

Plastic helps front-end carrier carry the load

The 2007 **Jeep** Wrangler's front-end carrier (FEC) represents the first use of reinforced plastic as a structural load member for a body-on-frame assembly, according to system supplier **Decoma** International. The application was a finalist in the **Society of Plastics Engineers'** (SPE) annual Automotive Innovation Awards, which recognize innovative plastics use in a variety of categories.

The original FEC design called for an all-steel welded system that consisted of eight components and had a mass of 15.6 lb (7.1 kg). The bonded plastic/steel assembly, which is an integral part of the front-end body structure, features two fewer components and is about 3 lb (1.4 kg) lighter.

Long-glass-fiber-reinforced polypropylene (Celstran PP-GF 40-03 supplied by **Ticona**) provides structural connection between the upper and lower steel tube crossmembers. **Dow** Automotive's Betamate low-energy substrate adhesives (LESA) join the upper crossmember to the plastic carrier to distribute stresses and improve modal performance. This assembly allowed joint stiffnesses to be maintained while improving durability performance. Decoma engineers used predictive warp analysis to ensure final product capability.

The front-end carrier is molded by **Toledo Mold and Die**.

"In the traditional assembly of hybrid front-end carriers, the metal reinforcement is attached to the plastic using mechanical techniques such as rivets, heat stakes, or through over-molding," said Dave Recktenwald, Dow Automotive Plastic Bonding Market Development Manager. "When the substrates are bonded with Betamate LESAs, the metal reinforcements and molded plastic parts can be optimized for reduction of part thickness, resulting in significant weight savings and improved structural performance."

Betamate LESAs, which bond long-glass filled polypropylene and e-coated steel with no pre-treatment or primers, is also used on the 2007 **Dodge** Nitro's front-end carrier.

Not only do the plastic components manage all vertical loads between the upper and lower closed-section steel tubes, they also provide mounting features for other front-end components. Functional integration examples include a molded-in element for attaching the temperature sensor, a radiator grille attachment, and headlamp mounting points. A molded rib serves as an air guide to prevent bypass of the heat exchangers.



As with the 2007 Jeep Wrangler, the front-end carrier for the new Dodge Nitro (shown) uses Betamate low-energy substrate adhesive from Dow Automotive to join plastic and steel components.

In addition to a 15% weight savings, the plastic/steel assembly offers a 25% cost savings (about \$3) vs. the traditional all-steel construction, according to the system supplier. "We can estimate \$250,000 of cost avoidance in the areas of stamping tools and body fixturing tools," a Decoma engineer said during an SPE presentation.

The technology can be used on all vehicles with similar body-on-frame construction, says Decoma.

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briefs

ThyssenKrupp Steel, Germany, and **JFE Steel**, Japan, agreed to extend their comprehensive cooperation agreement (CCA) for another five years. The agreement, first signed in April 2002, concerns the joint development of automotive steel sheet and related research and development. In line with the extension, JFE Steel agreed to license to ThyssenKrupp Steel its proprietary technology for JAZ (JFE Advanced Zinc), a high-lubrication galvanized automotive steel sheet said to be environmentally friendly. ThyssenKrupp Steel and JFE Steel will build supply systems for the material in both Japan and Europe. Earlier results of the CCA include the development of common specifications for high-strength automotive steel sheet, as well as cross-licensing of ThyssenKrupp Steel's CP complex phase steel and JFE Steel's NANO HITEN.

Alcoa has opened an aluminum brazing sheet plant in Kunshan City, China, its third flat-rolled products facility in that country.

Kunshan Aluminum Products, a joint venture between Alcoa and **Yencheng Engraving** established last April, produces heat exchanger materials for automotive and other industrial HVAC applications and complementary common alloy aluminum products. Kunshan Aluminum produces aluminum brazing sheet primarily for the Asian automotive market.

