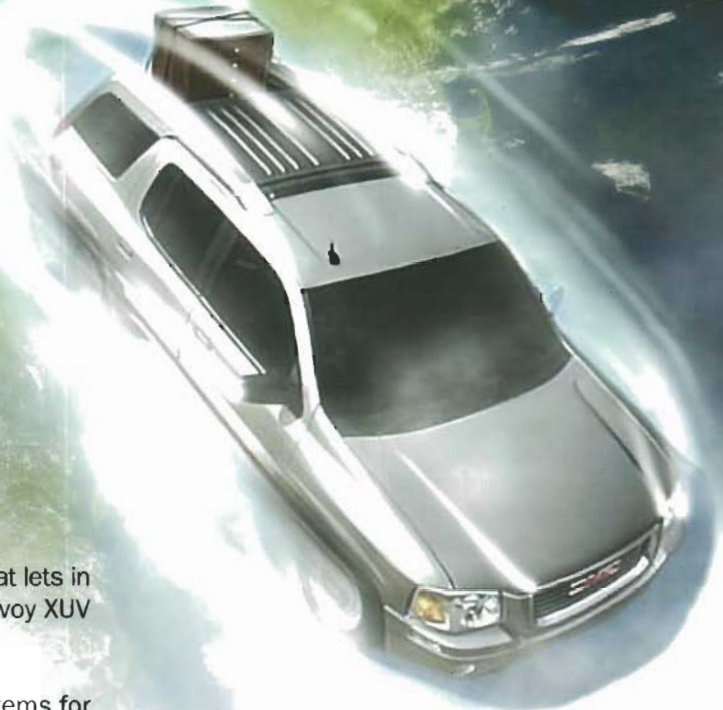


COMPOSITES 2004

THE SKY'S THE LIMIT



It's really quite nifty: A retractable rear roof that lets in the sky - as well as cargo - on the 2004 GMC Envoy XUV sport utility vehicle.

Molded and painted by Meridian Automotive Systems for Inalfa Roof Systems, the sheet-molding composite (SMC) roof assembly moves forward to clear space for bulky cargo. "It's another exciting example of how composites can provide distinct advantages in niche vehicles," says Dan Dowdall, engineering director-composite products, at Meridian. "In addition to creating new ways to utilize space in an SUV, the retractable roof is light, tough and can withstand extreme changes in weather conditions," Dowdall adds.

The Envoy XUV also features a composite, next-generation MidGate® to separate the passenger compartment from the cargo area. With the rear window lowered into the MidGate, which then flips forward to become flush with

the cargo floor, loading and unloading is **made even easier**. Additionally, the 2004 XUV features a **SMC composite endgate** inner panel, manufactured by ThyssenKrupp Budd.

GM also chose SMC and a structural reaction injection molding (SRIM) composite for the 2004 Hummer H2 SUT endgate assembly. The key value is easier close-effort for the consumer and it also eliminates corrosion in an area historically susceptible to rust damage. The use of SMC and SRIM provides an extremely tough and durable component. Meridian fabricates the H2 endgate.

...But 'Down-to-Earth' Also Applies

Thanks to advancing technology such as "Tough Class A" (TCA™) SMC and new coating and primer developments, such as BASF Corporation's Dynaseal™ UV-sealer, Fusion UV Systems, Inc.'s UV-curing process and Red Spot's Pop Free™, microcracks or "pops" have practically disappeared as a concern for Class A composite body panels in terms of surface quality. Composites also are carving new inroads in under-hood and structural applications, territory long held by competing materials, where their advantages of light weight, toughness and tooling cost savings are winning new converts.



The 2004 GMC Envoy XUV features a retractable roof assembly molded from SMC. It also has a composite MidGate and a SMC composite endgate inner panel.



Composite valve covers for Daimler-Chrysler's 4.7-liter V-8 engines were developed without prototypes in 12-months and reduced cost by \$10 per component.



