Edited by ***Ryan Gehm***

Soy foam debuts on Mustang

The 2008 Ford Mustang's seats will use the industry's first soy-based flexible foam. "There were no changes necessary to accommodate the manufacturing process," said Lear's Jeff Frelich.

Kami Buchholz

Urethane Soy Systems, Bayer, and Renosol played a role in soy foam development. Monetary grants from the United Soybean Board also helped make a soy foam seat from Lear (shown) possible.

Drivers of that marvel of modern manufacturing, the Model T, might not have realized they were helping to steer agricultural history by motoring in a vehicle that once contained 60 lb (27 kg) of soybeans via its paint and molded plastic parts.

Nearly a century later, the 2008 **Ford** Mustang will sport seats made of soy-based foams. Seating supplier **Lear** will substitute "up to 28% of the petroleum product with soy polyol. The initial soy-foam cushion and back pads will use formulations that replace 10-12% of petroleum polyol with soy polyol—giving 5-6% by weight of soy per cushion," noted Cynthia Flanigan, Technical Specialist in the Material Research & Advanced Engineering Department at Ford.

Lear is saving 40,000 barrels of oil annually, assuming Ford hits its quoted annual production volumes, by using a percentage of soy polyol in the Mustang's seats. Less petroleum consumption is only one of the eco-benefits. "Lear SoyFoam uses a petroleum-replacement ingredient [polyol] that, when made from soybean oil, 2 kg of CO_2 is removed from the atmosphere vs. 3.5 kg of CO_2 added to the atmosphere when petroleum is converted. This results in a total reduction of 5.5 kg CO_2 release for every kilogram of the product used in SoyFoam," said Jeff Frelich, Director of Research & Development for Lear's Seating Systems Division.

At the 2003 North American International Auto Show in Detroit, Ford showcased a vehicle employing an array of eco-friendly materials, like a soy-based resin-composite tailgate, soy-resin body panels, and a corn-based canvas roof. "We [also] demonstrated the idea of using soy-based polyurethane foam for seating on the Ford concept Model U. Within Ford Research and Advanced Engineering, we invented several ways to remove, encapsulate, or not generate the odor bodies that were also an impairment to implementing soy-based foams in automotive," said Flanigan.

Unwanted odors were a troublesome pest in the early stages of SoyFoam development. "When Ford and Lear first started, it gave off an aroma of burnt popcorn," said Frelich. Added Flanigan: "The soy-polyol provider was able to improve the odor of the polyols by stripping the low-molecular-weight species—the odor-containing bodies—from the oil. The current foam formulations are able to pass automotive requirements for odor."

Challenges still remain that prevent 100% soy-based polyols from being used. "Currently, the soy-based materials have secondary functionality. That means that the reactive group is in a secondary position, and they aren't as reactive as their petroleum counterparts. In order to generate good foams, we had to rebalance the blowing and gelling reactions to account for the slower reaction rate. That becomes increasingly difficult as you increase the percentage of soy," noted Flanigan.

Both Ford and Lear researchers think higher-percentage soy-based polyols are possible. "We continue to push our engineers to develop these solutions. Our goal is to double the amount of soy-oil use for the 2009 model year," said Frelich, adding, "We can go up to 40% on smaller parts, such as head restraints and armrests. On larger parts, such as cushions and backs, there are different requirements, and that has led to a lesser amount of soy oil for those applications."

The Mustang became the first application of SoyFoam because of program timing. "We are currently discussing this technology with other program platforms, too," noted Flanigan. "The possibilities for using soy-based foams could be extended to other interior applications such as instrument panel foam, headliner foam, or package trays (rigid foam), for example."

Added Frelich: "Lear is currently working with Ford on other vehicle lines for 2008. We are also taking this to other OEMs. And, we are working on other eco-friendly materials in other parts of our seat systems."

Kami Buchholz

USCAR, ECO2 rinse and recycle plastics

Composed of researchers from **Chrysler**, **Ford**, and **General Motors**, the U.S. Council for Automotive Research's (**USCAR**) Vehicle Recycling Partnership (VRP) is pushing for optimization in the recycling of all materials in shredder residue, regardless of their source.

As part of this endeavor, the VRP has contracted with San Francisco-based **ECO2 Plastics** to evaluate its proprietary polyethylene terephthalate (PET) plastic recycling technology. The ECO2 technology removes substances of concern (SOCs) from plastics recovered from shredder residue, the material left when end-of-life vehicles (ELVs) and other large items are shredded by grinding hammer mills as part of their recycling process.

According to USCAR, U.S. automakers have worked to eliminate SOCs from general vehicle content, but some SOCs can still be found in shredder residue, which contains materials from a combination of automotive and nonautomotive sources, including appliances, building demolition materials, and commercial and industrial waste.

ECO2 Plastics is one of several private companies (which include **Changing World Technologies** to convert organic material from shredder residue into an oil, **Troy Polymers** to convert foam recovered from shredder residue into a glycol that can be used in making new foams, and **SiCon** to mechanically separate, or isolate, plastic streams from shredder residue) working with the VRP and its partners to develop shredder residue recycling solutions. The shredder residue plastics are cleaned in a process that uses no water and deploys a biodegradable solvent and liquid carbon dioxide to remove the SOCs so the plastic can be more readily reused.

