

# Automotive Plastics News

Today, Tomorrow - Together

January 2006 Volume 35, Issue 2



## 35<sup>th</sup>-Anniversary Innovation Awards Gala

*"License To Thrill"*

At its 35th-Anniversary Innovation Awards Gala, the Automotive Division of the Society of Plastics Engineers International (SPE) presented 11 awards for innovation in plastics for transportation applications and the teams of OEMs, tier suppliers, toolmakers, and materials suppliers that developed and commercialized them. The nominations pool for this year's judging process was the largest in at least a decade and more diverse - in terms of the number of OEMs and suppliers represented - than in any previous year since the event started in 1970. Over 800 automotive engineers, business executives, materials suppliers, and media attended the sold-out event, which took place November 16 at Burton Manor in Livonia.

The most prestigious prize of the evening - the **Grand Award** - was given to the team that developed the composite In-Bed Trunk featured on the '05 MY Honda Ridgeline pickup truck. The integrated storage system molded from sheet-molding compound (SMC) composite provides 8.5 cubic feet of easily accessible, lockable, weather-tight stowage. It can hold toolboxes, luggage, or up to 3 sets of golf clubs, and doubles as an in-bed ice chest (with integral drainage plug). With an 1,100-pound carrying capacity and integral tie downs, the rugged trunk offers better durability and slip resistance than conventional systems and is rustproof. Additionally, the trunk offers a weight savings of 30% vs. steel, and its 7-piece construction replaced over 100 steel parts while greatly enhancing manufacturability, assembly, and durability.

In fact, this truly innovative application achieves levels of component integration that would not be feasible in sheet metal for reasons of cost, mass, and manufacturability. Meridian Automotive Systems was the systems supplier for this application; tooling was supplied by Century and Global Tooling Systems; and the materials suppliers included



*Kevin Thelen of Honda Research of America on stage accepting the Grand Award Trophy for the "Most Innovative Use of Plastics" for the In-Bed Trunk on the Honda Ridgeline.*

Ashland Chemical, Saint-Gobain, and Rohm & Haas. In addition to the Grand Award, the application also won the top award in the **Body Exterior** category. Kevin Thelen of Honda Research of America accepted both trophies.

In the **Body Interior** category, the top award was presented to General Motors (GM) for the HVAC film valve featured on the '05 MY Pontiac Grand Prix sports sedan. In this application, a highly flexible, plastic film valve with apertures

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# Treasurer's Report

Brian Grosser

Account balances for the SPE Automotive Division total \$152,766.87. This value is high as we have not yet paid all balances from the 2005 Awards Event.

In accordance with SPE policy, we filed all appropriate SPE and IRS documentation for the year ended June 30, 2005 by the November 15th deadline. The Automotive Division had a net loss in cash for the reporting period. We will look to improve our financial strength during the current reporting period.

The financial summary for the 2005 Automotive Composites Conference (ACCE) follows:

Proceeds:	\$124,103
Expenses:	\$78,694
Gross Proceeds:	\$45,409

The gross proceeds are split 50-50 with the SPE Composites Division. SPE National will receive 30% from each Division. Therefore, the net proceeds for the Automotive Division were \$15,894. This is more than double last year's figure, and is a reflection of the outstanding work by the entire ACCE organization team. Since the Automotive Division is a Michigan 501(c)3 non-profit organization, these proceeds will help fund the various scholarships, grants, and education programs supported by our Division.

## Automotive Division Meeting Schedule and Special Events Calendar

Division BOD Meeting APC, Troy, MI	February 6, 2006
Division BOD Meeting APC, Troy, MI	April 3, 2006
Engineering Plastics Conference Sterling Inn, Sterling Heights, MI	April 25, 2006
ANTEC 2006 Charlotte Convention Center Charlotte, NC	May 7-11, 2006
Division BOD Planning Meeting APC, Troy, MI	June 2006 (exact date TBD)
Automotive Composites Conference MSU Management Education Center, Troy, MI	September 12-14, 2006

Automotive Division Board of Directors meetings are open to all SPE members. Call Norm Kakarala at (248) 655.8483 for more information.

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# Chairman's Message

Norm Kakarala

Thanks to the SPE Automotive Division's Innovation Awards Gala planning committee and the committee chair, Suzanne Cole for their outstanding efforts in making our 35th-anniversary event a grand success. We received many accolades from attendees about how well the program was organized and executed. To many of our guests' amazement, the formal program closed precisely at the allocated time.

I want to thank all the Innovation Awards Gala event sponsors for providing the financial support that allowed us to properly honor the executives for their leadership and the winning teams for their innovative use of plastics in automotive applications. Truly, without your help, it would not be possible to host an event of this magnitude.

The Innovation Awards committee implemented many new ideas this year, such as adding the new Safety Category, raffling off artwork from the event, and developing the After-Glow to extend networking opportunities after the formal program closed.

In another change from past events, the Automotive Division was pleased to honor Dave Hill with our first ever "Chief Engineer Award" at this year's event. For 52 years, the Corvette has been the icon of the American sports car. As only the third chief engineer to helm Corvette, Dave Hill has taken the vehicle to new heights of performance - particularly in the last two generations - the C5 and C6 models. Dave is retiring as Corvette Chief Engineer and GM Vehicle Line Executive (VLE) of performance cars after 41 years of service to GM and to the industry at the start of 2006. As VLE, Dave also led the team that developed composite body panels for the Cadillac XLR, challenging the SMC industry to reach new heights of performance in fit and finish.

Also at this year's program, Monica Prokopyshen received the Division's Past Chair Award, and the Division received a commemorative license plate honoring the 35th-anniversary of the Innovation Awards Gala from Michigan Secretary of State, Terri Lynn Land. Additionally, Suzanne Cole was honored with the Outstanding Member Award for her distinguished service to SPE and the Automotive Division. While Suzanne was the Chair of the Automotive Division, she developed a cooperative partnership between the University of Michigan Trauma Burn Center and the

Division to educate children and their parents on the proper installation of child safety seats and booster seats. Through her work on this project, Suzanne was able to secure 1,000 booster seats from Ford Motor Company as a gift to the program. Also, Suzanne founded, organized, and chaired three consecutive Automotive Safety Conferences on behalf of the Division.

A joint technical conference between the Automotive Division and the Detroit Section - Design and Developments with Automotive Engineering Plastics -a has been scheduled as a 1-day SPE mini-tech event on April 25, 2006 at the Best Western Sterling Inn, Sterling Heights, MI. There is more information on this exciting new event elsewhere in the issue in an article and also a Call for Presentations flyer. The conference co-chairs, Tom Pickett and Nippani Rao are looking for volunteers to help plan and execute the event. Please support them by recruiting speakers and sponsors for the successful execution of this conference.

Lastly, I want to thank the SPE Detroit Section Board for joining the Innovations Awards Program as a Gold-Level Sponsor and participating in the nominations judging. The section's participation at the Awards Gala and the mini-tech event are two good examples of how we are working hard to increase collaboration within our society and with other societies on activities in the Detroit area.



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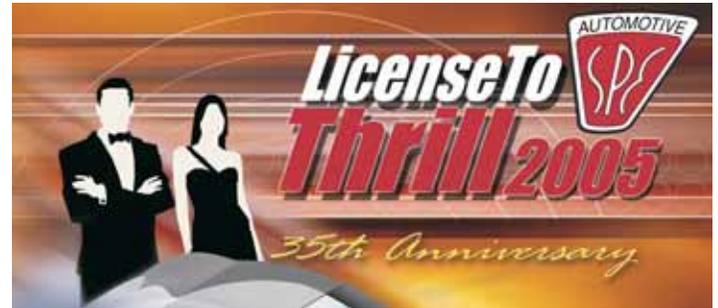
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# 35<sup>th</sup>-Anniversary Innovation Awards Gala

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is moved within a housing to precisely meter airflow within a very confined space without stratification of hot and cold airstreams. The film valve offers 13 thermal settings for improved passenger comfort. Air-rush noise is reduced because the valve does not "rudder" through the air stream, which would otherwise create turbulence. A combination of polytetrafluoroethylene (PTFE), fiberglass, and silicone rubber is used to create the system. Delphi was the systems supplier for the application; Macauto Industrial was both the molder and toolmaker; and the film material was provided by Saint-Gobain. Frank Joo, engineering group manager at GM's HVAC and Powertrain Cooling, accepted the award.

In the **Chassis / Hardware** category, an all-plastic window-lift system on the '06 MY DaimlerChrysler PT Cruiser[5] multipurpose vehicle was the winner. By converting from steel to plastic, numerous benefits were achieved, including improved crash performance and durability, 25% lower mass, and 15% less cost, and elimination of the need for external lubricant. With fewer attachment points to the vehicle, fewer assembly line workers were needed to install the window lift. Tier supplier, Dura Automotive Systems, developed the innovative yet simple design; Titan Plastics Group was both molder and tooling supplier; Michael Day Enterprises supplied the proprietary nylon 6/6 material; and Mertech Intellectual Properties holds the intellectual property. Jeff Tibbenham, supervisor, Body Hardware at DaimlerChrysler accepted the award.



The winner in the **Environmental** category was DaimlerChrysler for a composite spare-tire carrier on the 2-door, Mercedes-Benz A-Class mini-car. Here, abaca (banana) fiber replaced glass as reinforcement for the polypropylene matrix, making this application the first large-scale use of a natural-fiber-based composite for the exterior of an automobile. Rieter Automotive molded the part with fibers supplied by Manila Cordage. The application addresses a number of important social and environmental issues through reforestation of previously clear-cut rainforests, thereby reducing soil erosion and poverty for the local inhabitants, while enhancing biodiversity. Further, the component offers cost, mass, and occupational-safety benefits, reduces carbon dioxide emissions, saves 60% of the energy required to produce glass fiber, and demonstrates sustainability via the use of natural, renewable fibers. A 10-year public-private partnership between DaimlerChrysler, the German Investment and Development Foundation (DEG), Euronatur, the University



Over one dozen racing, performance, customized, and speciality vehicles were on display at the 35<sup>th</sup> Innovation Awards Program. Also on display were all 60 of the parts and applications that competed for the coveted "Most Innovative Use of Plastics" award.



of Hohenheim, the Technical College of Reutlingen, Leyte State University, the National Abaca Research Center of the Philippines, and Swiss systems supplier Rieter Automotive brought this concept to fruition. The award was accepted by Larry Williams, director of Materials Engineering, DaimlerChrysler, and Jeff VanBuskirk, vice-president, Rieter Business Group America.

