

SAE ARIZONA • NEVADA SECTION

January 2007

MEETING: JAN 17

Section Web Site: www.saearizona.org - Sign up for your newsletter on our website.

HIGHLIGHTS...

- GM Tahoe Hybrid
- Speaker Biographies

- Message from Chair

- Recap of November Meeting
- Maps for Meeting Location

Dinner Presentation...

2008 Chevrolet Tahoe Hybrid

by Michael (Micky) J. Bly,
Mark Cieslak, and Tim Grewe

The 2008 Chevrolet Tahoe Hybrid sport utility vehicle – the first offering of General Motors’ new generation of advanced hybrid vehicles – is designed and engineered with the single purpose of delivering unparalleled fuel economy in the full-size SUV marketplace. Available in two- or four-wheel drive, the Tahoe Hybrid provides the power and capability expected from a full-size utility while delivering a composite fuel efficiency improvement of approximately 25-percent – including up to an estimated 40-percent improvement in urban driving situations.

The propelling power behind the Hybrid comes in two forms – twin electric 60 kilowatt motors and a modified Vortec 6.0L V8 engine that was engineered with an aluminum cylinder block, and is specified with GM’s industry leading Active Fuel Management (AFM) technology. The engine also features GM’s cam-in-block variable valve timing as well as late intake valve closing – a technology incorporated from the proven “Atkinson” engine cycle. However, the term “Two-Mode” does not apply to the two forms of power used in the hybrid system, but to two distinct operating modes within the system.

In the first mode, at low speed and light load, the Hybrid can operate in three ways: electric power, internal combustion engine power, or in any combination of electric and engine power.

When operating on electric power, it provides all the efficiency of a full hybrid system. Leaving the internal combustion engine off for extended periods of time and moving under electric power is key to reducing fuel consumption in heavy stop-and-go traffic.

The second mode is used primarily at highway speeds to optimize fuel economy. It provides electric assist in addi-



tion to four- or eight-cylinder power when conditions demand, such as trailer towing and climbing steep grades. This enables the benefit of low fuel consumption while ensuring the horsepower, torque and utility expected of a full-size SUV.

The second mode integrates sophisticated hardware – such as cam phasing (variable valve timing, or VVT) and late-intake valve closure to deliver even more efficient internal combustion engine operation. Additionally, AFM technology smoothly shifts from eight cylinders to four and back, depending on how much power is needed.

Shifts between the two modes of operation are synchronous, meaning no engine speed changes are necessary for the mode shift to occur. The result is exceptionally smooth acceleration and responsiveness.

The two-mode hybrid differs from other single-mode hybrid offerings in that it is not only capable of blending both internal combustion (V-8) and electric power, but its transmission is capable of being both electrically variable and fixed gear.

The hybrid system is also torque-based, which is a far more accurate and comprehensive means of continuously

DATE	TIME	LOCATION	COST With Dinner	Presentation Only
Jan 17	Social	- 6:00 pm	Members - \$22	\$10
	Dinner	- 6:30 pm	Guests - \$27	\$10
	Presentation	- 7:30 pm	Students - \$10	no charge
RSVP by 10:00am Tuesday Jan 15			Call Sam Bethune: 602.364.7456	

determining – within milliseconds – optimal propulsion configurations throughout the driving cycle. More common single-mode hybrid systems in the marketplace today base such decisions on the rate of airflow into the engine.

At all times, the two-mode system’s Hybrid Optimizing System collects torque-based data, deciphers it, then determines the most fuel efficient means of propelling the vehicle – e.g. with electric power, combustion power, a blending of both, in continuously variable drive, fixed gear, etc.

MICHAEL (MICKY) J. BLY
ENGINEERING DIRECTOR - GLOBAL HYBRID VEHICLES
GENERAL MOTORS CORPORATION

Micky Bly is the GM North America's Director of Hybrid Vehicle Integration. In this position, he leads the team responsible for the performance and integration of GM's 13 different hybrid models with 3 unique hybrid technologies under development.

MARK CIESLAK
CHIEF ENGINEER - FULL-SIZE HYBRID TRUCKS
GENERAL MOTORS CORPORATION

Mark Cieslak is the Chief Engineer GM's Full-Size Hybrid SUVs and Pickups. In this role, he is responsible for engineering design, development and integration activities for marketed under the Chevrolet, GMC and Cadillac brands.

