CHEM ECONOMICS

Light Vehicles Drive Bright Future for Plastics

The light-vehicle industry continues to be an important customer for most manufacturing industries, including chemicals. The chemistry embedded in every light vehicle produced in North America has a value of $3,297 — which represents an increase of 10.5% over the value in 2010 and nearly double what it was 10 years ago.

The chemistry in a vehicle includes antifreeze and other fluids, catalysts, plastic components, rubber tires and hoses, upholstery fibers, coatings, adhesives, and much more. Virtually every component, from the front bumper to the rear taillights, features some chemistry.

Lightweight materials are prominent in these components. During the last several decades, plastics and composites, aluminum, and magnesium have taken market share away from iron castings, steel, lead, and other heavier materials. The average light vehicle — with an average weight in 2010 of 4,039 lb — now contains 378 lb of plastics and composites, *i.e.*, 9.4% by weight. This is up from 286 lb in 2000 (7.3%) and 194 lb (5.7%) in 1990. In 1960, less than 20 lb were used.

The favorable performance properties of plastics and composites are manifold, but weight savings is primary among these. A pound of plastic and composite, for example, supplants 2–3 lb of other, heavier materials. As a result, polymers help to reduce vehicle weight, thus improving fuel efficiency and reducing greenhouse gas (GHG) emissions. Substituting 100 lb of plastic for conventional materials improves a vehicle's fuel efficiency by 1.4%.

Plastics and composites offer additional benefits beyond their ability to reduce vehicle weight, improve fuel efficiency, and reduce emissions. They also enhance design flexibility, allow for exceptional aerodynamic modeling, enhance safety, provide unparalleled resistance to corrosion and damage (*i.e.*, dent and ding), improve internal damping (*i.e.*, reduced noise and vibration), and allow manufacturers to consolidate parts and shorten assembly time. In addition, the tooling costs for composite parts can be as much as 80% lower than those for comparable steel parts. Typical plastics and composites applications include exterior panels, trim, and bumper fascia, as well as interior trim panels, window encapsulation, headlamp housings, manifolds and valve covers, electronic and electric parts and components, wiring harnesses, steering wheels, insulation, dampening and deadeners, upholstery, mechanical parts and components, safety glass, and myriad others.

The automotive industry is an important market for plastic resins such as polypropylene, polyurethane, nylon, other engineering polymers, and thermoplastic polyesters. Light-vehicle applications account for over 30% of the demand for each of these resins produced in North America. Other important resins include acrylonitrile butadiene styrene (ABS) and polyvinyl butyral. Engineering polymers such as nylon, polycarbonate, polyacetal, polyphenylene ether (PPE), thermoplastic polyester engineering resins, and others are supplanting metals in many applications.

The use of plastics and composites in vehicles has not reached its full potential. Additional opportunities to reduce weight with plastics and composites are possible. These include: reducing the weight of existing plastic and composite parts with the use of low-density additives, nanoparticles, and alternative fibers; and converting more metal parts to plastics and composites. As a result, the light-vehicle market presents significant opportunities for further diffusion of plastics and composites in the future.

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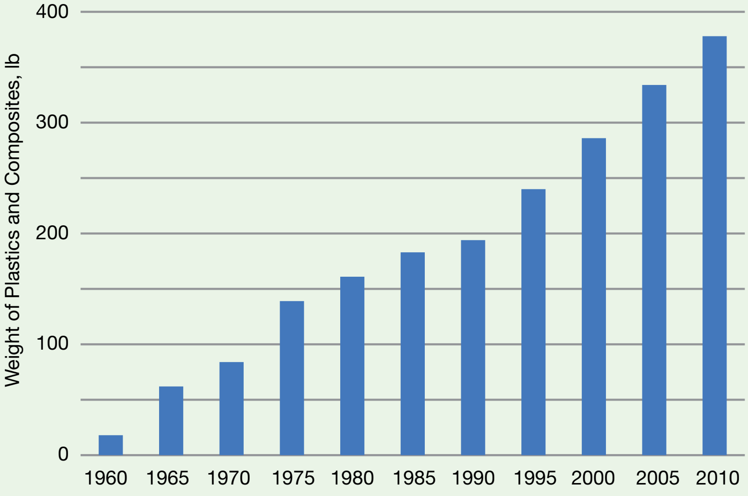

▲ The amount of plastics and composites in vehicles in North America continues to increase, bringing benefits that include improved fuel efficiency, reduced emissions, and enhanced safety.