The first molded-in color, reactor thermoplastic polyolefin (TPO) resin with Class-A appearance and excellent low-temperature impact strength was judged the most innovative application in the **Materials** category. The highly rubber-modified material is used for the side airbag covers of the '06 MY Buick Lucerne sedan from GM. The material met or exceeded all of the automaker's requirements for the application and offers significant cost savings vs. conventional painted covers. The systems supplier for this application was Autoliv; the molder and toolmaker was Key Plastics; and Basell supplied the material. GM's Dave Mattis, director of Materials & Appearance Engineering, accepted the award.



*"Most Innovative Use of Plastics" Trophy*

Introduced last year, the **Performance & Customization** category accommodates an ever-growing list of aftermarket or optional OEM accessories where plastics improve the appearance, functionality, and / or performance of vehicles. This year's winner was the cargo management system manufactured by Lear Corporation and SCA Packaging North America for the Ford Escape, Mercury Mariner, and Mazda Tribute sport-utility vehicles. This application combines multiple plastic forming technologies and materials to create a lightweight system providing significant additional secure storage for vehicle users. A molded expanded-polypropylene foam structure (EPP resin supplied by JSP International), with a blow-molded lid produced via Lear's patented blow-molding process, and a deep-draw thermoformed carpet create a system that meets Ford's tough load / deflection requirements. Steve Angus, engineering supervisor, and Jennifer Bremmer, design & release engineer accepted the award on behalf of Ford Motor Company.

A water jacket spacer for the open-deck engine design of the '03 MY Toyota Crown sedan was the winner in the **Powertrain** category. This first-ever use of a plastic spacer in the cylinder block was inspired by high-performance racecar engines. The application provides significant benefits. It allows Toyota to deliver precisely tuned coolant flow to areas of the engine most in need. It provides longer engine life through uniform cylinder-bore temperature

distribution. Moreover, it increases fuel economy by 1%. A high-performance aromatic polyamide (PPA (nylon)) material from DuPont was used for the application. The molder and systems supplier was Aisan. Yoshikatsu Nakamura, vice president of Powertrain & Chassis Engineering at Toyota's Technical Center USA accepted the award.



2005 Innovation Awards Program  
**Program Sponsor**

In the **Process / Assembly / Enabling Technologies** category, the world's first bonded hybrid metal / plastic automotive front-end carrier for the '05 MY Volkswagen (VW) Polo A05GM compact car was the winner. The stiffness-to-weight ratio of the system was maximized by adhesive bonding a metal reinforcement to an injection-molded long-glass-fiber-reinforced polypropylene (LGF-PP) composite carrier while reducing stress concentrations (associated with mechanical fasteners) and spreading the load over the entire structure for higher load-bearing capabilities. A special 2-component acrylic adhesive bonds to the low-energy PP substrate without pre-treatment. Simoldes was the toolmaker and molder of this application and Dow Automotive supplied the adhesive and resin. Armin Prinke of VW accepted the award.

**Safety** is the newest nomination category added to the Innovation Awards judging process this year. The winning



*Introduce new this year, the Afterglow Reception was another exceptional opportunity to network. Desserts, coffee, and after dinner drinks were served to all event attendees. Award winners mingled with VIP's, OEM executives, and program sponsors.*

# Innovation Awards Gala

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entry was for pedestrian protection systems used on the front-end of vehicles in Europe. The entry featured 2 different nominations and designs for complying with the European Union's Phase 1 Lower Leg requirements, which came into effect in July of this year. In both systems, the OEMs were able to meet requirements within an existing vehicle design. One system is featured on the '05 MY Suzuki Swift compact car and makes use of a 2-piece polycarbonate / polybutylene terephthalate (PC / PBT) energy absorbing system, which fits in just a 45-mm packaging space. The molder and tooling supplier is Takagi Seiko and the materials supplier is GE - Plastics. The second system, featured on the '05 MY Volkswagen Golf hatchback, makes use of a textile-reinforced glass-mat thermoplastic (GMT) composite beam to meet requirements. The molder was AKsys GmbH; Eppinger WF supplied the tooling; and the materials supplier was Quadrant Plastic Composites AG. The award was accepted by Naruse Msam from Suzuki and by Armin Prinke from Volkswagen.

Travis Meister, a Ford materials engineer, originally proposed the **Hall of Fame** award in 1983. The criteria for the award are simply that the application must have been implemented at least 10 years ago and it must have made a significant and lasting contribution to the use of plastics in the automotive industry. It has become increasingly difficult to name a single winner for this honor, since plastics use in vehicles has proliferated so successfully in the past 2-1/2 decades. Unlike the category awards, which only consider applications specifically nominated in a given year, this award considers all plastics applications that have been in continuous use for 10 years or more. The winner is selected from new submissions, a review of past submissions, and any other candidates that the panel deems worthy.

This year's winner is the thermoplastic intake manifold first used on the 1972 Porsche 911 sports car. That application was molded by IBS Brocke using nylon resin supplied by BASF. The original application has subsequently been translated for use on most production engines in the auto industry. Plastic intake manifolds have continued to evolve through the contributions of suppliers such as BASF, DuPont, Mann & Hummel, Siemens, Freudenberg-NOK, Delphi, and others. In fact, other thermoplastic intake manifolds have been Innovation Awards category winners in 1992, 1993, 1994, and 1999, and a finalist in this year's Powertrain category. Paul Ritchie, president and CEO of Porsche Engineering Services, and Jay Baker, group vice-president, BASF Engineering Plastics, accepted the trophy.

This year's nominations represented more automakers than ever before, including Audi, DaimlerChrysler, Ford, General Motors, Honda, Mercedes-Benz, Mitsubishi, Nissan, Porsche, Seat, Suzuki, Toyota, and Volkswagen. The 60 nominations that were accepted after initial review is the

largest pool of applications submitted for Innovation Awards judging in over a decade. These 60 nominations were painstakingly pared down to a list of category finalists by an initial panel of judges made up of industry experts and SPE Automotive Division board members. Then a panel of 20 Blue Ribbon judges - comprised of media, technical, and industry experts - reviewed the finalists and selected category winners as well as the Grand Award winner.

As is customary, proceeds raised from this event will be used to fund SPE educational efforts and technical seminars, which will help to secure the role of plastics in the advancement of the automobile.





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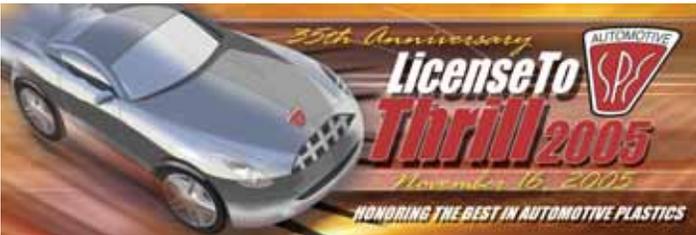
# 2005 SPE Automotive Division Grand Award Winner

*"Most Innovative Use of Plastics"*

Composite In-Bed Trunk on the 2006 Honda Ridgeline



The Body Exterior and Grand Award winning team for the Honda Ridgeline In-Bed Trunk system. Team members include David Edwards, Jason Ruminski, Mike Ishmael, Jim Ryan, Kevin Thelen, Steve McKenzie, Fran Leveque, Dan Dowdall, Pat Jeakle, Andy Swikoski, Steve Pelczarski, Jerry Omillion and Pat DePalma.



Vehicle:	2006 MY Honda Ridgeline
System Supplier:	Meridian Automotive Systems
Material Processor:	Meridian Automotive Systems
Tooling Suppliers:	Century / Global Tooling Systems
Material Suppliers:	Meridian / Ashland

This is the industry's first composite, multi-piece, in-bed trunk. The use of SMC composites permitted a lockable storage area in a pick-up truck that has integrated tie-down features, high carrying capacity (1100 lb), better impact strength, and improved slip and corrosion resistance.



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**Body Interior Category Winner**

**HVAC Film Valve**

Vehicle: 2004 MY  
 General Motors Pontiac Grand Prix  
 System Supplier: Delphi Corporation  
 Material Processor: Macauto Industrial Co., Ltd.  
 Tooling Supplier: Macauto Industrial Co., Ltd.  
 Material Supplier: Saint Gobain PPL

A highly flexible, plastic film valve with apertures is moved within a housing to precisely meter airflow within a very confined space without stratificating hot & cold airstreams. The composite "film" is made of polytetrafluoroethylene (PTFE) and silicone rubber reinforced with fiberglass. For manufacturability, a unique plastic snap-fit spring-loaded pin / bearing assembly was developed. The tensioning system results in superior anti-rattle & anti-vibration characteristics. Air rush noise is reduced because the valve does not "rudder" through the air stream, which would otherwise create turbulence.

**Chassis/Hardware Category Winner**

**All-Plastic Window Regulator**

Vehicle: 2006 MY  
 DaimlerChrysler PT Cruiser  
 System Supplier: DURA Automotive  
 Material Processor: Titan Plastics  
 Tooling Supplier: Titan Plastics  
 Material Supplier: Michael Day Enterprises

This product is a lightweight highly efficient window regulator with all major components produced from plastic instead of steel. The simple design reduces part count over other conventional regulator designs. And the Racklift™ provides inboard/outboard flexibility that improves efficiency and reduces efforts and seal wear due to imperfect matching between the regulator and door glass path.



