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Generation Y Speeds New Plastics Uses In Cars

By Peter Mapleston

As "Generation Y" matures and becomes a major consumer demographic, carmakers are taking a close view at what they look for in automobiles. And what the oems conclude is bound to have an effect on their suppliers. Yet, there are emerging trends driven by vastly more than just Generation Y's sensibilities.

Generation Y is made up of those born between 1977 and 1994. According to Business Week, "at 60 million strong, more than three times the size of Generation X, they're the biggest thing to hit the American scene since the 72 million baby boomers." Consultant J.D. Power and Associates, which just published a study on Generation Y's car-buying patterns, classifies a typical "Gen Yer" as stylish, risk-taking, one who prefers style over practicality, and "cheap," which means they are not yet ready to hand over big bucks for a car.

Balancing high quality on a tight budget is nothing new, but it will be an oft-repeated theme. So how can the auto industry respond? Following are some notable developments.

Carmakers have made it clear that they'd happily stop painting exterior panels if there were less-costly and cleaner methods that produced comparable, if not better, surface finishes (July 02 mp, 24; mpi, 29). While painting won't be entirely supplanted in the near future, such technologies as Paintless Film Molding (pfm), pioneered by BASF, already are used in selective applications. The latest application, introduced in the middle of last year, is an integrated roof module for the City Coupé by DaimlerChrysler subsidiary Smart GmbH.

The module is built by ArvinMeritor, in Gifhorn, Germany. It comprises two fixed, high-

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gloss black pfm panels with Class A surfaces, and two black-tinted sliding glass panels. A coextrusion of BASF's Luran S asa/polycarbonate blend with two layers of acrylic (one clear, one pigmented) is thermoformed, then Krauss-Maffei's Long Fiber Injection technology is used to inject a long-glass-fiber-reinforced polyurethane foam (Elastogran's Elastoflex) onto its inner surface. Post-molding assembly and finishing are minimized by integrating the main parts of the sunroof's sliding mechanism into the roof module during the foam molding process.

The development of roof modules will revolutionize the assembly-line process, according to Enrico Fin, advanced sales manager for ArvinMeritor at its Troy, mi, headquarters. Benefits to automakers include the flexibility to produce different types of roofs on the same car body, allowing product differentiation and providing major savings in tooling costs. The modules are structural components that contribute to the rigidity of the car body and improve resistance to side impacts.

Fin admits that exact color matching of pfm panels with neighboring painted metal surfaces is still an unresolved issue, although BASF now offers a grade of Luran S for monolayer films that can be painted offline with waterborne paint systems from BASF Coatings after backmolding. The two companies plan a full color-matching service with a pre-coated film.

So, ArvinMeritor will initially target vehicles where matching is not critical — for instance, when there is a split line between the roof and sides — and where the lower weight of the modules versus steel parts could be decisive in lowering center of gravity, such as in sport-utilities, which are coveted by Generation Y. With that said, Fin expects progress in roof modules, initially in Europe rather than the U.S., since consumers there are increasingly choosing cars with skylights.

Thermoformed Class-A parts are beginning to accelerate

Generation Y, more than any other group, is likely to want cars that are different from everyone else's. That suits a trend for some time among carmakers, of making a wide range of models in lower numbers from one platform. This, in turn, opens the door for process methods not geared to high-volume production, like thermoforming.

At the Society of Plastics Engineers thermoforming conference last year, the consensus was that it would be years before thermoformed parts could duplicate a Class-A finish (Nov 02 mp, 41; mpi, 49). But Manfred Geiss, managing director at thermoforming machine supplier Geiss Maschinenfabrik, Sessloch, Germany, says the future is closer than many think. (Indeed, this year's SPE Automotive Division Innovation Awards featured an application with thermoformed Class-A parts — p. 58.)

Geiss makes machines for technical parts, as well as cnc finishing equipment, and recently recorded its first sales in the U.S. market, including one machine to GE Plastics, Pittsfield, ma. GEP intends to use the machine to demonstrate production of Class-A parts. Geiss has developed equipment to link thermoforming and cnc trimming machinery for automated production.

