Special Supplement to Ward's AutoWorld

Composites: Bold Stroke in 1953

SMART CHOICE IN 2003

1953 Chevrolet Corvette, the first composite-bodied car
2003 Cadillac XLR, a composites showcase

50 Years and Counting...

When the Chevrolet Corvette two-seat sports car arrived in 1953 with its composite fiberglass body - the world's first composite all-plastic body - it boldly launched what has become a virtual explosion in composites: From stem to stern, inside and out - from Class-A body panels and structural assemblies to pickup boxes and cam covers, composites' attributes of low mass, design freedom, low tooling investment, and parts consolidation have proven ideal for the automotive industry.

Featuring an all-composite body, the 2003 Cadillac XLR continues the tradition with doors, hood, decklid, fuel door, tonneau cover, roll bar and roofs - front and back - made of sheet-molded composite (SMC) produced by Meridian Automotive and the ThyssenKrupp Budd Company. The XLR door inners signal a breakthrough in low-density SMC, matching aluminum's strength but at lower cost and weight. RRIM - reinforced reaction injection molding technology - is used for the front fenders and rear quarter panels. The front floor and rear tub are made of a liquid compression molded composite balsa sandwich using Baltek's balsa core, and are designed to reduce weight and noise, while adding stiffness.

Both Meridian and ThyssenKrupp Budd Co. are utilizing new, specialized high-performance sealers and/or "Tough Class A" sheet molded composite to meet and exceed GM's expectations. Ashland Specialty Chemical and AOC are leading the way with enhanced resins, allowing for tremendous gains in surface quality and enhanced ding and dent resistance. These new and proven technologies offer the breakthrough performance that enable today's SMC composite body panels to process through typical assembly plant paint lines with "steel-like" first-run capability.

"The headlight on the train in the tunnel is a CAFÉ-mandated, higher fuel economy model for the industry," says David White, ACA Executive Committee chairman and vice president, sales and marketing at Meridian Automotive. "SMC and other reinforced composites will be at the forefront of lightweight materials needed to meet tomorrow's higher standards." Like Corvette, composites have come a long way. Imagine what the next 50 years will bring.

From FRP to Carbon Fiber SMC, Composite Technology Soars

From the launch of the '53 Corvette, SMC usage has spread widely to include inner panels, hoods, decklids, fenders and engine and structural components. Now, in 2003, amazingly strong and lightweight carbon fiber SMC is making its mark for the first time in automotive applications while new technology is boosting surface quality of conventional SMC.

Although SMC has played a dominant role, the list of acronyms has exploded as other technologies have taken root in automotive applications: BMC (bulk molding composite); RRIM (reinforced reaction injection molding); SRIM (structural reaction injection molding); RTM (resin transfer molding); and LCM (liquid compression molding).

The Mercedes Maybach has an SMC trunk lid with a carbon fiber body, representing continued composites' growth in Europe on specific luxury car panels and structures.

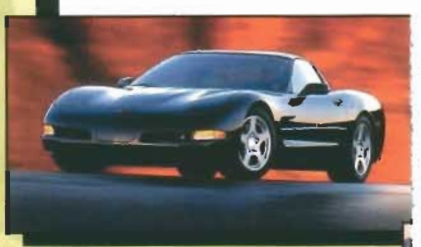
Why Composites are Increasingly a Smart Choice

Composites have gained ground because they offer significant advantages over other materials. They typically weigh 35 percent less, helping to improve fuel economy and lower emissions. They create tooling savings up to 40 percent by consolidating dozens of parts into a single molding, offering significant lifetime cost savings to the program. They're dent-resistant, rust-free and provide designers much more flexibility in "designing in" unique styling cues that can be set into molds at less cost and much faster than steel components. That makes them ideal for quickly and economically creating a "new look" in niche-vehicle and medium-volume applications, where time in today's crowded market is of the essence.

What's New for 2003: *Carbon Fiber Composites Introduced*

Dodge Viper and Mercedes Maybach top the list of exotic new applications, each boasting state-of-the-art carbon fiber composites formerly limited to aerospace and race-car applications. Both are low-volume models, but they could become harbingers. The re-engineered Viper has 17 pounds of carbon fiber/low-density glass SMC, produced by Meridian Automotive Systems, spread over nine components "to provide structural support and achieve significant weight savings," a DaimlerChrysler engineer explains in a Viper research paper. Among them are windshield surround inner and outer panels, inner door panels, fender support systems and headlamp supports. No doubt, these industry-first production applications represent the tip of the iceberg as more vehicles take advantage of the strength-to-weight ratios inherent in carbon fiber composites.