Accepting the Body Interior category award from Mark Lapain (left) are Jim Giardino, Frank Joo, Gerald Goupil, and Timothy Graly.



Bonnie Bennyhoff with the Chassis/Hardware category awards Jeff Tibberham, Melinda Duff, and Bryan MacPhail-Fausey.

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**Environmental Category Winner**

**Spare-Wheel Cover with Abaca-Fiber Reinforcement**

Vehicle: 2005 MY  
 DaimlerChrysler A-Class 2 door  
 System Supplier: Rieter Automotive  
 Material Processor: Rieter Automotive  
 Material Supplier: Manila Cordage (Abaca fiber)

This is the world's first large-scale use (40 tons / yr) of natural-fiber reinforcement in an exterior application. The patented process for production of Abaca fibers uses 60% less energy than the standard process used to produce glass fibers (rovings).

**Materials Category Winner**

**Molded-in-Color Reactor TPO for Airbag Covers**

Vehicle: 2006 MY  
 General Motors Buick Lucerne  
 System Supplier: Autoliv  
 Material Processor: Key Plastics  
 Tooling Supplier: Key Plastics  
 Material Supplier: Basell Polyolefins

This new material is the first molded-in-color (MIC) reactor TPO with excellent cold-temperature impact resistance for Class-A side-airbag covers. The new TPO meets all related OEM specifications and offers significant cost savings vs. conventional painted covers.



Accepting the Environmental category award from Monica Prokopyshen is Larry Williams and Jeff VanBuskirk.



Brian Gross presents the Materials category award to Dave Mattis; also pictured is Ted Dziemiahowicz, Tim Nelson and Mike Ward.



**Performance/Customization Category Winner**

**Powertrain Category Winner**

**Cargo Management System**

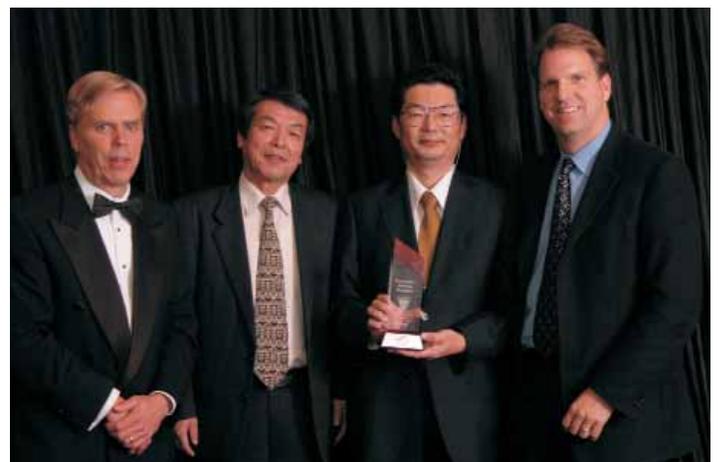
**Water-Jacket Spacer**

Vehicle: 2005 MY  
 Ford Escape  
 System Supplier: Lear Corporation  
 Material Processor: SCA Packaging North America  
 Tooling Suppliers: Lear Corporation  
 SCA Packaging North America  
 Material Supplier: JSP International

Vehicle: 2003 MY  
 Toyota Crown  
 System Supplier: Aisan Industry Co.  
 Material Processor: Uchiyama Manufacturing Co.  
 Tooling Supplier: Uchiyama Manufacturing Co.  
 Material Supplier: DuPont

A molded expanded-polypropylene (EPP) foam structure, combined with a blow-molded lid and deep-draw thermoformed carpet, creates a lightweight system that meets Ford's tough load / deflection requirements for a cargo management system. A tongue-and-groove design ensures fit to vehicle during installation at the assembly plant. The system provides significant additional secure storage.

The water-jacket spacer directs coolant flow to transfer heat away from key areas of the cylinder bore liner, and the improved cooling increases fuel economy and extends engine life. Molded in PPA resin, this is a breakthrough application because it is the first water-jacket spacer designed for open-deck engines.



Accepting the Performance and Customization category award from Kevin Pageau is Steve Angus and Jennifer Bremmer of Ford.

Terry Cressy (left) presented the Powertrain Category award to Yoshikatsu Nakamura, Kenji Kasamatsu and Jim Hay.



**Safety Category Winner (tie)**

**Pedestrian Protection System**

Vehicle: 2004 MY Volkswagen Golf  
 System Supplier: AKSYS GmbH  
 Material Processor: AKSYS GmbH  
 Tooling Supplier: Eppinger WF  
 Material Supplier: Quadrant AG

A textile-reinforced glass-mat-thermoplastic (GMT) composite pedestrian-protection beam fulfills the European Unions' new pedestrian-protection safety standards on an existing vehicle design. Versus steel, the pedestrian-protection beam provides a 30% weight savings, 50% material cost savings, and 15% tooling cost savings, while also simplifying assembly and reducing recycling costs.

**Safety Category Winner (tie)**

**Pedestrian Protection Energy Absorber**

Vehicle: 2005 MY Suzuki Swift  
 System Supplier: Takagi Seiko  
 Material Processor: Takagi Seiko  
 Tooling Supplier: Takagi Seiko  
 Material Supplier: GE Advanced Materials

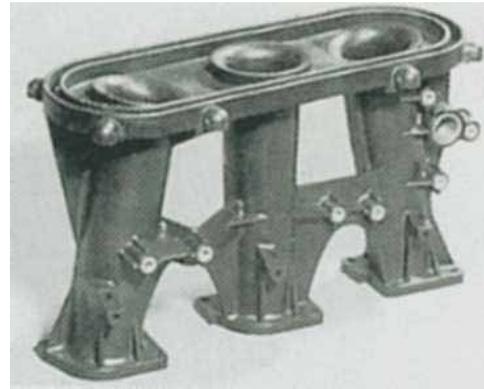
A polycarbonate (PC) / polybutylene terephthalate (PBT) front-end pedestrian-protection system weighing 1.5 lb less than a comparable steel design enables the Suzuki Swift to meet the European Union's Phase 1 lower-leg pedestrian-protection requirements within a 45-mm packaging space.



*Maria Ciliberti with Armin Prinke and Henning Eichhorn and the Safety category trophy.*



*Maria Ciliberti presents the Safety category award to Masaharu Naruse, Michael Mahfeta and Eric Jaarda.*



**Process/Assembly/Enabling Technologies Category Winner**

**Hall of Fame Award**

**Bonded Hybrid Metal-Plastic Front End Carrier**

**First Thermoplastic Intake Manifold**

Vehicle: 2005 MY Volkswagen Polo A05GP  
 System Supplier: Simoldes  
 Material Processor: Simoldes  
 Tooling Supplier: Simoldes  
 Material Supplier: Dow Automotive

Vehicle: 1972 MY Porsche 911  
 System Supplier: IBS Brocke  
 Materials Supplier: BASF

The stiffness / weight ratio of the world's first bonded front-end carrier is maximized by adhesively bonding a metal reinforcement to an injection-molded thermoplastic-composite component. By bonding the parts together, stress concentrations are reduced on the composite part and the load is spread over the structure, enabling higher stiffness and load-bearing capacity. The metal is bonded to the composite using a special 2-component acrylic adhesive, which has been designed to structurally bond to low-energy substrates without surface pre-treatment.

The Thermoplastic Intake Manifold was first used on the 1972 Porsche 911. The plastic intake manifold provides significant benefits in the area of weight reduction, cost reduction, and engine performance improvement. This application is now used on most production automotive engines, and has continued to evolve through contributions by suppliers such as BASF, DuPont, Mann & Hummel, Siemens, Freudenberg-NOK, Delphi, and many others. The Hall of Fame Award is selected from plastic applications that were implemented at least ten years ago, with the winner having made a significant and lasting contribution to the use of plastics in the automotive industry.



Accepting the Process/Assembly/Enabling Technologies category award from Suresh Shah is Armin Prinke, Art Lawley, Orhan Iman, Tom Shafer and Dave Recktenward.

Accepting the Hall of Fame Award from Josh Madden is Paul Ritchie and Jay Beker of Porsche.

# 2005 Lifetime Achievement Award

Mr. Shigeki Suzuki, general manager of the Materials Engineering Division of Toyota Motor Corporation in Japan, received the **2005 Lifetime Achievement Award** at the SPE Automotive Division's 35th-annual Innovation Awards Gala. Mr. Suzuki has developed and/or managed development of new polymeric materials for automotive applications throughout his career and will receive his award on November 16th at Burton Manor in Livonia, Mich.

The Lifetime Achievement Award recognizes the technical achievements of automotive industry executives whose work (in research, design, engineering, etc.) has led to significant integration of polymeric materials in vehicles. Past winners of the award include J.T. Battenberg III, chairman and CEO of Delphi; Bernard Robertson, executive vice-president of DaimlerChrysler; Robert Schaad, chairman of Husky; and Tom Moore, retired vice-president, Liberty and Technical Affairs at DaimlerChrysler.

Mr. Suzuki was selected as this year's Lifetime Achievement Award because of his extensive involvement in developing or managing development of a wide variety of polymeric materials for passenger vehicles at Toyota. Prior to his current assignment as manager of the Materials Engineering Division, he held general manager positions in the company's Paint & Finishing Design Department, Organic Materials Department, and Production Engineering Department for the Tahara Manufacturing Plant, which produces plastic components for the Lexus® vehicle line.

Applications he was directly involved in developing include:

- A glass-reinforced composite patch to reinforce a steel door panel on the Soarer® passenger vehicle in 1982.

- A sheet composite pre-preg seat with an adhesive for oily surfaces in 1983 for the Corolla® passenger car.
- A highly filled foam noise-suppression material for pillars on the Crown® passenger vehicle in 1987.
- A structural adhesive tape pre-form for the 1988 Mark II® passenger vehicle.
- A multilayer, highly filled foam pillar material for the Celsior® passenger vehicle in 1988.
- A paste-type, highly filled foam pillar material for the Aristo® passenger vehicle in 1991.
- A structural adhesive for the aluminum hood of the 1993 Supra® sports car.
- Plus various vibration damping sheet materials, adhesives, and steel/asphalt sheet seating materials.

