Specialized techniques are required to recycle fiber-reinforced components like dashboards.

Meeting the **automotive** industry's **recycling** challenges

By: Nick Palmen

Demand for recycled plastics is growing exponentially as all industrial sectors around the world prioritize sustainability and reducing their carbon and waste footprints.

Policymakers and legislators are implementing new standards and laws to lower energy consumption, reduce environment-threatening emissions and enforce a more sustainable use of resources. This has profoundly changed global manufacturing and increased the application of circular principles such as remanufacturing, reuse and recycling.

Significant strides are being made to meet these requirements in the automotive industry in particular. Manufacturers are seeking and adopting both new and recycled materials to reduce vehicle weight, increase fuel efficiency and address environmental concerns. The trend for lightweighting has been ongoing for decades, with every manufacturer pursuing innovative ideas and more sustainable ways to use renewable/reusable materials – whether aluminum, plastics or carbon fibers.

Thomas Schmutz, Director Technical Service & Application Development, SONGWON Industrial Group.

Back in the 1960s, the average North American car only contained approximately 8kg of plastics and composites, while cars today incorporate roughly 200kg. This is expected to rise to almost 350kg by 2020. Consequently, the current demand for lightweight, fuel-efficient vehicles is helping to boost the plastic industry's contributions towards more sustainability in the design, manufacturing and after-life of all transportation forms.

It is commonplace for recycled plastics to be used to make parts in other areas. An example is plastics originally used for bumpers being recycled to produce new exterior parts like mudguards. Manufacturers are also looking beyond their own products to recycled materials originating from other industries. For example, plastic bottles and caps are recycled and used for interior applications like components in dashboards, floor panels and speakers.

While there has been some progress in the recycling of automotive plastics, metals in vehicles are still more likely to be recovered during the end-of-life stream than plastics. A great number of plastics end up in landfills, despite the fact that many are high-value, high-performance polymers. It is estimated that about 100,000 metric tons of thermoplastic polymers (TPO) in bumpers are sent to scrap yards in the U.S. alone each year.

For many years, industry stakeholders have discussed and explored possibilities for recovering more polymer components from end-of-life vehicles. Only a few years ago, the End-Of-Life Vehicle Recycling Project spearheaded by the Plastics Industry Association (PIA) was launched to prevent the direct route to the landfill and reduce the loss of valuable materials and the negative environmental impacts.

Roughly 9kg of bumper plastics mostly made of TPO are on the outside of a vehicle and can be removed if damaged. As recycled TPO is suitable for many applications and has the potential to meet or exceed quality standards, the PIA project is focusing on bumper recycling potential. Over recent years, manufacturers' efforts have produced impressive results but many experts believe more can still be done.

Automotive Industries (AI) asked Thomas Schmutz, Director Technical Service & Application Development, SONGWON Industrial Group, to shed some light on the sustainability progress and breakthroughs in automotive applications.

Schmutz: Actively seeking to meet sustainability goals, the automotive industry is taking advantage of the benefits recycled plastics offer. Plastics can be incorporated almost anywhere manufacturers require high performance. Suitable for exterior and interior applications, they facilitate development of more innovative concepts in modular design and reduce production costs.

Driven by global demand for more sustainable solutions, automobile manufacturers are strongly committed to reducing waste and using more recycled materials. In only a few decades, this has dramatically improved the quality of available recycled materials and made it possible to use more recycled plastics in new components. Experience has shown that automotive parts made of recycled plastics can match the same quality levels as new plastic materials.

In the past, most recycling compounds were offered by mid-sized companies but nowadays, resin producers are also offering specialized grades for automotive compounds.

As a result, technology is advancing and more parts are being developed with plastics that provide attractive alternatives to traditional metals.

AI: What are the benefits for environment, health and safety?

Schmutz: Reducing the resources needed to produce new plastics and keeping waste out of landfills are among plastics recycling's many advantages. Recycled plastics contribute to saving energy, conserving natural resources and lowering pollution levels and GHG emissions.

They also greatly contribute to vehicle safety. Lightweight plastics used in a car's front area are able to absorb the energy from an impact through a so-called "crumple zone". In an accident, hollow structures such as panels filled with lightweight plastic foams add strength to a vehicle's overall structure and increase protection for occupants. In car interiors, less volatile organic content (VOC) provides a healthier interior environment. Furthermore, replacing auto glass with plastic contributes to weight reduction and prevents injuries from shattering glass.

AI: What are the biggest challenges in recycling?

Schmutz: One of the biggest recycling challenges is the cost-intensive complexity involved in separating mixed plastics or hard-to-remove residues. Most plastics used in automotive parts such as dashboards, bumpers and casings are injection molded. As reinforced plastics they contain fillers such as glass or carbon fiber and glass beads or plastic blends which have been PP compounded.

Another major challenge for producing recycled resins from plastic wastes is the lack of compatibility between varying plastic types. Obtaining reliable and consistent recycled resins for making automotive compounds is difficult. Odors accompanying recycled resins are not easily removed and limit use in interior applications. To make recycling economically feasible, prices must also be lower than virgin resins. To successfully obtain cost-effective products fit for further usage, manufacturers must consider the costs of removing odors and contaminants, as well as introducing additives for up-cycling. Therefore, in most interior applications virgin resins are preferred due to their surface finish, scratch resistance, color consistency and odour.

What are some of the solutions SONGWON offers?

Schmutz: Sustainability is a high priority at SONGWON. Contributing to plastics recycling is an important issue for us and our customers. We have developed several strategies for polyolefin automotive compounds. In recycling, maintaining molecular weight and protecting the polymer during processing are essential. Classic b-blends such as SONGNOX® 11B are ideal for this. Showing a good balance of properties between processing stability, color and long-term thermal stability, it has low initial color and displays low gas fading. It also provides excellent melt flow and color protection during the processing of polyolefins.

Furthermore, preserving recycled plastics' quality enables their use in interior applications. One of the additives especially developed and certified for interior applications is our stabilizer blend, SONGXTEND® 2721. Meeting the industry's requirements of improved long-term heat stability, it increases the quality and upgrades the performance of recycled-PP while extending its service life.

Ideal for interior automotive applications such as dashboards and door panels SABO®STAB UV 228 50PP* or SABO®STAB UV 229 50PP* light stabilizers meet the industry's more stringent requirements for VOC/FOG and total carbon emission.

Plastics originally used for bumpers being recycled to produce new exterior parts like mudguards.

For TPO automotive exterior and interior parts, SABO®STAB UV 229 50PP or SABO®STAB UV 229 50PP outperform other HALS in terms of color stability, gloss retention and mechanical property retention.

Another high-performance product with excellent compatibility is SONGXTEND® 1103. Offering maximal polymer resin stabilization, it significantly reduces VOC, while optimizing compounding conditions, providing more production flexibility and reducing the need for degassing.

Intended for PP compounds in automotive interiors, SONGXTEND® 1103 also contributes to reducing VOC and improves air quality.

SONGWON intends to continue developing new, improved solutions for addressing key industry issues for removing odors and contaminants, and providing high flexibility products to facilitate plastics up-cycling. AI

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