Meridian Automotive Systems launched the front bumpers on the Peterbilt 387 using the RIM-DCPD process, which provides a smooth appearance, low mass and high impact resistance.

Why Composites are Increasingly the Material of Choice

- Composites typically reduce weight by 35 percent, helping to improve fuel economy and reduce exhaust pollution.
- Tooling cost savings versus steel can be up to 50 percent.
- Composites speed time-to-production, creating cost savings in the process.
- Composites are ideal for niche vehicles and applications because they can be moved into production quickly and offer extraordinary design freedom to create distinct products that stand out from the crowd.
- Composites can combine numerous, complex metal components into a single module, saving across the board in tooling and assembly.

GM chose SMC and SRIM for the 2004 Hummer H2 SUT endgate assembly.



Other Composites Also Make Gains in '04 Models

RRIM (reinforced reaction injection molding) finds new applications in the '04 models, including the rear fenders on the Silverado QuadraSteer pickup. It provides weight reduction, and better dent and impact-resistance compared to sheet metal.

The load floor on the GMC Envoy utilizes a structural reaction injection molding (SRIM) composite. This provides for a weight reduction and durability that makes it easier for the consumer to handle. Both the GMC load floor and the Silverado fenders use Bayer's polyurethane technology.

In 2003, Meridian launched the Peterbilt 387 front bumper and the Freightliner M2 and Coronado fenders using the RIM-DCPD (di-cyclopenta-diene) process. Commercial truck customers appreciate DCPD's smooth appearance, low mass, and extreme impact resistance.

Composites Make Breakthroughs in Valve Covers

Representing a major breakthrough for structural composites in 2004 are valve covers for DaimlerChrysler's 4.7-liter V-8 engines using a composite material designed and developed by Premix. The valve cover also was a finalist in the SPE Automotive Innovation Awards competition.

Developed without prototypes in less than 12 months, compared to the typical 18 to 24 month programs, the valve cover significantly reduced costs by 10 dollars per component. This development process underscores the advantages of utilizing composite technology versus competing materials such as magnesium, which was used previously.

Surmounting under-hood temperatures was the biggest obstacle, says Premix. With temperatures exceeding 450 degrees F at the manifold, that was indeed a challenge. To test durability in the real world, taxis in hot-weather Las Vegas clocked 125,000 miles without failure. Other advantages include the use of press-in-place gaskets, replacing adhesives, and reducing noise by one to two decibels. The covers are being used in four 2004 models: The Durango full-size SUV, Jeep Grand Cherokee, and Dodge Ram and Dakota pickups.

Also new under the hood are composite valve covers on General Motors' all new line of modular inline four, five, and six-cylinder engines. Newest to launch is the four-cylinder engine on the 2004 Chevrolet Colorado and 2004 GMC Cheyenne midsize pickups. These GM valve covers are molded by Meridian. The SMC compound is supplied by Premix.



COMPOSITES TECHNOLOGY SOARS



Carbon fiber will be used for the hood of the 2004 Z06 Commemorative Edition Chevrolet Corvette.

"Tough Class A" (TCA™) SMC, introduced by ThyssenKrupp Budd in collaboration with AOC in 2001, makes big strides in 2004 models. It is so resistant to microcracking, which produces "pops" in the surface, that it typically eliminates 95 percent of SMC defects. Pops are caused by solvent gases escaping to the surface as SMC parts pass through 380-degree F paint ovens.

Ford switched its TK Budd exterior body panels entirely to TCA™ from traditional Class A SMC in June, 2003. For 2004, TCA™ is being used on exterior body panels in eight Ford models, including the Mustang (hood, decklid and fenders), Thunderbird (hood, front fenders, decklid, removable top), Explorer Sport Trac (cargo box, rear body side panels), Lincoln Navigator (hood and front fenders), Econoline (hood outer panel) and the all-new F150 FX Off-Road Series (box outer panels), says Mike Dorney, vice president of sales and marketing for TK Budd - Body Sector.