Additionally, Mr. Suzuki managed resources that developed the following materials:

- Fiberglass-reinforced plastic (FRP) top cover for the 1984 Hylux® passenger vehicle.
- Acid-rain-resistant, clear-coat paint for the 1994 Celsior® passenger vehicle.
- High-productivity, water-based paints for the 1996 Camry® passenger car.
- Solventless window adhesive for the 1999 Crown® passenger vehicle.
- A bio-plastic (produced from plants not oil) for the 2003 Raum® passenger vehicle.
- Plus 5 generations of Toyota super olefin polymer (TSOP) for various interior and exterior components.

Suzuki has worked for Toyota for over 25 years and has a strong background in the design, development, and evaluation of rubber, plastic, and paint materials.



*Shigeki Suzuki of Toyota accepts the 2005 Lifetime Achievement Award from Suzanne Cole and Peggy Malnati of the SPE Automotive Division.*

# 2005 Chief Engineer Award

During its 35th-anniversary Innovation Awards Gala the Automotive Division awarded Dave Hill of General Motors Corp. with its first Chief Engineer Award. Hill, who retired at year's end 2005 after 41 years of service, was vehicle chief engineer (VCE) of the Chevrolet Corvette and vehicle line executive (VLE) of Performance Cars at GM. He is the third chief engineer to lead Corvette in the platform's 53-year history, a position he had held since 1993.

The Chief Engineer Award is the newest executive accolade developed by SPE's Automotive Division to recognize exceptional leadership among chief engineers working at global automakers. The award recognizes a chief engineer who:

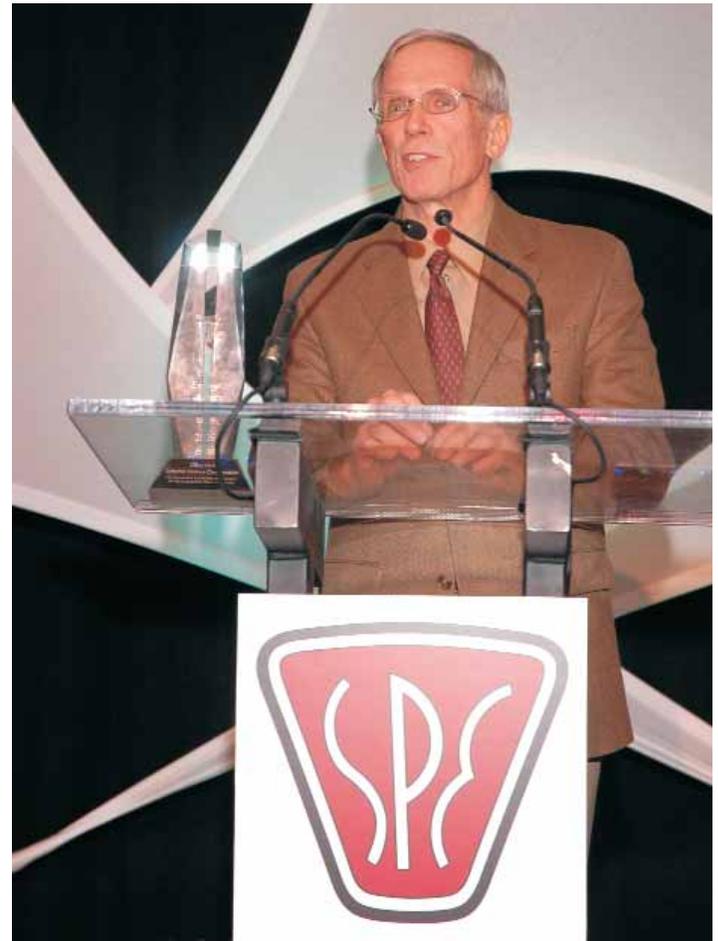
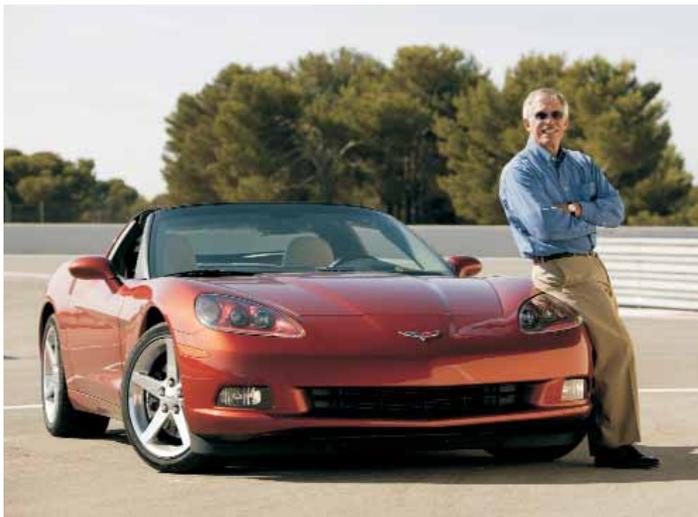
- Has exhibited outstanding leadership in bringing vehicles to market that incorporate polymeric materials;
- Has worked to increase polymeric materials on vehicles throughout his/her career;
- Has led one or more vehicle lines or generations consistently to success in the marketplace, making improvements and refinements that created sustained brand enthusiasm;
- Is viewed by peers as an outstanding leader, exceeding performance expectations while setting the pace for others to follow;
- Is recognized in automotive circles as an outstanding leader and an auto enthusiast; and
- Has been a strong contributor and supporter of activities sponsored by the SPE Automotive Division.

According to Innovation Awards Gala Program Chair, Suzanne Cole, president, Cole & Associates, "Dave Hill is the ideal candidate to receive our first Chief Engineer Award. His long-time leadership at Corvette - a vehicle that has featured plastic body panels from day one, and has pioneered the use of many new polymeric materials - quickly brought his name to the top of our list when we decided to create this award. Dave also is a true car enthusiast and frequently speaks to Corvette clubs around the country. Furthermore, as only the third chief engineer at

Corvette in more than half-a-century, he has had a major role refining and improving that vehicle, and creating sustained brand awareness and excitement."

Hill's career with GM began when he joined the Cadillac Motor Car Division in 1964. He moved through the organization in a variety of engineering positions, and he was named an executive in 1979. In 1982, Hill was named chief engineer of the Cadillac Allante. Following the introduction of the Northstar engine in 1992, Hill assumed chief engineer responsibilities for the Cadillac Deville and Concours. In 1995, Hill was named vehicle line executive of Performance Cars and led the development of the fifth-generation Corvette and the introduction of the Cadillac XLR. Last year, Hill launched the sixth-generation Corvette followed by the introduction of the new 505 bhp Corvette Z06 for 2006.

Hill holds a bachelor's degree in mechanical engineering from Michigan Technological University and a master's degree in mechanical engineering from the University of Michigan.



*Dave Hill of General Motors, retired*

# 2005 Executive Leadership Award

Tom Edson, director - Applied Material and Manufacturing Technology, Advanced Vehicle Engineering at DaimlerChrysler received the **2005 Executive Leadership Award** at the SPE Automotive Division's 35th-annual Innovation Awards Gala.

The Executive Leadership Award was started in 2004 and honors automotive executives who have demonstrated leadership in integrating polymeric materials on global vehicle platforms and who have been recognized within the industry as well as in their community as leaders. While this award's recipient may not have been directly involved in fostering the technical advances of polymers - as the recipient of SPE's other executive accolade, the Lifetime Achievement Award will have been - the honoree will have led his/her company to profitability, increased marketshare, and been at the helm of new vehicle launches that were considered a commercial success. The award's first recipient was Jim Padilla, chief operating officer and president of Global Automotive Operations, Ford Motor Company.

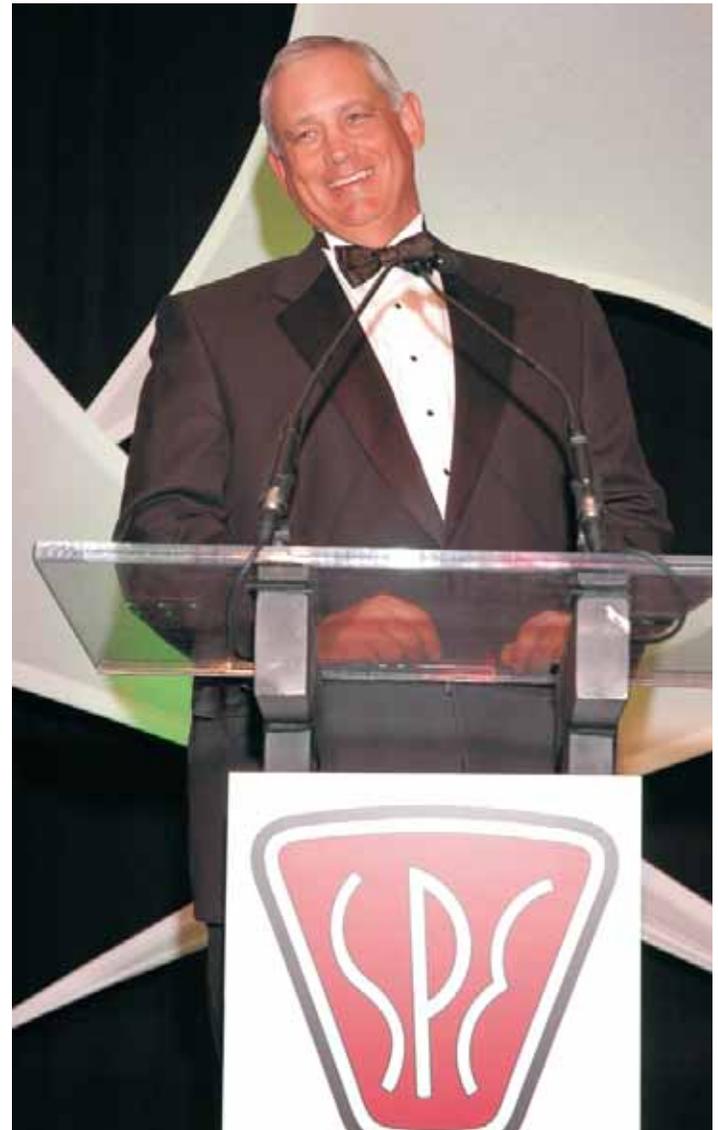
Edson has more than 33 years of experience at DaimlerChrysler, holding positions in Program Management, Vehicle Development, Body Engineering, Chassis Engineering, Proving Ground, and Vehicle Dynamics. He was selected as the winner of this year's Executive Leadership Award because of his dual experience in business leadership and as a technical champion. He has demonstrated business leadership during successful new vehicle launches such as the PT Cruiser flexible-activity vehicle and, on the technical side, he has overseen selection and integration of polymeric materials on multiple platforms. Additionally, he has demonstrated receptiveness to suppliers approaching DaimlerChrysler with new technologies and new ideas for polymeric applications, and he has provided opportunities for suppliers to demonstrate their new technologies.