Lincoln Aviator -This all-new sports utility vehicle has sheet molded composite (SMC) front fenders and a composite grille opening reinforcement.



The 2003 Corvette - Celebrating its 50th anniversary this year, the Corvette is a shining example of an all composite-bodied vehicle.

A History of Automotive Composites

1953

Chevrolet Corvette 2-seat sports car, originally planned as a steel body, instead uses fiber glass to become the first production "composite - plastic" car, with an initial run of 300 units.

1963

Studebaker introduces the Avanti sports car with an all-fiber glass body, but halts production in 1964 after about 1,000 are built as Studebaker's financial woes accelerate.

1970

First grille opening panel (GOP) is introduced in Pontiac's Tempest, demonstrating SMC's ability to consolidate numerous parts into a single component.

1982

A low-profile additive (LPA) for optimum "Class A" surface is introduced, creating a smooth surface finish and eliminating short-term waviness. Vacuum-assist molding that prevents air-entrapped surface defects is introduced.

1986

Cummins' valve covers are introduced as the first SMC engine components.

1987

The Hummer H2 contains a SMC front end, hood and fenders helping illustrate how composites help OEMs develop uniquely styled, big vehicles that weigh less than steel.

The body of the **Dodge Viper VGX** is made from SMC. The dash board and fenders are made from reinforced reaction injection molding (RRIM).

Enter "Tough Class A" SMC

Major gains in improving SMC surfaces and reducing defects come to fruition on numerous 2003 models. New Atryl "Tough Class A" (TCA) SMC, combined with new high-performance sealing technology, are sharply reducing microcracks that can cause "pops" when SMC parts pass through the 380-degree (Fahrenheit) paint ovens as solvent gases escape to the surface. Ford Motor Co. began using TCA at its Louisville, Kentucky and Wixom, Michigan, assembly plants early in 2002.

The hood, door surrounds, doors, rear quarter panels and decklid and roof combination are made of SMC on **Cadillac's XLR.**

TCA, offered by resin supplier AOC and molded by ThyssenKrupp Budd debuts on several Ford 2003 models including the Ranger hood, Explorer Sport Trac box side outer panels, Thunderbird hood, decklid and fenders, Navigator fenders and Mustang Mach 1 hood. "We're getting major breakthroughs," says Probir Guha, vice president of research and development at ThyssenKrupp Budd. "Test results with Atryl® TCA resin show a minimum of 90 percent reduction in the formation of paint pops," says Mike Dettre, AOC business manager-Closed Mold. "Similar - and in some cases, even greater - reductions are being recorded on the OEM 'concerns per thousands' (C/1000) charts that measure the number of defects per thousand production parts."

Pop Go the "Pops"

All OE paint shops share a common goal: Meet or exceed daily quality and quantity commitments. In the past two years, breakthrough technologies have emerged in the high-performance sealer area. Meridian Automotive Systems introduced an all-new Ultra-Violet (UV) cured sealer on the popular Ford SuperCrew F-150 rear quarter panels two years ago with outstanding results. The UV cured sealer gives a tough, smooth finish to the surface, enabling "steel-like" processability through the paint line. "These parts have set the new industry standard for quality and finish, all but eliminating paint pops caused by outgassing during the high heat ecoat and topcoat oven cycles," says White. The UV sealer is also being used on the 2003 Lincoln Aviator fenders. Other new primer/sealer technologies that seal the substrate to prevent microcracking are gaining widespread applications. Redspot's new primer is being used on the 2003 Thunderbird hood, Mustang rear decklid, Navigator hoods and fenders, Ranger hood, Hummer H2 hood and fender assembly, XLR hood and rear deck, and on Viper panels. The industry is continuing to develop lighter and tougher materials that will continue to expand the applications available for SMC and other composites in the future.

1993

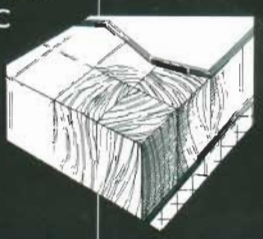
Mercury Tracer ows with the first igh-volume SMC umper beams, a rst in structural pplications.