Specialty compounding company **RTP** added multiple long fiber-reinforced thermoplastic (LFRT) production lines at its Suzhou, China, manufacturing facility. The long-glass-fiber compounds are based on various resin systems including nylon and polypropylene. The new LFRT lines will support the company's automotive and industrial customer base in China.

3M and **Thermal Ceramics** announced a joint development agreement to develop, produce, and market molded insulation products for automotive catalytic converter exhaust systems. Under the terms of the agreement, Interam engineered end cone insulation from 3M will be manufactured by Thermal Ceramics.

Guilford, a North Carolina-based designer and manufacturer of performance textiles, expanded its European operations with the establishment of **Guilford France**. Guilford France was formed by the acquisition of France-based **Salome-Rokona**, including its manufacturing operations and sales offices. The creation of Guilford France secures the continued operation of the plant in Troisvilles, said to be the principal provider of warp knit textiles for the French automotive headliner market.

Solvay puts on a TPV topcoat

Hong Yang Sealings of Guiyang, China, is using new materials and a proprietary process to improve both the quality and weatherability of co-extruded automotive door seals with a colored decorative topcoat.

According to **Solvay Engineered Polymers**, conventional designs for such an application include three primary features: a foamed thermoset rubber bulb that contacts the door to provide the functional seal; a backbone of solid thermoset rubber, extruded over a metal structure, to clamp onto a car's door frame; and a wing with a colored topcoat, which is visible in the interior and serves to cover the edges of headliners, pillars, and carpeting.



Made of NexPrene 9075A TPV from Solvay, the decorative topcoat on this door seal from Hong Yang Sealings is visible in the interior of a Mazda 323 built for the Chinese market by Haima Motor.

Instead of a traditional thermoset material, Hong Yang selected a NexPrene 9075A vulcanized thermoplastic elastomer (TPV) from Solvay for the topcoat. The NexPrene TPV is delivered as a natural that is UV stabilized. Color concentrate is added during production to produce a topcoat in various colors, including "champagne" and "light stone." NexPrene TPV is used to replace thermoset rubber or conventional TPV.

"Hong Yang prefers the clean, consistent, easily colored natural that TPVs in the NexPrene 9000 series provide," said Kevin Cai, Product Development Manager at Solvay Engineered Polymers.

"Thermoset EPDM [ethylene propylene diene monomer] is difficult to make in color, and the use of sulfur-based curing agents limits the choice of palette to the darker shades. And regardless of titanium dioxide or pigment concentrations, it doesn't weather well."

Cai noted that conventional phenolic-cured TPV may be better than thermoset EPDM in colorability, but color variation in natural grades of these materials is still an issue. "And they do not weather well when colored in light hues," he said.

Hui Wang, Deputy General Manager at Hong Yang, said that "NexPrene TPV allows us to improve our product quality significantly. It enables us to match the topcoat to any color that our OEM customers require. With NexPrene TPV, the topcoat will not show noticeable color change even after many years of use, based on our extensive heat-aging and accelerated weathering tests."

The use of NexPrene 9075A TPV is also said to simplify material handling.



This automotive door seal features a colored topcoat of NexPrene 9075A vulcanized thermoplastic elastomer (TPV) from Solvay Engineered Polymers. The body of the seal and the foamed bulb section are co-extruded of thermoset EPDM by Hong Yang Sealings at its plant in Guiyang, China.

"Because our NexPrene 9000 series TPVs do not contain any moisture-absorbing components, they do not need to be dried prior to processing, as do conventional phenolic-cured TPVs," said Cai.

Hong Yang has developed its own EPDM/TPV co-extrusion process for applying the TPV topcoat to the door seal. The company produces several different door-seal profiles for vehicles sold in China, all of them using NexPrene TPV to provide the colored topcoat.

The finished, top-coated profiles are cut to length to fit the door openings of various vehicles, and corner moldings are joined to the profiles by overmolding. The completed loops are shipped to the OEMs to be assembled into the door frames.

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