"Thermoforming is becoming a key issue for us," remarks Jay Pomeroy, a GEP spokesman. He thinks the company's SollX pc copolymer film (Jul 02 mp, 28; mpi, 30) will, "before too long, have an enormous impact on the automotive industry," as painted steel parts are replaced with thermoformed ones.

In Europe, Geiss has worked with sheet processor Senoplast Klepsch & Co. GmbH, Piesendorf, Austria (which is a partner with BASF in pfm). Phil Brooks, director of Senoplast (UK) Ltd., says automation of thermoforming is a significant leap forward for the process. "The delay [with commercialization of thermoformed Class-A parts] has been the production process, not the materials," notes Brooks. "That's where the Geiss machinery fits in."

Senoplast coextrudes thermoformable abs/pmma sheet for exterior parts. It supplied sheet for the roof, spoiler, and headlamp surrounds of Ford's original Th!nk electric car. Brooks says the company, together with thermoformer Linecross Thermoplastics, Oakham, England, developed exterior panels for the following generation of the Th!nk, but they disagreed with Ford on the best way to make them. Ford wanted to use female tools, but Senoplast and Linecross said they would not provide a Class-A surface. The thermoforming contract was eventually given to Trelleborg Stanton, West Thurrock, England, using sheet from VTS Royalite, Newbridge, Scotland. However, the car may not reach production (Dec 02 mp, 19; mpi, 22).

Resin makers get involved in fuel cell production

Generation Y did not exist when the first of the 1970s oil crises hit, but now is maturing when the twilight of the internal combustion engine is being predicted.

Development of fuel-cell technology will inevitably lead to a shake-up in supplier-customer relations for engine-related applications. Large-scale production of fuel cells for cars is unlikely before 2010 (the total market could be worth $10 billion by then, thanks to applications besides automotive), but indications are that polymer suppliers intend to be directly involved in component production. For example, DuPont, which is a leader in proton exchange membranes (pem) produced with its Nafion ionomer resin, last year said it would make complete membrane electrode assemblies (mea), in which hydrogen and oxygen react to generate electricity, and other fuel-cell components.

DuPont also is developing conductive bipolar plates, housings that double as the anode and cathode of fuel cells. "We will be a plate supplier and make finished plates according to customer designs," says Jean-Marc Tixhon, business development manager in Geneva. The material used for the plates, and how they are made, remain guarded.

Celanese, the parent company of polymer maker Ticona, in Frankfurt, Germany, is taking a similar approach. Last September, it started pilot production of high-temperature meas containing Celtec membranes produced with its polybenzimidazole (pbi). A company spokesman says Celanese is in contact with all major fuel cell developers.

Up against these majors are relatively small companies like Bulk Molding Compounds Inc., West Chicago, il, and Quantum Composites, Bay City, mi, both of which are developing special types of conductive bmc for bipolar plates. Quantum last year inked a deal with polyester resins major Dainippon Ink & Chemicals Inc., Osaka, Japan, for the development of compounds with high heat and corrosion resistance for injection and compression molding.

Attention to acoustics promises sound gains

In-car entertainment will sound clearer in Generation Y's cars, partly because of new types of underfloor systems. In the coming years, a substantial market is likely to develop for fiber-reinforced polypropylene compounds for underbody shields that protect the car, contribute to aerodynamics, and reduce noise. In Europe, shields also reduce "drive-by" noise. The European Union recently toughened legislation governing noise levels vehicles produce. And, with the increasing popularity of diesel engines, which generate more noise than gasoline engines, the need for noise-abatement solutions intensifies.

Numerous materials and processing technologies exist, such as glass-mat-reinforced pp (gmt-pp) and, increasingly, compression and injection moldable compounds that are pre-pelletized or produced inline. BP's Curv self-reinforced pp is another potential technology. According to the GKV processors association in Frankfurt, use of long-fiber-reinforced pp for underbody shields will rise among German carmakers to 17,000 tonnes/yr in 2005, from just 2000 tonnes/yr in 1999.