"We are encouraged by our initial review of the ECO2 process," said Nakia Simon, Chrysler product development engineer and VRP representative. "Innovative processes like these can help bring us closer to our goal of more fully recycling all end-of-life vehicles with the added benefit of creating a recycled product for automotive use."

Currently, more than 84%, by weight of materials, of each ELV in the U.S. is recycled, according to USCAR, with 95% of all vehicles going through the existing infrastructure. ECO2's proprietary recycling process addresses the plastics found in the unrecycled portion.

"Sustainable end-of-life vehicle recycling is a global issue," said Rod Rougelot, CEO of ECO2 Plastics. "ECO2's recycling process has been found to clean the plastics recovered from shredder

The ECO2 process is one of many USCAR VRP research initiatives under way. Here, a chemical engineer at Argonne National Laboratory sifts plastic chips ground from shredder residue, which are cleaned and sorted by froth flotation in Argonne's Pilot Plant.

residue to a level that meets the regulatory guidelines, allowing it to be reused as recycled plastic content for new automobile manufacturing."

The USCAR VRP currently is engaged in a Cooperative Research and Development Agreement (CRADA) with the **U.S. Department of Energy**'s **Argonne National Laboratory** and the Plastics Division of the **American Chemistry Council** to address the sustainable recycling of current and future materials from ELVs. This is the third CRADA established among the participants since the VRP's inception in 1991.

USCAR believes that ECO2's PET plastic recycling technology has the potential to be one of several recycling solutions for shredder residue that fits within the current U.S. recycling infrastructure. The evaluation project will take about six months, according to Simon, followed by a review of the research results, which should be complete in the first quarter of 2008. The results will help to determine if changes need to be made to ECO2's current commercial system to make it suitable for use in recycling plastics recovered from shredder residue, said Simon.

ECO2 Plastics' process was developed through a research partnership with **Honeywell FM&T** (Federal Manufacturing & Technologies) and the U.S. Department of Energy. The company operates a recycling plant in Riverbank, CA, and has another plant currently under development in Southern California.

Ryan Gehm

Paint film shines on C-Class exterior

Both the roofing strips and greenbelt moldings on the new **Mercedes-Benz** C-Class are extruded with Fluorex paint film from **Soliant**, giving the trim components a high-gloss black appearance. According to the South Carolina-based decorative films and coatings supplier, the main technical advantages of its paint film for these applications are good chemical resistance, high UV resistance, high gloss in combination with very good short-wave analysis values, and enhanced scratch resistance.

Kunststoff-Technik Scherer & Trier, based in Michelau, Germany, is the Tier 1 supplier for the greenbelt moldings. The roofing strips are supplied by **Silvatrim**, based in Monaco.

"Using Fluorex paint film on the trim components enables us to provide added value by improving part performance," said Volker Heinel, head of marketing for Kunststoff-Technik Scherer & Trier. "We are using this technology to produce complicated extruded profiles with a body-color finish in a cost-effective way."

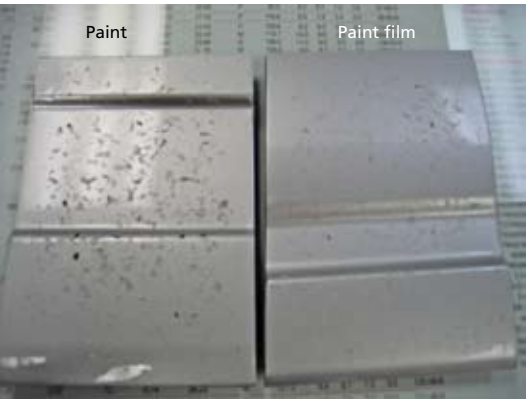
The roofing strips and greenbelt moldings on the new Mercedes-Benz C-Class are extruded with Soliant Fluorex paint film.

Added durability is one of the main reasons Fluorex paint film is gaining popularity among automakers, according to Soliant. Gravelometer laboratory tests and field tests have shown that paint film is more chip- and weather-resistant than paint, offering OEMs the potential benefit of fewer warranty issues.

The increased use of paint films drives "major manufacturing cost saves," claims Soliant. An immediate cost saving results by cutting out a step in the manufacturing process; paint-film parts are finished right out of the mold. New plants especially benefit from the use of paint films, the supplier points out, because there is no need to install or maintain a painting facility.

Fluorex paint film is compatible with extrusion, thermoforming, injection molding, and compression molding, enabling multiple parts to be processed with one

Soliant Fluorex paint film and bright film (chrome) are available in a full color palette for durable automotive Class A finishes.



Soliant

Gravelometer test samples show that paint film is more durable and chip-resistant than paint, illustrating paint film's suitability for exterior applications such as rocker panels, running boards, stone guards, fascias, bumpers, and moldings.

film. The versatile film also allows automakers to achieve multiple looks and decorating options with the same tool and process.

Paint films have been called a "sustainable technology" because they are thermoplastic and recyclable, so any scrap can be reground into the resin stream. Soliant won the Environmental Award in the "Emerging Technologies" category at the 2006 **Society of Plastics Engineers**—Global Plastics Environmental Conference for its paint-film process. The company demonstrated a 98% reduction in volatile organic compound emissions based on an analysis of the production and use of its product compared to traditional vehicle painting.

More than 40 million parts with paint film have been in the field over the last five years without issue, according to Soliant, which currently offers 140 colors under the Fluorex brand name for automotive interior and exterior applications. The company will match any color and create new ones to help customers differentiate their offerings.

Ryan Gehm