According to Suzanne Cole, president of Cole and Associates and the 2005 SPE Innovation Awards Gala program chair, "Tom has a great eye for design - from the big picture down to the smallest detail. He also has an amazing memory, retaining details about past projects, which is one of the ways he helps keep suppliers from repeating past mistakes. As a supplier, you have to be prepared when you meet with him. He knows how to cut right through the fluff and ask the difficult questions. However, if you are prepared and you can deliver results, then Tom will support you all the way to the top.

In his current position, Edson is responsible for seeking out new technologies and materials for introduction into production vehicles within a 2-3 year timeframe. As the former director of Body and Interior Engineering - Liberty and Technical Affairs, Edson was part of an award-winning

team that developed the patented, multi-position PT Cruiser shelf-panel. He also worked on development of midsize plastics-intensive composite vehicles and as a champion of extruded paint film technology to eliminate paint on specific components. He has demonstrated a strong commitment to education and development of engineers at both DaimlerChrysler and elsewhere. He has provided longstanding support of SPE's Automotive Division and Detroit Section conferences, technical symposia, and other events.

Edson holds a B.S. in Engineering Mechanics and an M.S. in Mechanical Engineering from the University of Michigan, as well as an M.S. in Engineering Management from University of Detroit-Mercy, and an M.B.A. from Michigan State University. He started his education and career at the former Chrysler Institute. He also is a member of the Materials Technical Leadership Council on USCAR, and the Joint Policy Board of the Auto/Steel Partnership.



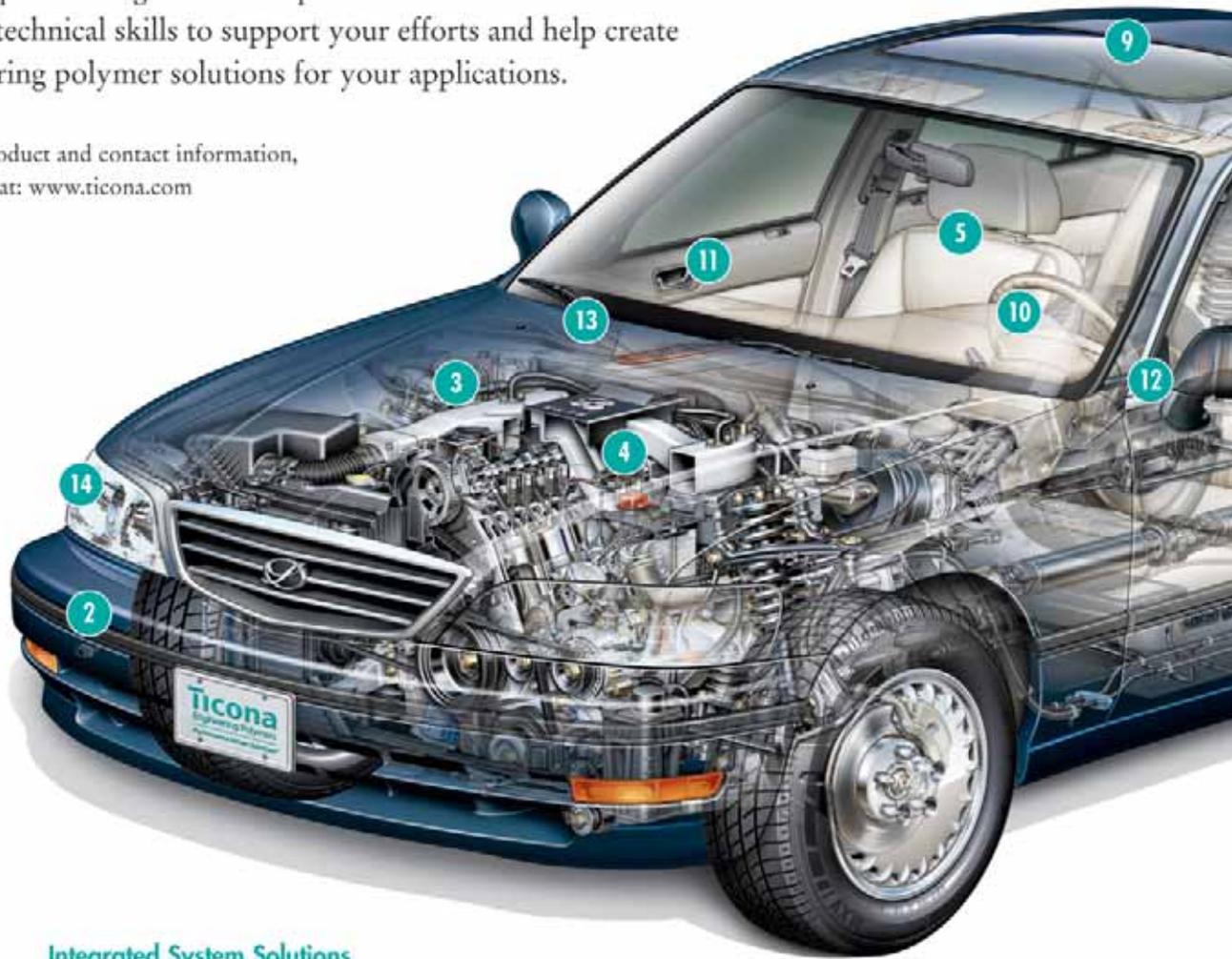
*Tom Edson of DaimlerChrysler*

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# Ticona

## Engineering Polymers

2005 Innovation Awards Program

**Gala Sponsor**



**Above Top:** Michigan Secretary of State Terry Lynn Land

**Above Center:** Executive Leadership Award Winner Tom Edson (DaimlerChrysler), with Suzanne Cole, SPE Awards Program Chair, Shigeki Suzuki (Toyota), Lifetime Achievement Award Winner, and Norm Kakarala, SPE Automotive Division Chairman.

**Above Bottom:** Norm Kakarala introduces Shigeki Suzuki to Len Czuba, SPE International President.

**Right:** Ticona Engineering Polymer employees pose with the now infamous Ice Sculpture Martini Bar.



# VIP Reception 2005

The VIP cocktail reception (reserved for program sponsors and senior level automotive executives) was one of the absolute best networking opportunities in town, according to several supplier executives in attendance. This year's VIP reception featured lighted performance vehicles, a unique Ice Sculpture bar (for martini's "shaken, not stirred") and a string quartet. This created a very conducive environment for Tom Edson, Dave Hill, Shigeki Suzuki and top level General Motors, Toyota and DaimlerChrysler executives to interact with program sponsors and VIPs.



# Innovation Awards Program Questions and Answers

## How does my company benefit from participating?

- Involvement in the process drives and rewards innovative thinking, and promotes excellence.
- Keep up to date on the latest innovations from other engineers, designers, competitors, and customers.
- Reward your team and company through worldwide recognition.

## Is there any cost to make a nomination?

- No, there is no application fee. You must supply SPE a representative part/assembly, and be willing to make presentations to the judging committee(s).

## Who can make a nomination?

- Nominations can be made by anyone knowledgeable of the achievement - material supplier, molder, Tier 1, OEM, etc.
- OEM approval is required for the nomination to be considered.

## Where do I get the nomination form, and when is the deadline for nominations?

- The electronic nomination form can be downloaded from our website at [www.speautomotive.com](http://www.speautomotive.com). It is usually posted by early June. The deadline for nominations varies each year, but is usually around the middle of September.

## Is my application eligible?

- Parts must be in mass production and on a vehicle that is available for purchase by November 1 of the year of the judging.
- The vehicle can be manufactured anywhere in the world.
- There is no minimum number of vehicles required.
- The application (innovation) cannot have previously been nominated.

## How do I know if my application has been previously nominated, and/or whether it is innovative enough?

- You really can't know. The past 5 years of the Award Program can be viewed at our website, but it can be tedious reviewing the previous nominations. You can contact the SPE Automotive Division board for guidance.
- If there is any doubt, we strongly encourage you to nominate your application. If it has been nominated previously, we will let you know. Many times people are so involved in the application development process that innovation and uniqueness of their application has become transparent to them.

## What are the categories, and is the judging criteria the same for each category?

- The categories are **Body Interior, Body Exterior, Chassis/Hardware, Powertrain, Materials, Environmental, Process/Assembly/Enabling Technologies, Performance and Customization, Safety, and Hall of Fame.**
- For Interior, Exterior, Chassis/Hardware, and Powertrain, the judging compares the attributes of the nomination to the others in the same category. These tend to be design-related innovations, but often have process or materials innovations that helped the application succeed. Examples might include a new invisible airbag tear-seam design, a new bumper energy absorber, metal replacement for powertrain, a new plastic door module, etc.