TIM GREWE
CHIEF ENGINEER - REAR WHEEL DRIVE 2 MODE HYBRID SYSTEMS
GENERAL MOTORS CORPORATION - POWER TRAIN

Tim Grewe is the Chief Engineer for GM Powertrain Rear Wheel Drive 2 Mode hybrid system. In this position, he is responsible for the design and release of all rear wheel drive hybrids ranging from a 60ft articulated bus to the Chevrolet Tahoe

Message from the Chair

Our November meeting was a great success with Rich Schaum, SAE International President, as our main speaker. We had over 55 people at the meeting. Rich’s presentation on Evolution of Powertrains was very well received. In addition, the student chapter from NAU presented an update on their high mileage vehicle as our coffee talk. I want to thank our board members and officers who helped make this meeting a success.

Rich Schaum and Brian Taylor from SAE International spent the entire day prior to meeting touring with us. We started our tour with a meeting at Sierra Vista Elementary School that has an active AWIM program, thanks to the efforts of several GM retirees. It was amazing the impact that the AWIM program has made on the students at this low-income school. Thanks, Don Robins, for arranging this visit. Our tour continued with a tour of the flight operation center and maintenance facility for US Airways. The highlights of this portion of the tour included a chance to tryout an A320 flight-training simulator and get a close look



Sierra Vista AWIM

at the turbo jet engines. Thank you to Hal Heule for the arrangements.

In the afternoon, we toured the new engine labs at ASU, with a presentation by the SAE student chapter. The deans of Mechanical Engineering joined us at this meeting. Rich did a short ad hoc speak and answered question from the group. Thank you, Steve Trimble for arranging this part of our tour.



ASU Polytechnic

Later in the afternoon, we traveled to the Polytechnic campus of ASU. For those who have not had the opportunity, Polytechnic campus has extensive manufacturing oriented laboratories including CNC machining,

welding, controls and quality measurement. Rich met with the SAE student chapter and the Provost. He did a short talk to the group followed by extensive questions from the student body regarding the automotive industry. Thank you, Brad Rogers for arranging this portion of the tour.



ASU Tempe Visit

On another note, I want to express our condolences to Allan Watts and his wife on the recent loss of their newborn baby. Allan is a past Chair of our section.

Just a reminder, there will not be a meeting in December. Our next meeting will be January 17, 2008. The presentation will be on the new Chevrolet Tahoe Hybrid vehicle.

Happy Holidays!
 Bill Gest, Section Chair

Recap of November Meeting

by Josh Rudin

Coffee Talk: NAU's Efficient Vehicle

NAU's SAE section spoke about 2 competitions based on fuel economy, minimizing aerodynamic drag, rolling resistance and weight. The goal was to achieve an amazing 1900 miles per gallon. Last year's model won the team \$10K and weighed 100 lbs. It was designed on SolidWorks. Computational fluid analysis was utilized to minimize drag. Carbon-fiber materials were used for the body.

This year an aluminum honeycomb frame/polycarbonate fairing/overhead valve motor/ model will be used along with high-strength adhesives to deliver higher compression. This model must pass a thorough technical inspection as well.

NAU has the largest student section of Arizona's 3 universities. We all applaud their participation and performance. Good luck to the team.

Main Speaker: Evolutionary Trends in Powertrain Technology

SAE President Richard Schaum spoke of 5 trends which pertain to the evolution of an automobile's powertrain: Emissions, fuel efficiency, performance, safety, and alternative fuels.

Mr. Schaum mentioned that 99.9% of hydrocarbon emissions were removed since the 1970 models and that tur-



NAU Students

bochargers address emissions, fuel efficiency and performance. The mean 0-60 mph for 2007 models is now 10 seconds, a significant improvement in performance.

Another interesting trend is the convergence of the diesel and gas motor designs. Direct fuel injection, originally developed for use in diesel motors is now being used for gasoline motors. HCCI engines and pressure sensor glow plugs are also carryovers from diesels now being developed for gasoline motors.

Transmissions now have more speeds, up to 8, with a dual clutch being developed to allow a manual to shift as smoothly as an automatic.

The subject of alternative fuels is difficult because it was revealed there is no one "silver bullet" or logical choice in all types of locales & driving conditions. For example, diesel is more effective in long-haul rural routes, where electric is more conducive to urban locales. Compressed natural gas (CNG) is plentiful in Eastern Europe and sugar-based ethanol is popular in Brazil, but there is no overall, single solution for all drivers.

For an electrical car to be implemented, the battery

must be further developed. In addition, because the batteries charge from the electrical grid and the grid is coal-powered, this is just as detrimental to emissions as an internal-combustion motor.