Rieter Automotive Heatshields AG, in Sevelen, Switzerland, uses most of the available technologies. Bernd Uwe Wulf, head of the company's composites center, sees cost-savings with long-fiber compounds, but notes that gmt, although sometimes overengineered, is a proven technology for structural components. This is particularly important, as Rieter sees a trend in the medium term from underfloors to complete floor modules that fulfill the functions of current underfloor panels, heat shields, steel structures, acoustic packaging, and carpeting.

"The readiness of the processing industry to develop, the readiness of the supplier industry to invest, and the readiness of vehicle makers to innovate may result in highly competitive solutions and thus advantages throughout the entire value chain," Wulf said at last year's VDI-K plastics in automotive engineering conference in Mannheim, Germany.

Benefits of TPV seals are spurring greater adoption

Suppliers of thermoplastic vulcanizates (tpv) are finally reaping the rewards of their substantial effort to break into the weatherseals market, which is dominated by ethylene-propylene-diene (epdm) rubber. The market appears to be persuaded by arguments of simplified fabrication, faster production, lower scrap rates, recyclability, colorability, and lower capital-equipment costs.

Leading supplier Advanced Elastomer Systems, with headquarters in Akron, oh, and Brussels, Belgium, says it now has applications running at most oems. At Solvay Engineered Polymers, Auburn Hills, mi, tpv product manager Jim Haseley says all the top suppliers of rubber weatherseals have thermoplastic elastomer application engineers. "They definitely see it coming," he says.

Sam Jyawook certainly thinks the future of weatherseals is in tpv. He set up Jyco Sealing Technologies in Dexter, mi, in 2001, just to produce tpv seals. The company began commercial production of glass run channels in mid-2002 for some vehicles and already has doubled capacity, which Jya-wook declined to reveal. "When we started, we expected to do development for a couple of years, but we found out that the market was ready," he says. Jyawook, who has a background in the seals industry, notes that it is now possible for tpvs with high rubber content to have compression-set values surpassing those of epdm.

Jyco will make microcellular foamed as well as solid tpv seals. It has an exclusive North American license to use Trexel's Mucell process for extruded tpv. Foaming technologies developed by tpv suppliers use either chemical blowing agents or water, but Jyawook says Mucell gives better control over cell structure and a pore-free surface finish. Profiles are currently undergoing long-term tests.

Generation Y may be risk-takers, but carmakers aren't about to make their products less safe. In fact, legislation (or the threat of it) is driving activities to improve the crash performance of cars.

European legislation on passenger head-impact regulations similar to that now going into force in the U.S. (FMVSS 201U) is likely to be enacted within five years. Conversely, a voluntary agreement among European carmakers to adopt improved pedestrian-safety

standards will probably serve as a model for the U.S. for implementation around 2008. In Europe, all new types of vehicles will have to meet pedestrian-safety standards covering lower-leg and head impact as of July 1, 2005, although it will not be until 2012 when all new vehicles, no matter the type, will have to comply.

Many car fascias and pillar covers are now padded with pur and pp foam energy-absorption systems, but one of the most promising technologies uses injection molding and designs that make use of the "crash cans." GEP has developed designs molded in its Xenoy pc/pbt that can be integrated into the energy absorber. And Collision Energy Management (cem) technology from Beienheim Plastics, Beienheim, Germany (previously part of LDM Technologies, Auburn Hills, mi), uses similar principles, but works with high-density polyethylene (Feb 01 mp/mpi, 56).

Commercial director Axel Schuch-mann says cem's energy-absorption properties are so good, it can even replace hydraulic shock absorbers. "It's a huge cost-saving for the oem," he says. Beienheim is talking with several oems and Tier 1 suppliers on applications. Depending on carmakers' acceptance, the company may license the technology.

"Feedback from the industry is phenomenal," claims Schuchmann. "It sees cem as a core technology, especially for fulfilling the FFS head-impact test, which virtually no one does at the moment."

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