➤ In the Materials category, the focus of the evaluation is how innovative is the material used in the application, and the benefits the new material provides, with less emphasis on the actual part or application. Past winners include nano-composite TPO, carbon fiber SMC, and UV-stable TPU.

➤ The Environmental category looks at the long-term sustainability of plastics. Applications should be nominated if they make use of post-industrial or post-consumer recycle, especially in decorative or structural applications. Also, if an application is uniquely designed for recycling, it may compete well.

➤ The Process category is straightforward, where the primary innovation is in the process (gas-assist, multi-layer blow molding, co-extrusion, etc). Once a process has been submitted, another unique part made with the same process cannot be submitted in this category in following years; the part can compete in any of the other categories. Assembly/Enabling Technologies is a "catch-all" category where the primary innovation is related to unique assembly methods (welding, snap fits) or some other technology that contributes to the overall application development process.

➤ In the Performance and Customization the judges will be evaluating how plastics contributed to the important industry trends in personalization and vehicle enhancement. Nominations will be judged on the effective and creative use of plastics to enhance vehicles.

➤ Applications in the Safety category will be judged regarding the effective application of plastics to improve the safety performance of vehicles.

➤ The Hall of Fame Award will be presented for an innovative application that has stood the test of time, being in continuous production for over 10 years.

## My part/application could fit multiple categories; which one do I enter it in?

➤ This often happens when a new design requires development of a new resin and/or new processing techniques. By answering the questions in the nomination form, this can often lead you to identify the single most innovative aspect of the application. The review committee may recategorize the nomination upon review.

➤ The nomination may also be moved to another category if that category is filled with strong nominations. For example, an exterior nomination with unique process may be moved to the Process/Enabling Technologies if that category has a low number of nominations.

➤ Our objective is to get nomination in the category in which it will compete best, and have the best chance to win.

## Who judges the competition?

➤ The first round of judging is by the Board of Directors of the SPE Automotive Division and select industry experts. The finalists that will move on to the Blue Ribbon Judges are selected.

➤ The Blue Ribbon judging panel consists of leading industry experts, including journalists from automotive and plastics publications, university professors, automotive/plastics consultants, and retired automotive engineers.

➤ The Blue Ribbon panel selects the category winners from the list of finalists in each category, and the Grand Award Winner from the list of category winners.





# Innovation Awards Program History

"Most Innovative Use of Plastics"

Recognizing Innovation for 35 years

## Grand Award Winner Summary

Year	Category	Part Name	OEM	Make/Model	Tier 1 Supplier	Resin Supplier
2005	Body Exterior	Composite In-Bed Trunk	Honda	2006 Ridgeline	Meridian	Meridian / Ashland
2004	Body Interior	Door Trim with Integrated Acoustic Chamber and Subwoofer	Ford	2005 Mustang	Visteon Corporation	Ferro Corporation
2003	Body Exterior	smart Roadster Roof Module	DaimlerChrysler	2003 smart Roadster	Arvin Meritor	GE Plastics
2002	Process/Enabling Technologies	Extruded Polymer Film Fascia	DaimlerChrysler	2002 Dodge Neon	DCC - Belvidere Assy Plant	A.Schulman / ExxonMobil
2001	Materials	Nano-Composite TPO	GM	2002 Astro & Safari	Blackhawk Automotive	Basell USA, Inc. / Souther Clay Products
2000	Chassis/Hardware/Powertrain	Controlled Energy Management Bumper Isolator	Ford	2001 Ford Windstar	LDM Technologies	ExxonMobil Chemical
1999	Process/Enabling	Fan Shroud and Reservoir Assembly	DaimlerChrysler	Dodge Dakota	Textron	Montell
1998	Body Exterior	I-Section Bumper Beam	Mitsubishi	1998 Galant	Continental Structural Plastics	Azdel, Inc.
1997	Environmental	"Carpet to Car Parts"	Ford	All N.A. vehicles using nylon air cleaners	Visteon/Ford, Sandusky Plastics Plant & Atul Vora DuPont	DuPont Automotive
1996	Chassis/Hardware	Structural Battery Tray	GM	1997 EV-1	Delphi Energy & Engine Management Systems, Cambridge Industries	Exxon Chemical Co.
1995	Chassis/Hardware	Integrated Front End System (I.F.E.S.)	Ford	Taurus/Sable	Budd Co., Plastics Div.	Budd Co.
1994	Powertrain	Thermoplastic Air Intake Manifold	GM	Northstar Engine	Freudenberg-NOK	BASF
1993	Chassis/Hardware	Front Suspension Stabilizer Link	Ford	1994 Taurus/Sable	Lemforder	BASF
1992	Body Interior	Instrument Panel System	Chrysler	1993 LH Platform	Lescoa, Acustar, Davidson, Blue Water	GE, Exxon, Rhotech, BASF, Davidson Vinyl
1991	Body Interior	Integrated Child Seat and Top Impact Pad	Chrysler	1992 Plymouth Voyager, Dodge Caravan	Intergram, Barnum Company, Pac-Lite Products	Exxon Chemical, Huntsman Chemical
1990	Body Exterior	Exterior Door Panel	Saturn	1991 2-Door and 4-Door	Saturn Corp.	Dow Chemical
1989	Chassis/Hardware	Composite Wheel Passenger Car	Chrysler	1990 Shelby CSX	Goodyear	Dow, Reichold
1988	Body Exterior	Front Fender	GM	1989 Cadillac "C" (Deville & Fleetwood)	BOC-FAD	GE Plastics
1987		Quarter Panel Assembly - Sportside	GM	Truck & Bus		
1986		Quarter Window	GM	Pontiac Fiero		
1985		Windshield w/Anti-Lacerative Layer	GM	Cadillac		
1984		Drive Shaft	Ford	Truck		
1983		Exterior Body Panels	GM	Pontiac		
1982		Tailgate Assembly	GM		Fisher Body	
1981		Radiator Core End Caps	Ford			
1980		Rear Axle Leaf Spring	GM	Chevrolet Corvette		
1979		Grille Opening Panel Assembly	Ford	Truck		
1978		Bucket Seat Frame	GM	Chevrolet Corvette		
1977		Instrument Panel	Ford	CL-9000 Truck		
1976		Fender Aprons	Ford			
1975		One Piece Jeep Top	AMC	Jeep		GE Plastics
1974		Fascia and Rear Bumper Cover	GM	Chevrolet Monza		
1973		Block Heater Motor Housing	Ford			
1972		Radiator Fan Shroud Assembl	GM	Buick		
1971		Transmission Reactor	Ford			



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# Meeting Minutes - Automotive Division Board Planning Meeting

December 5, 2005

by Tom Pickett, Division Secretary

## Attendance:

Norm Kakarala, Tom Pickett, Nippani Rao, Kevin Pageau, Fred Deans, Peggy Malnati, Ed Garnham, Monica Prokopyshen, Dave Reed, Brian Grosser, Maria Ciliberti, Suzanne Cole, Terry Cressy, Mark Lapain, Josh Madden, Jay Raisonni, Ron Price

Meeting Called to Order. Chairman Norm Kakarala called the meeting to order at 5:47 PM. Meeting minutes recorded by Secretary Tom Pickett.

1. Debriefing of the Awards Event - Norm Kakarala congratulated Suzanne Cole and her team for a great SPE Innovation Awards Night. Norm indicated that the event's planning committee had met before the board meeting to discuss the successes of the event and potential improvements.

2. Budget - Brian Grosser had submitted the SPE Automotive Division tax form by the deadline. Brian presented the treasurer report. Net proceeds for the 2005 Composites Conference to the Automotive Division were \$15,894. He also noted that the newsletter is still losing money. The Board discussed whether or not the Division should continue to publish a hard copy of the newsletter, but agreed to continue. Brian suggested we should revisit ways of increasing revenue, such as through more advertising, to help offset production costs.

3. Minutes of October Board Meeting Approval - Tom Pickett presented the October Board Meeting Minutes. Minutes were approved by the board as written.

4. Membership - Norm reported that Suzanne Cole was nominated by the Automotive Division for the SPE Honored Service Member Award. Rose Ryntz was nominated for SPE Fellow Award. SPE National will announce the award winners the end of January.

5. Councilor's Report - Nippani Rao said there is no report since the last Councilor's meeting. Nippani said there will be SPE National elections next year.

6. Input for PRIDE Report - Mark Lapain is collecting the necessary information to complete the Division's application for this year's PRIDE Report.

7. Newsletter - Kevin Pageau informed the Board that the deadline for the January newsletter is December 16th. He requested that individuals submit their articles by this time. Kevin indicated the January newsletter would highlight the Innovation Awards Gala.

8. ANTEC Technical Program Update - Tom Pickett gave an update on the Automotive Plastics Session planned for ANTEC. The Division has received abstracts for the session, and is already reviewing them. Tom, the technical program chair, is being helped by Norm Kakarala, Michael Shoemaker, Jay Raisonni, Suresh Shah, and Kaylan Sehanobish.

9. Education Committee Report - Norm was invited by the SPE Detroit Section to attend the PlastiVan Program demonstration at Eaton as a representative of the SPE Detroit Section Education Committee. Norm updated the Automotive Board on potential improvements to increase the value of the program. The Detroit

Section Education Committee plans to convey their suggestions to the PlastiVan Program. Suzanne Cole asked the Board to renew its support of UMPIR, University of Michigan's Program for Injury Research and Education. Fred Deans made the motion to support UMPIR. Peggy Malnati seconded the motion. Monica Prokopyshen indicated that the annual Explorathon 2006 is scheduled for Wednesday, April 5, 2006 at Detroit Country Day School. Monica will confirm PlastiVan availability. Monica also discussed the Lightspeed contract renewal. Lightspeed produces the modules summarizing all nominations for the past year's Innovation Awards Competition, which are accessed from the Division's website at [www.speautomotive.com](http://www.speautomotive.com). Also, Monica discussed the contract renewal for the Division's website.