Tour of US Airways

Transportation

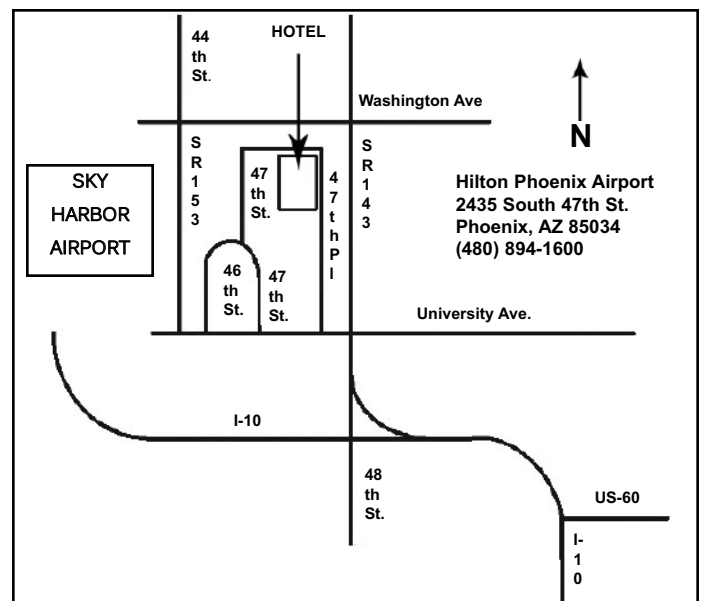
only accounts for 13% of greenhouse gas, third on the overall list. Coal-produced electricity and heat is number one, with a 24% contribution and another 18% is attributable to global deforestation. Coal is still a formidable source of energy, contributing to 50% of outputted energy today.

Mr. Schaum relayed that the best near-term alternative is hybrid-electric diesels, although that without government subsidy it is very difficult to replace conventional oil as an energy source. The main factor to consider is the overall "Well-to-Wheel" basis in which the efficiencies both into and out of the energy-manufacturing facility is multiplied to get a total overall value.



Past SAE Presidents (Left to Right) Claude Verbal, Richard Schaum, and Ed Mabley

*** Meeting Location ***



THE UNIVERSITY OF ARIZONA ANNOUNCES:

The 45th Reliability Engineering and Management Institute provides all engineers, particularly Reliability Managers and Engineers, Product Assurance Managers and Engineers in government and Industry, with a working knowledge of Reliability Engineering Theory and Practice, Mechanical Reliability Prediction, Reliability Testing and Demonstration, and more. Dr. Dimitri B. Kececioğlu and 10 speakers from 15 sponsoring industries will take part in expertly covering the subject matter of this Institute. For more information, please see the contact information below.

The 34th Annual Reliability Testing Institute provides coverage of how to implement and manage the Design-for-Reliability process through testing, to implement an integrated Reliability & Maintainability Engineering management strategy, learn a practical approach to attain the high Reliability goals demanded nowadays, to improve our worldwide competitive posture by creating more Reliable products through thorough testing, to determine the useful life of our products, and more. Dr. Dimitri B. Kececioğlu and 10 speakers from 10 sponsoring industries will take part in expertly covering the subject matter of this Institute. For more information, please see the contact information below.

THE 45th ANNUAL RELIABILITY ENGINEERING
AND MANAGEMENT INSTITUTE
November 12-15, 2007

THE 34th ANNUAL APPLIED RELIABILITY TESTING INSTITUTE
May 5-8, 2008

Clarion Hotel, Tucson Airport
6801 S. Tucson Blvd.
Tucson, Arizona 85706
520-746-3932 or 800-526-0550

Registration Fee: \$1500 Proceedings Cost: \$50

For Details and Technical Information, please write to:
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Please see his website at: <http://www.u.arizona.edu/~dimitri>



ESG Engineering (WWW.ESGENG.COM) is a full service mechanical engineering consulting company located in Tempe, Arizona. We provide Industrial Design, CAD Design and Engineering Analysis including linear and non-linear Stress, Dynamics, Fluids, Thermal and Tolerance. We also sell the Z Corp rapid prototyping machines and scanners; SensAble design software and the full line of Altair HyperWorks analysis software. How can we help you? Contact Bill Gest at 602-618-1304. ESG Engineering is growing, contact Mike Kremer at MKremer@esgeng.com for career opportunities.

ARIZONA-NEVADA SECTION: Meeting Schedule

Jan 17	- 2008 Chevrolet Tahoe Hybrid
Feb 21	- General Dynamics - Tactical Decisions
Mar 20	- Honeywell

Bill Gest Chair bgest@esgeng.com	Joshua Rudin Vice Chair 602-369-6487	Mike Kremer Secretary MKremer@esgeng.com	Larry Wilson Treasurer wilson.lawrence@orbital.com	Robert Riley Newsletter Editor 623-872-8010
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