Automakers continue to expand the use of engineered, next-generation primers and sealers to meet ever-increasing surface appearance standards on Class A panels. An example is Fusion UV Systems' UV radiation curing system used in conjunction with a UV-activated hybrid sealer developed by BASF.

The all-new Cadillac XLR uses Ashland Specialty Chemical Company's enhanced PHASE EPSILON™ SMC, molded by Meridian, in conjunction with BASF's UV sealer technology for the front and rear roof, decklid, tonneau cover, A pillars and fuel filler doors. Red Spot's Pop Free™ is used on the doors. This combination allows Meridian to meet General Motors' stringent surface quality requirements. "These advancements in resins and sealers have reduced SMC Class A defect levels so they're now comparable to steel," says David White, vice president of sales at Meridian, and executive committee chairman of the Automotive Composites Alliance (ACA). The balsa core for the XLR load floor is supplied by Alcan Baltek.

An integral function for most composite parts is the bonding of inner and outer parts and/or reinforcements. Major suppliers providing specialty-engineered adhesives are

Ashland and Lord Corporation. The fiberglass for most composite parts is supplied by Owens Corning and Saint Gobain. Plasticolors, Inc. is a major supplier of pigments to the industry.

Carbon Fiber: A First for Corvette

Carbon fiber composite, the "race car material of choice," that first appeared on the 2003 Dodge Viper and Mercedes Maybach, continues to gain new applications by being selected for the hood of the 2004 Z06 Commemorative Edition Chevrolet Corvette. The hood outer panel weighs only 20.5 pounds, 33 percent less than standard SMC.

A finalist in the 2003 Society of Plastics Engineers (SPE) Automotive Innovation Awards competition, the hood consists of a carbon fiber outer panel using a unique epoxy that bonds the material to a hybrid carbon fiber/low density SMC inner panel molded by Meridian. "As the usage of automotive carbon fiber composite grows, raw material prices will decrease, making the value proposition even more advantageous for the OEM program team," says White.



The all-new Cadillac XLR uses Ashland Specialty Chemical Company's enhanced PHASE EPSILON™ SMC, molded by Meridian, in conjunction with BASF's UV sealer technology for the front and rear roof, decklid, tonneau cover, A pillars and fuel filler doors. Red Spot's Pop Free™ is used on the doors.



Tough Class A (TCA™) introduced by TK Budd in collaboration with AOC, is being used on the box outer panels of the all-new F150 FX Off-Road Series and seven other Ford models.

Composites Champion Gordon Miesel...."Easing Out"

Gordon (Gordie) Miesel is easing out slowly from the active work-a-day world, but you haven't heard the last of him. He plans to remain involved with the ACA, SPE, and Society of Automotive Engineers (SAE).

One of the founders of the Automotive Composites Alliance (formerly the SMC Automotive Alliance) in 1988, Miesel spent 22 years with PPG Industries in OEM Sales/Marketing, and when PPG sold its thermoset polyester resin business to Ashland Chemical in 1984, Miesel joined Ashland, where for these past 19 years, he has been the Sales/Marketing interface with automakers and the composite industry's molding customers.

A native Detroit and Central Michigan University graduate, Miesel has been involved in numerous automotive composites' programs including the Pontiac GTO fascia, GM Fisher Body SMC Tailgate, Pontiac Fiero, Dodge Viper and

for many years on the SMC-rich Chevrolet Corvette. Clearly he was successful, as along with the Ashland Automotive Composite Team, Ashland SMC resins are now widely used in myriad car and truck applications.

Gordie also has been an inveterate champion of composite causes. He has been a member of the SPE for over 25 years, and in 1988-9 served as chairman of SPE's Automotive Division. He's a 27-year member of the SAE and was treasurer of the SMC Automotive Alliance in its early years.



ACA veteran Gordon (Gordie) Miesel is easing out from the active work-a-day world after nearly 40 years in the auto industry.

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