

COMPOSITES

Pick Up Speed

in the
NEW MILLENNIUM



Chevrolet Silverado

In the early 1940's, thermoset composite plastics were introduced by Henry Ford in a dramatic photo opportunity — he hit the new composite rear trunk lid on an experimental car with an axe to demonstrate its toughness. In the early '80's, Ford worked with suppliers to develop a fully composite pickup box. Now, nearly 60 years after Mr. Ford struck the trunk lid, the durability and weight savings offered by composites are being proven in new production applications, such as pickup boxes that include the inner and box outer, and even the tailgate.

First out of the "gate" is the 2001 Explorer Sport Trac, a vehicle being touted as a sport utility vehicle, but combines features of both a pickup truck and an SUV, with four doors and a 4-foot-long pickup box. The Sport Trac will reach dealer show rooms early in 2000. On its tail, will come the first full-size composite pickup box on the 2001 Chevrolet Silverado 1500 Series truck, that debuts in the fall of 2000.

It's no wonder then, that the use of reinforced thermoset composites by automakers has nearly doubled in the last decade, and is expected to pick up even more speed during the next five years. The Automotive Composites Alliance (ACA), an industry association of 25 molders, raw materials suppliers and toolmakers projects OEMs will use 327 million pounds of reinforced thermoset composites in 2000 and 467 million by 2004, a 44% increase in just five years.



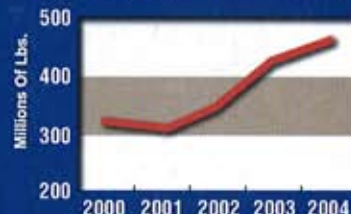
Ford Explorer Sport Trac

What's spurring
this dramatic growth?

- Cost Savings
- Customization
- Durability
- Fuel Efficiency

"Consumer demand for more customized, durable, and fuel-efficient vehicles is driving the growth of composites," says Mike Dorney, ACA chairman and vice president of sales for The Budd Company's Plastics Division in Troy. "More now than ever,

ACA FORECASTED TOTAL ANNUAL PRODUCTION OF REINFORCED THERMOSET COMPOSITES FOR AUTOMOTIVE AND HEAVY TRUCK INDUSTRIES



Automotive
Composites
Alliance

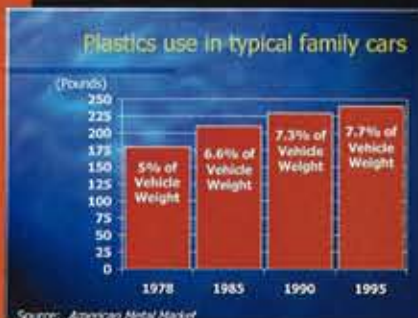
automakers are looking for ways to beat competitors by adding value enhancers for consumers. This includes creating a car or truck that is visually appealing, yet meets their needs for practicality. The composite pickup box is one example of this."

Chevrolet Silverado Box: Light Weight, High-Impact, Corrosion Resistant

GM obviously thinks so. In August, the OEM debuted its composite box on the Chevrolet 1500 Series 4WD Extended Cab Silverado, at the University of Michigan Management Briefing Seminar in Traverse City, MI. Reminiscent of Henry Ford's striking the composite rear trunk lid in the '40's to demonstrate its strength and durability, Larry Burns, vice president of GM R&D and Planning, hit the box and fenders with a 17-pound bowling ball to prove the tremendous impact resistance of advanced composites. The box will be available to the buying public in the fall of 2000.

The GM pickup box is an excellent example of how the composites industry is learning up to bring automakers the best products using superior materials for the specific application. Cambridge molds the box inner panels and tailgate inner portions on the GM box from structural reinforced

reaction injection molding (SRIM), an extremely strong composite, and Budd Plastics Division makes the pickup box outer panels using reinforced reaction injection molding (RRIM).



Shaved 50 Pounds from Vehicle

"This GM-exclusive application of composite technology provides the highest level of working truck durability and load-carrying capability, while reducing repair costs and increasing fuel economy," says Burns. "GM's box offers customers unparalleled ruggedness and long-term durability — where customers need it most." In fact, the molded parts reduce the total weight of the vehicle by more than 50 pounds, and the tailgate is 15 pounds lighter than the current steel tailgate, making it easier to open and close.

Improved Impact and Corrosion Resistance

GM put the box through a rigorous round of testing to make sure it would exceed the expectations of its customers. The company installed 48 pickup box units on Chevy G/K trucks and subjected them to more than one million miles in some of the harshest operating conditions in North America.

"Pickup boxes are especially prone to corrosion and impact damage," says Larry Kazanowski, CEO of Madison Heights, MI-based Cambridge Industries. "This application represents a breakthrough opportunity to demonstrate the excellent durability and mechanical properties of SRIM parts at this volume level.

"To accomplish this, Cambridge invested in a new preform technology to mold the pickup box. The glass fiber and unique binder technology enhances processability."