1995

The Corvette rear inner panel becomes the first North American part containing recycled SMC.

1997

Ford's Taurus and Sable introduce the industry's first SMC radiator supports. Lincoln Continental features the first flexible SMC fenders.



2001

First use of balsa "sandwich" floor pans in Corvette, expanded in 2003 to Cadillac XLR

Chevrolet introduces Silverado pickup box featuring SRIM inner box and tailgate inner panel, with SMC outer, and RRIM body side panels and fenders.

2003

Carbon fiber composites make their first appearance in series production in nine 2003 Dodge Viper and Mercedes Maybach.

After 50 Years, 1.3 Million Corvettes Sold

Harley Earl, General Motors' famed styling chief, had long yearned to design an American 2-seat sports car that could compete with Europe's best. But he could hardly have envisioned that the Chevrolet Corvette would become a global icon with 1.3 million sold since it debuted in 1953.

His dream began to materialize when he saw a one-off fiberglass body sportster developed by an Air Force officer for his wife. U.S. Royal Tire Co. later backed the major and brought the car to Detroit in 1951, stirring Earl's imagination.

Here's the chronology: GM had experimented with fiberglass body show cars such as the Cadillac LeSabre (later a Buick series), Buick Wildcat, Oldsmobile Starfire and Pontiac LeMans, and even produced an experimental fiberglass-body '52 Chevy convertible.

But these were not small sports cars; he wanted something special. In May 1952, he and GM President Harlow (Red) Curtice got their first formal view of the proposed new car, and the go-ahead came a month later. GM began planning to show it at its Motorama extravaganza at the Waldorf Hotel in New York the following January.

GM chose fiberglass for the show car to save time, but originally planned to use a steel body in regular production. The New York reception was so favorable that Curtice told his troops he wanted fiberglass, and he wanted production to start in June - just five months away. Originally code-named "Opel," Corvette was named for a class of naval vessels described as "light, fast and maneuverable."

The first Corvette used the "lay-up" process in which fiberglass cloth is laid in the mold and resin is brushed over it. Then the cloth is rolled to force the resin into the material while forcing air out.

On December 22, 1952, the project was officially completed and the sparkling white Corvette with red interior trim was unveiled to the public on January 17, 1953 in New York. On June 30, job number one rolled off the line at the Flint, Michigan, pilot plant, the first of 300 built there. Production shifted to St. Louis in 1954 and to Bowling Green, Kentucky in 1984 where Corvettes are still produced, joined for 2003 by Cadillac's XLR luxury 2-seater.

2003 Automotive Composites Member Companys and Contacts

ThyssenKrupp Budd
Body Sector
Mr. Mike Dorney
Ph: 248.619.2233

Meridian Automotive Systems
Mr. David White
Ph: 313.336.4182

AOC
Mr. Mike Dettre
Ph: 901.854.7272

Ashland Specialty Chemical Company
Mr. Gordon Miesel
Ph: 248.244.9120

Lord Corporation
Mr. Ken Gross
Ph: 248.489.5800

Interplastic Corporation
Mr. Rich McDonald
Ph: 574.234.1105

Baltek Corporation
Ms. Jennifer Janson
Ph: 248.553.4146

BYK-ChemieUSA, Inc.
Mr. James Lemkie
Ph: 734.416.5240

Century Tool & Gage Company
Mr. Mike Borg
Ph: 810.629.0784

Dow Automotive
Mr. Dean Palmieri
Ph: 248.391.6570

Ferro Corporation
Mr. Ev Corcoran
Ph: 216.750.6584

Huber Engineered
Materials Corporation
Mr. Tom Cook
Ph/Fx: 770.622.0343

Maclean-Fogg
Mr. Bill Hayes
Ph: 847.541.1616

Owens Corning
Mr. Bill Mellian
Ph: 248.668.7541

Plasticolors, Inc.
Mr. Mark Lodwick
Ph: 440.997.5137 x221

Premix, Inc.
Mr. Steve McCormack
Ph: 440.224.2181

Redspot
Mr. Reinhart Hasselbring
Ph: 734.729.2781

Reichhold, Inc.
Mr. Vergil Demery
Ph: 800.448.3482 x8292

Saint-Gobain Vetrotex
Mr. Frank Smith
Ph: 419.868.7813

For more information about composites please contact the Automotive Composites Alliance at 248-601-9960 or visit our website at www.autocomposites.org

Automotive Composites Alliance