Engineering, Ford Motor Co.
Noon-12:30 p.m.

Drive-by-Wire: What Will Be Its Impact on Tomorrow's Vehicles? 2:30-4:00 p.m.

Drive-by-wire introduces a new paradigm in design flexibility for automotive vehicles. Along with this new freedom come issues related to control redundancy, architecture standards, and applications implementation. New powertrain options such as fuel cells/electric drive expand the flexibility offered through drive-by-wire.

Wilfried Achenbach, Director - Active Chassis Controls and Electrical/Electronic Architecture, Chrysler Group, DaimlerChrysler Corp. - Moderator

Rainer Kallenbach, General Manager, Asset Bosch Group, Bosch

Charles F. Heine, President, Technology Development and Diversified Products, Dana Corp.

Craig Stephens, Manager, Powertrain Controls Research & Advanced Engineering, Ford Motor Co.

Don C. Winter, Director - Network Centric Operations, Boeing Phantom Works

17 Million Vehicles Sold: Where's the Profit? Can OEM and supplier partnerships lead to profits for both? If so, when? If not, what's the new business model? 4:00-5:30 p.m.

As OEMs and suppliers both wrestle with competitive pressures to cut costs and lower prices, there have been examples of successful collaboration resulting in a "win" for both. This session will focus on these examples and look at opportunities for engineering to develop a new "scorecard" based on a systems relationship rather than a commodity relationship.

Ron Harbour, President, Harbour & Associates - Moderator

Donald L. Runkle, Vice Chairman, Enterprise Technologies, Delphi Corp.

Mike Laisure, President, Engine & Fluid Management Group, Dana Corp.

Robert J. Buckler, President and Chief Operating Officer, DTE Energy Distribution

James C. Orchard, President, North America & Asia, Visteon

George R. Perry, President & CEO, Yazaki North America

Alan Shaffer, Senior Vice President, Sales & Marketing, American Axle & Manufacturing

Exhibit Directory Addendum

The following is a Directory update, as of February 21, 2003.

New exhibitors

Correlated Solutions

952 Sunset Blvd.
West Columbia, SC 29169-6860, U.S.
www.CorrelatedSolutions.com
Johnson@CorrelatedSolutions.com

Booth 1271

Designs software and systems that produce full-field surface displacement and strain fields for samples undergoing mechanical stress.

JLO Metal Products Inc.

5841 W. Dickens Ave.
Chicago, IL 60639-4095, U.S.

Booth 2765

Polyspace

5840 N. Canton Center Rd., Ste. 270
Canton, MI 48187-2614, U.S.

Booth 3144

Saturn Electronics Corp.

28450 Northline Rd.
Romulus, MI 48174-2832, U.S.

Booth 3239

Satyam Venture Engineering Services

1027 E. 14 Mile Rd.
Troy, MI 48083-4527, U.S.

Booth 3258

State of Bavaria, US Office for Economic Development

560 Lexington Ave. 17th Floor
New York, NY 10022-6828 United States

Booth HOSP A

TECHRIM

3252 University Dr., 165
Auburn Hills, MI 48326-2786, U.S.
www.techrim.com
sales@techrim.com

Booth 3215

Provides automotive customers with low cost products and services produced in China and finished/inspected in USA including investment cast, sand cast and die cast components; extruded and molded rubber parts and assemblies. The company's engineering sector located in Auburn Hills and Shanghai also provides CAD/CAM and IT software services.

Texas Encore Materials Inc.

36639 Northline Rd.
Romulus, MI 48174-1179, U.S.

Booth 2875

Cancellations

Softlab Inc.

Dimension Bond

United Forward Inc.

Chorus Motors plc

Covisint

Fuel Cell Management

VM Motori SpA

Aria Power Products

Flowdrill



Panasonic, the sponsor for the Technology Theater today, is displaying a **Hummer H2** demonstration vehicle highlighting its automotive technology offerings. The vehicle's audio system includes a head unit with playback capability for DVD audio and video as well as CDs. The advanced speaker products are designed to reproduce the impressive sound quality of DVD audio as well as meet the stringent specifications for OEM automotive applications. Other highlights of the Panasonic audio system include a multichannel amplifier and unique system tuning for both two- and multichannel source material. The H2's next-generation DVD passenger entertainment system features a super-slim DVD playback mechanism, dual 9.0-in TFT LCD displays with independent video source control, and dual-channel wireless headphones. Another technology highlight of the demonstration vehicle is a parking assistance system using a second-generation color camera designed specifically for automotive applications.