10. Engineering Materials Meeting Update - Tom Pickett gave an update on the material technical meeting and expo. The event will be entitled: Design & Development in Automotive Engineering Plastics - A Technical Meeting & Expo. Tom and Nippani Rao are co-chairs of this meeting, which is being jointly planned and executed between the Automotive Division and the Detroit Section. The event will take place in April. A planning committee is in place and is in the process of obtaining presenters, sponsors, and exhibitors.

11. Intersociety - Mark Lapain informed the board there is an intersociety holiday meeting hosted by the Engineering Society of Detroit on 12-6-05 that Automotive Division members are invited to attend.

12. New Business - Brian is working on a new contract for clerical support with APC. Board decided to seek more representatives from transnational OEMs on the SPE Automotive Division Board.

13. Meeting Adjourned at 7:45 PM.

14. Next Meeting - Monday February 6, 2006 at 5:30 PM at the American Plastics Council's Automotive Learning Center building, 1800 Crooks Road, Troy, MI, USA.



# FREE booklet on Intellectual Property



Bill Abbatt was a speaker at the 5th Annual SPE Automotive Composites Conference.

His talk was entitled 'Strategic Management of Intellectual Property.' Intellectual property (IP) is value created by the mind: e.g., an invention, computer software, a brand name, and know-how. Respectively, these assets may be protected by a patent, a copyright, a trademark registration and a trade secret. IP accounts for a significant percentage of all corporate wealth, much of which is unexploited.

IP asset management calls for you to identify it, acquire it, and capitalize on it. Successful, long-term corporate performance requires control over value creation, preservation and enhancement. It cannot be sustained without managing intellectual property.

Bill is a shareholder at Brooks Kushman. Bill's firm has written a 112 page booklet entitled "Intellectual Property Primer." It includes some rudimentary templates for basic forms.

If you would like a free copy, send your contact information to: [jnoble@brookskushman.com](mailto:jnoble@brookskushman.com), or telephone Judy at 248-226-2736.

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**ANTEC 2006**  
**Annual Technical Conference**  
Charlotte, North Carolina May 7-11

## Automotive Sessions at ANTEC

SPE's Annual Technical Conference (ANTEC) will take place in Charlotte, North Carolina this year on May 7 - 11. The conference is the world's largest international technical gathering of engineers, scientists, academics, and business professionals working in the field of plastics development and application. ANTEC is a great opportunity to hear presentations from industry leaders.

The Automotive Division will have a full-day session at the conference this year, with at least 12 papers being presented. Each year the Division's Automotive Session is well attended by ANTEC guests.

This year, Tom Pickett is chairing the Division's Automotive Session. Supporting Tom in selecting and organizing papers for the event are Norm Kakarala, Jay Raisoni, Suresh Shah, Michael Shoemaker, and Kalyan Shehanobish.

We expect this will be an informative session covering many of the technical issues and advances in plastics for the automotive industry.

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# Bonded Hybrid Automotive Front End Carriers<sup>1</sup>

Samar Teli, Pádraig Naughton, Alexander Droste, Ashish Kotnis - Dow Automotive<sup>2</sup>

The front-end carrier (FEC) refers to the part of a car that supports most of the cooling package, headlights, latch and various other components. It also ties the upper and lower longitudinal rails and plays a role in the global and local structural stiffness of the car. The trend is to use such a FEC in a module that is supplied for assembly after the engine is mounted. FECs are currently a combination of plastics, to give form and various functions, and metal, to withstand mainly crash loading. Methods such as mechanical fasteners or over-molding are being used to form the hybrid plastic-metal part.

Dow Automotive offers a new solution that combines its application development capability and materials R&D. This concept consists of an injection-molded plastic (LGF-PP) bonded to an e-coated metal reinforcement using BETAMATE<sup>3</sup> LESA adhesive. This approach enables a closed-box profile with a continuous joint between the metal and the plastic that is not possible using traditional methods. The result is a significant increase in the stiffness/weight ratio as well as reduction in package space utilization. It also offers better design flexibility compared to other hybrid solutions and provides better bending and torsional stiffness. This paper will outline a prototype development demonstrating the technology as well as developments related to current programs.

## The Case for Metal-Plastic Hybrids

One of the main advantages of plastic is the ability to mold complex shapes and integrate various functions into a single part. This eliminates parts and process steps. In an ideal world the engineer would like a material with the density and moldability of plastic and the stiffness and strength of steel. An attempt to get closer to this ideal leads to the development of plastic composites, in various forms, to help boost the mechanical properties by adding glass, carbon fiber or other reinforcements, while maintaining the fabrication advantages. In most cases the designer has to compromise based on costs, packaging space, performance and weight to achieve an acceptable solution.

In recent years the trend in the automotive industry has swung towards the use of metal-plastic hybrid systems. The aim here is to use the metal for the majority of the mechanical performance and combine this with the functional integration and complex shapes, which the plastic enables. This is now becoming the norm, for instance, for front-end carriers, where the metal-plastic combination form an upper cross-member to contribute to the stiffness of the car and withstand loading such as latch pull [1, 2]. Examples are to be seen on Ford, VW, Audi, Renault, Nissan and other vehicles.

A study of the choice of plastics and the methods to combine these in a metal-plastic hybrid was presented in a past SPE conference [3]. This showed that the performance of a long-glass—fiber-filled polypropylene material bonded to the metal reinforcement with the aid of BETAMATE LESA adhesive gave superior performance to the other methods of forming hybrid systems. Some of the data for torsional stiffness per unit mass is shown in Figure 1.

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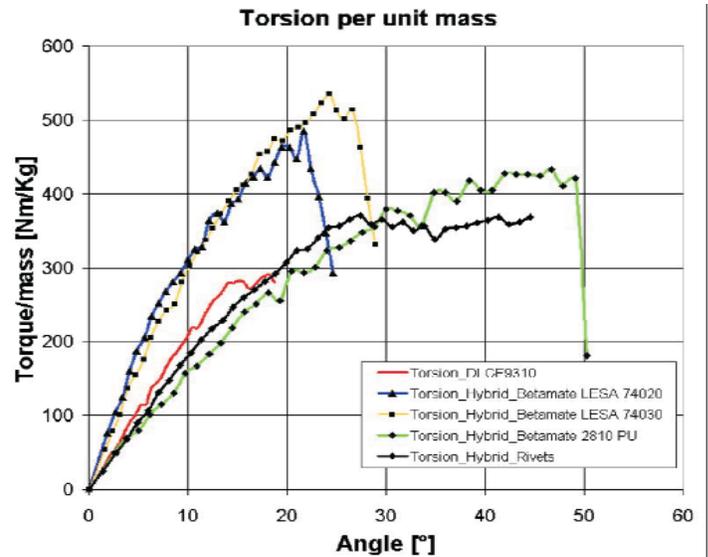


Figure 1: Torsion results per unit mass for various joining techniques in a metal-plastic hybrid beam

## Front-End Module (FEM) Development

In the most recent development in front-end carrier technology, VW has launched the Polo with a bonded hybrid metal-plastic front-end carrier, using the technology developed by Dow Automotive. This is the culmination of work conducted on the technology development, prototyping and testing [2], which showed significant mass reductions for improved stiffness performance. This development was based on the VW Golf IV, as shown in Figure 2. The stiffness was increased by 50-100%, depending on temperature, and the mass was reduced by 25%.

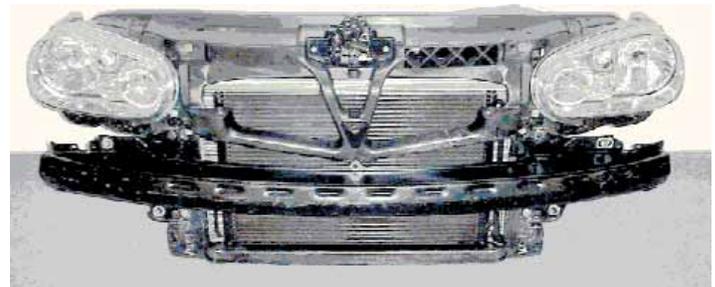


Figure 2: Assembled Prototype FEM with Bonded Hybrid FEC.

Since completion of this work, the technology has been further developed, with improvements in the adhesive<sup>4</sup> performance, which ensures high performance in impact loading, due to the increased elongation properties.

The VW Polo A04GP went into production early in 2005, with a front-end carrier assembled by bonding the metal reinforcement to the LGF-PP injection-molded carrier using adhesive<sup>4</sup>. Working together with Dow Automotive, Volkswagen developed a solution that not only reduced weight, but at the same met all requirements for part rigidity and cost requirements. Weight reduction of 25 % (or 1 ½ kg) per part was achieved in comparison to other solutions. A photograph of the Polo front-end carrier, with the metal reinforcement in position, is shown in Figure 3.

<sup>4</sup>BETAMATE LESA® adhesive

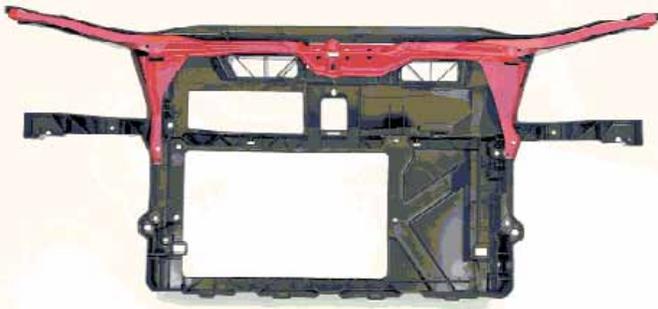


Figure 3: The bonded-hybrid front-end carrier of the new VW Polo, which recently went to production.