Chevrolet Silverado

Ford Explorer Sport Trac: On the Right Track with Composite Box

Ford will be the first to come to market with a three-piece, composite pickup box. A comparable steel assembly would include approximately 40 steel welded components, adding cost and complexity. The company's Explorer Sport Trac, which combines features of both pickup trucks and sport utility vehicles, will appear in dealer showrooms in the first quarter of 2000.

30% Lighter

"The Sport Trac builds on the Explorer platform," says Mike Dorney, ACA chairman and vice president of sales for The Budd Company's Plastics Division, which molds the sheet molding composite (SMC) box. "The vehicle will have four doors and a four-foot-long pickup box. The one-piece composite box will reduce the mass 20 to 30 percent compared to sheet metal and requires no plastic bedliner, which translates into cost savings to consumers."

\$25 Million Investment Savings

Dorney says the mass savings equates to better fuel economy for consumers and tooling investment savings of \$25 million, again compared to a new box made from sheet metal. "A steel pickup box is typically welded and assembled in the assembly plant," explains Dorney. "With a one-piece composite box, this space is saved. Assembly plant labor and painting of the box inner also can be eliminated."

Styling Differentiation

"There's a broader product offering but lower volumes of any one model being sold today," says Dorney. "This is good news for reinforced thermoset composites, which are ideal for applications, such as the different size pickup box options, that require a material that allows for the styling differentiation and durability

consumers want, but at a reduced tooling cost for automakers."



Ford Explorer Sport Trac



Also New for 2000 . . .

The new-for-2000 Ford Excursion debuted in September with the first-ever liftgate and cargo door assembly (also called "dutch doors" or "tri-doors") made from SMC — another indication that composites are replacing steel in applications where cost, weight and plain old practicality are needed. Also new: a grille opening panel (GOP) made by Venture Industries.

30% Investment Savings

"A typical investment cost for tooling the tri-door system using steel stampings would approach \$20 to \$25 million," says Kevin Alder, COO of Cambridge Industries, which molds the system. "These same parts in SMC cost 20 to 30 percent less than steel."

Up to 20% Weight Reduction

A similar assembly in steel would weigh approximately 15 to 20 percent more than the SMC tri-door system on the Ford



Ford Taurus/Sable

Excursion. "In an application like this, where people will be lifting and opening the doors often, any weight savings is a plus," says Alder.

Superior Fit and Finish

Because of the composite's tight tolerances, consumers benefit from a vehicle that not only looks good from the rear, but offers excellent sealing from harsh elements.

Paint Oven Compatible

Because the compression molded SMC tri-door system is capable of exceeding the material temperature range at the Ford Kentucky Truck plant's E-coat paint oven, the tri-door system can be easily installed on the Excursion in the body shop.



Ford Excursion

Technology in the New Millennium

"Other new exterior components include GOPs on the new Lincoln LS and Jaguar S-Type, both molded by Venture Industries. There's a lot happening on the surface, but the composites industry is also making technology strides underneath as well.

Ford Taurus Debuts Semi-Conductive Paint

One example is on the 2000 Ford Taurus and Mercury Sable. These cars debuted in 1996 with the first radiator support assembly made from SMC, which traditionally was painted with a semi-conductive surface to accommodate the OEM's electro-static painting system. Although the support controls the front-end fit and appearance and doesn't have an exterior painted surface, it must be compatible with the entire assembly plant paint system sequence.

The painting of the support is costly, so in 2000 the part will be molded with a less expensive semi-conductive SMC, which doesn't require a conductive primer. The industry is also researching molded-in color that may lead to UV resistant, weatherable composites.

GMT 800 Step-Assist Switches from Steel to Composite

GM's 2000-model Chevrolet Silverado debuts with a strong, cost-efficient, dealer-installed step-assist system, or running board. The SMC component has a TPO cover, step pad and steel brackets. Molded by Cambridge Industries, its design would be difficult to duplicate in steel, is light weight and lowers program cost.

Composite Pickup Box: A Hard Bed with Soft Lines . . .

The new composite pickup boxes, or beds, as some call



them, will hit showrooms across America in 2000, and promise to bring consumers performance not seen with traditional steel boxes, or plastic bedliners. And they're pretty to boot (no double meaning intended, but they can take a beating).



Chevrolet Silverado

Composites and the Environment

The combining of composites molding compound does not create high levels of CO₂ gas, like the production of virgin aluminum. This fuel economy results in a reduction of emissions. Energy savings begin with the production of raw materials, processing and manufacturing of composites compared with similar steel and aluminum parts. The weight savings to the vehicle provides the manufacturer an opportunity to add optional equipment without adversely affecting vehicle weight class.

Recycling Moves Ahead

Composites can contain substantial quantities of recycled material, including resin, filler and additives. What's more, composites are recyclable at the end of their life cycles. Currently, the best recycling approach for thermoset composites is to grind up scrap (end of life parts or in-plant scrap) to provide a material that can replace the filler in new formulations. Molders have successfully recycled many thermoset composite components because there is no need to remove paint and adhesive prior to grinding. Recycling will become an even bigger advantage, as the infrastructure develops to collect scrap composites.



Automotive Composites Alliance

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