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2020 MY *Corvette Stingray* sports car Wins SPE Automotive Innovation Awards Competition's Vehicle Engineering Team Award

TROY, MICH. — The composites-intensive 2020 model year (MY) *Chevrolet Corvette* Stingray sports car from General Motors Co. (Detroit) has been selected by a panel of industry experts as the winner of this year's Vehicle Engineering Team Award (VETA). The team was honored by the Automotive Division of the Society of Plastics Engineers (SPE*) at the group's 49th annual SPE Automotive Innovation Awards Gala on November 6, 2019. The VETA award was created in 2004 to recognize the technical achievements of entire teams — comprised of automotive designers and engineers, tier integrators, materials suppliers, toolmakers, and others — whose work in research, design, engineering, and/or manufacturing has led to significant integration of polymeric materials on a notable vehicle.

Previous winners of the VETA award, which is given from time to time, include:

- 2004 MY Porsche *Carrera GT* supercar
- 2009 MY *Ford Flex* crossover utility vehicle (CUV)
- 2010 MY *Ford Taurus* sedan
- 2011 MY *Ford Explorer* sports utility vehicle (SUV)
- 2011 MY *Chrysler 200 & Dodge Avenger* sedans
- 2013 MY *SRT Viper* supercar

For 67 years, the iconic Corvette has been a composites-intensive sports car. Therefore, it is not surprising that the eighth generation Corvette features a host of innovative new composites technologies, many of which were nominated in other categories of SPE's 49th Automotive Innovation Awards Competition. Some of the notable applications on the vehicle include:

- Body Exterior Category Nomination: **Rear Bulkhead Window Frame** — Made from a custom-blended unsaturated polyester/vinyl ester resin system using beryllium graphite fillers to deaden sound on the rear bulkhead window frame, the part meets twin thermal and acoustic challenges seen when moving to a mid-engine architecture on the new *Corvette*. This 2.2 specific gravity (SG), low-volatile organic compound (VOC), compression moldable sheet molding compound (SMC) eliminates the need for secondary stampings/baffles, die-cut foam, lofted fabrics, gaskets, and other sound deadeners, reducing costs while increasing interior package space and improving body sealing and noise/vibration/harshness (NVH).

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- Body Exterior Category Nomination: **Rear Fascia Assembly** — This is the first use of a low-density (1.2 SG), Class A SMC for a rear fascia on vehicles with high production volumes. Versus thermoplastic polyolefins (TPO) more commonly used on vehicle fascias, the SMC's superior thermal stability enables it to be used next to hot exhaust tips. Its higher mechanical performance allows for the design of a short rear overhang and larger spacings between attachments. The SMC also does a better job of spreading loads over a larger area in low-speed rear crashes. Brackets and rear-parking assist sensors were bonded to the SMC.
- Body Exterior Category Nomination: **Rear Surround Frame** — A low-density (1.2 SG) toughened structural SMC with both carbon and glass fiber reinforcement enabled a large (64 x 69 x 24 inch/163 x 175 x 61 centimeter) rear-surround frame assembly to be compression molded for mass savings of 15% vs. previously used structural SMC and cost savings due to parts consolidation. The pigmented, low-VOC formulation survives engine-compartment heat, eliminated secondary attachments, increased interior packaging space, reduced NVH, provided better body structure and sealing performance, and improved rear-hatch visibility. The assembly is the dimensional foundation for all rear exterior/interior panels and provides the flexibility for multiple model variants from a single design.
- Chassis & Hardware Category Finalist: **Precision Wheel-Balance System** — A unique composite with high density (5.8 SG) has replaced traditional metallic wheel weights in steel, zinc, or lead. The extruded fluoropolymer contains 67% by volume post-industrial, corrosion-resistant steel alloy and can be recycled again. Supplied as a continuous tape, and with tailored magnetic properties, the weights can be precisely dispensed using a fully automated wheel-balance system in smaller increments for improved ride and less tire wear. The weights reduce assembly time up to 50%, lower costs approximately 10%, significantly reduce and simplify inventory, and offer a broader range of colors.
- Chassis & Hardware Category Nomination: **Underbody Tunnel Structural Closeout** — Liquid compression molding (LCM) was used to form a structural composite reinforced with two layers of carbon and three layers of glass fiber impregnated with a low-VOC vinyl ester matrix. The resulting composite closeout provides better body structure and chassis performance and contributes 10% or more torsional stiffness to this tunnel-dominated vehicle architecture, while reducing mass 4.2 pounds/1.9 kilograms and cost vs. aluminum. Secondary attachments also were eliminated, reducing labor, tooling, and capital expenditures.