### Bonding Approach

The approach proposed and presented in this paper is to bond the metal to the plastic using an adhesive. Adhesive bonding provides a continuous joint between the metal and the plastic and allows a closed section to maximize the moment of inertia and hence the stiffness (Figure 4). A continuous joint distributes the load uniformly and reduces difficulties with stress concentrations. This increases the load bearing capability of the bonded structure. This enables (1) increased total mechanical performance of the structure; (2) reduced weight of the structure for the same performance as other approaches; (3) reduced packaging space to achieve the mechanical performance targets; or (4) a balance of the various benefits according to the requirements.

Design of the bond line and the layout of the parts for assembly can play an important role in the performance and the assembly process. In general the parts can be designed for automatic application of adhesive and the assembly of the parts by a robot. The use of adhesive<sup>4</sup> enables bonding without the use of plasma or flame treatment and eliminates the need for a primer, even on low energy surfaces, such as PP substrates.

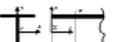
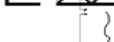
		Comparison Factors					
		Stiffness			Load bearing Capacity		
		Torsion Tz	Bending By	Bending Bx	Torsion Tz	Bending By	
	Baseline	1.0	1.0	1.0	1.0	1.0	
	Absolute A	1.0	1.9	1.0	1.0	1.4	
	Factor per unit volume B	1.0	1.9	1.0	1.0	1.4	
	Absolute A	54.0	2.0	1.0	6.6	1.6	
	Factor per unit volume B	35.0	1.3	0.7	4.2	1.0	
	Absolute A	73.0	3.7	1.1	13.5	3.8	
	Factor per unit volume B	54.0	2.7	0.8	10.0	2.8	
	Absolute A						

Figure 4: Comparative Analysis of Stiffness and Load Bearing Capacity of Sections.

Additional benefits brought by bonding include:

- More flexibility in the development process, reducing the costs when changes occur since it may be possible to change one tool design instead of both e.g. changes to the plastic part which are not in the bond line region can be introduced without the need to modify the tool for the metal part.

- Reduced risk of damage to the e-coated metal parts, since handling of the parts is limited to the assembly onto the plastic part. This avoids contact with metal tools, which can chip the coating.
- Careful and well thought out design will enable later extension of metal parts, or variations in the design without changes to the mold for the plastic part.

### Future Trends for FECs

It is widely expected that the use of FEMs and plastic-metal hybrid FECs will increase significantly in coming years. There is a trend towards injection-molded carriers since they allow more functional integration. Also, injection molding is widely available and highly used process, allowing production in most parts of the world in large volume with cost effectiveness. The need for better cost management and reduction of weight will inevitably lead to better-engineered solutions using lower cost materials such as PP, with fiber reinforcement to obtain stiffness. Long glass fiber materials are in many cases a good choice to maintain the impact resistance and durability of the structure. Online compounding, introducing additives and glass rovings directly on the injection molding machines is very interesting emerging technology offering cost advantages and flexibility.

In addition to structural and process requirements, the design/geometry of a front-end carrier is driven by 2 additional factors:

- 1) Geometry and design of components assembled to the front-end carrier:
  - Cooling unit
  - AC Condenser
  - Charging air cooling unit
  - Additional liquid cooling units
- 2) Styling and design of visible components influenced by the front-end carrier:
  - Bonnet / latch design
  - Wing/fender design
  - Bumper design
  - Headlamp design
  - Grille and fascia design
  - Pedestrian safety regulations, crash and stiffness specifications

Figure 5 shows an example of the regions that influence these factors. Region A relates to the assembly of the various components on the carrier, while region B influences, or is influenced by, the styling of the head lights, the bonnet, bumper mountings and wings.

Current platform strategies at various OEMs promote the idea of using carry-over parts in non-visible areas. For front-ends it could be the use of one cooling unit for different cars built on the same platform. Modifying the exterior design of the bumper fascia, headlights, bonnet and wings then differentiates the styling. The combination of these requirements leads to a modular front-end carrier design (shown in Figure 6).

Part A forms the outer shell and part B forms the lower, inner shell of a closed box. The two parts are bonded together to form a stable, stiff structure. The enclosed space opens opportunities to incorporate air ducting functions and/or fluid reservoirs, as well as providing a structure, which can be tuned to manage energy absorption in pedestrian impact.

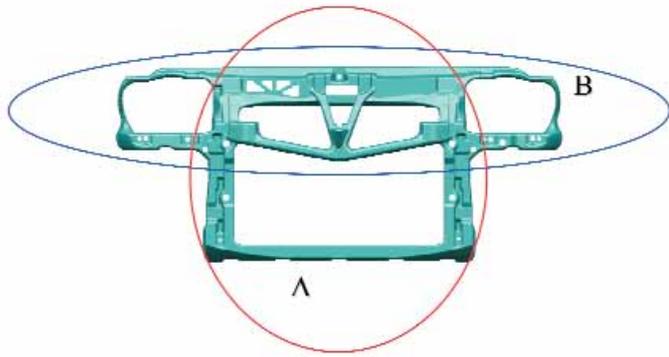


Figure 5: Platform and design driven areas on front-end carriers

Additional simple metal reinforcements can be added in the same bonding process to manage crash performance.

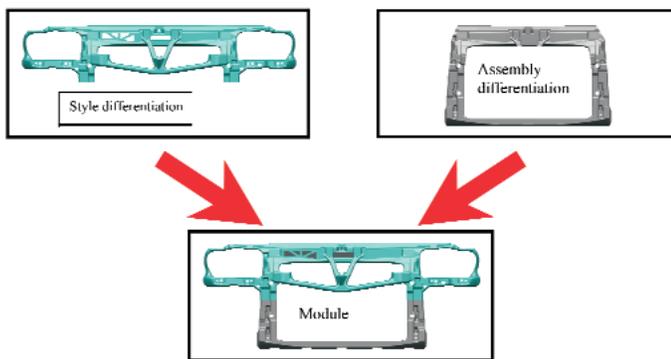


Figure 6: Functions of components making up the front-end module

### Conclusions

Hybrid plastic-metal systems will play an important role for the future due to their better stiffness/weight ratios. It is expected that hybrid solutions will take on a much broader meaning than the injection overmolding approach, extending to compression overmolding or a trend towards bonded systems, which offer the possibility to further increase stiffness through closed sections,

and increase development flexibility because of interdependence in design. Also some of the new requirements such as pedestrian safety and recycling will highly influence the FEC designs, leading to designs that balance stiffness and structural behavior to meet increasing mechanical demands and assemblies that address disassembly and recycling needs.

Further integration of functions and front-end components will be also another important factor in driving future FEC solutions. Integration of hood and possibly fenders into the FEM is one possibility, adding a new dimension to the meaning of front-end module.

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# Education Report

Monica Prokopyshen

## Innovation Awards Student Participation Program

This year twenty students from the College for Creative Studies, Ferris State, Wayne State and the University of Michigan, Dearborn assisted in various capacities with the Innovation Awards program held November 16, 2005 at Burton Manner. They got to see and touch the most innovative automotive plastics applications of 2005 and network with over 800 industry insiders, including the award winning designers and engineers.

Participants from the College for Creative Studies (CCS) included: Leon Fitzpatrick, Mark Reisen, Aditya Mahajan, and Chris Piscitelli from the Transportation Studies Design Program. Engineering was represented by 8-10 Ferris State students including Sara Westerdale; Wayne State University students Najwa Abouhassan, Yara Alame, Raquel Bellamy, Tamer Girgis, and Gurmeet Singh; and the University of Michigan Dearborn students Glenda Patch, Mike Ramey, and Gabriel Scruggs.

Many thanks to the SPE Detroit Section for sponsoring the student program this year, and for the students who volunteered on this intense, hectic evening. Special thanks to Chris, Mark and Leon, CCS veterans who helped out a second year in a row.

## Santa Should've Shopped at CCS

If Santa had, he could have packed his sleigh (inside and out) more efficiently and made it more versatile and fun. He would have delivered gifts to delight car drivers of all ages. Tasked with using plastic intensive designs to fulfill an unmet OEM or aftermarket vehicle need, transportation studies students wowed the American Plastics Council (APC) and SPE Automotive Division and Detroit Section representatives with some "must have" vehicle add-ons. From ergonomic snowboard/ski carriers to modules that let you redefine and customize the interior space of your vehicle and more, the students delivered on design. Congratulations. Thanks to Jim Kolb of the APC for leading this effort and to Josh Madden for sharing his wealth of design knowledge with the students.



Left: Neil Cox, CCS student, displays his "Roof Rack System - Fold down rack and secure storage."



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*Event is Scheduled for April 25, 2006*

Tom Pickett

Norm Kakarala's vision as the 2005-2006 Chair of SPE Automotive Division is to have an annual materials conference that will educate and promote the latest advances and developments in engineering plastics used in automotive applications. That vision is becoming a reality as the Automotive Division teams up with the SPE Detroit Section to hold a 1-day mini-tech technical conference and expo in late April in the Detroit area. The event is being called Automotive Design & Development with Engineering Plastics.

Tom Pickett and Nippani Rao are the event's Co-Chairs; and the planning committee is comprised of many Division and Section members, including: Norm Kakarala, Mike Shoemaker, Terry Cressy, Tom Miller, Ron Price, Jim Kolb, Pat Levine, Cindy Job, Suresh Shah, Jay Rasoni, Peggy Malnati, Maria Cilberti, and Venkatakrishnan Umamaheshwaran.

It will be a one-day conference on Tuesday, April 25, 2006 at the Best Western Sterling Inn Sterling Heights, MI. There will be a full day of technical presentations, exhibitors, lunch, reception, and dinner. After dinner there will be a keynote speaker.

Those interested in making a technical presentation (no formal papers are required) should contact Mike Shoemaker as soon as possible at (248) 393-3074 or [mrshoemaker@dow.com](mailto:mrshoemaker@dow.com).

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The full sum of \$110.00 can be used to compile the aggregate amount of miscellaneous deductions, of which that in excess of 2% of the taxpayer's adjusted gross income can be deducted. Remember, however, you can't deduct any portion of your dues twice. It's an "either/or" situation.





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