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- Materials Category Finalist: **SMC/LMC Front & Rear Trunk Components** — A lower density (0.9 SG), structural composite, which literally floats on water, was developed to replace standard low-density SMC (1.25 SG), injection molded composite, and multipiece metallic structures for the vehicle's rear and front trunks. Compared with metals, the new LCM material reduces mass approximately 10 pounds/4.5 kilograms and direct costs while offering the flexibility of two storage trunks, lower NVH, and higher parts-consolidation opportunities. The material/process combo, with a low-VOC unsaturated polyester/vinyl ester matrix, also made it possible to successfully mold both front and rear trunks with tall walls and deep-draw sides.
- Powertrain Category Nomination: **Rear Induction Duct** — Made from a special toughened, low-density SMC (SG 0.95), which was developed to reduce noise as well as mass without needing resonators on rear induction ducts, these parts are the first to be fully integral to the body frame. The low-VOC, low-styrene polyester/vinyl ester SMC formulation reduces emissions while providing required mechanicals at approximate 5.2 pounds/2.4 kilograms mass savings plus delivered cost savings vs. alternative technologies. A unique duct design is required to funnel air from the rear air intake vents into the mid-mounted engine.

- Process, Assembly & Enabling Technology Category Winner: **Rear Bumper** — The auto industry's first pultruded curved bumper beam uses the unique radius-pultrusion process and equipment to achieve a hollow beam with central web in carbon fiber fabric-reinforced polyurethane/acrylate resin. The curved geometry was desired to better match rear styling and vehicle package space. The beam features an integral tow hook mounting and is assembled to the body-in-white (BIW). It travels through the electrophoretic coating (e-coat) process, so it must offer excellent mechanicals at elevated temperature. The beam meets low-speed crash requirements while cutting mass by 4.9 pounds/2.2 kilograms vs. a metal-inert gas (MIG) welded aluminum extrusion. 3D printing was used to produce mandrels to maintain the hollow interior. This part also won the Process Innovation-Production Part category at this past September's SPE Automotive Composites Conference & Exhibition (ACCE).
- Process, Assembly & Enabling Technology Category Nomination: **Rear Service Doors** — A one-part silicone thixotropic elastomeric foam was key to creating durable seals on rear service doors, permitting customer access to trunk space and the air-filter system. The high-temperature elastomer can handle engine-bay temperatures in excess of 392°F/200°C. Most other die-cut foams and gaskets would melt or break down under such temperatures. Additionally, the elastomer provides excellent durability and compression-set resistance to withstand repeated open/close cycles during normal use. After dispensing, the applied gasket material is heat treated (167°F/75°C for 10 min) to expand the foam, eliminating the cost and waste of die cutting foam/gaskets.

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"It is an incredible honor for our team to win the VETA award," said Tadge Juechter, Chevrolet Corvette Executive Chief Engineer. "It is a wonderful recognition of 67 years of composites advancement. The 2020 Stingray is being hailed as a revolutionary car due in no small part to our state-of-the-art mixed material construction."

The team that worked on the 2020 Corvette was honored at this year's SPE Automotive Innovation Awards Gala that began with a VIP Cocktail Reception at 4:00 p.m., generously sponsored by Celanese Corp. At 4:30 p.m., the main exhibit area opened for general admission and guests to review the Automotive Innovation Awards part nominations and vehicle displays. Dinner began at 6:00 p.m. and the awards program itself was from 7:00-9:00 p.m. The evening concluded with an Afterglow from 9:00-11:00 p.m.

SPE's Automotive Innovation Awards Program is the oldest and largest competition of its kind in the world. Dozens of teams made up of OEMs, tier suppliers, and polymer producers submit nominations describing their part, system, or complete vehicle and why it merits the claim as the Year's Most Innovative Use of Plastics. This annual event typically draws 800 OEM engineers, automotive and plastics industry executives, and media. As is customary, funds raised from this event are used to support SPE educational efforts and technical seminars, which help educate and secure the role of plastics in the advancement of the automobile.

SPE's mission is to promote scientific and engineering knowledge relating to plastics worldwide and to educate industry, academia, and the public about these advances. SPE's Automotive Division is active in educating, promoting, recognizing, and communicating technical accomplishments for all aspects of plastics and plastic based-composites developments in the global transportation industry, including applications, materials, processing, equipment, tooling, design, and development.

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Image courtesy of General Motors Co. Attn. Editors: High-resolution digital art available upon request.