

**PLASTICS WORLD INSIGHT**  
**Vol. 1, No. 1/September 2008**

**PWI Newsletter Abstract:**

This Plastics World Insight newsletter reports and analyzes plastics industry related, new and emerging, global technologies and business trends:

- (1) PEEK's expanding high performance range and electro-optical waste management separation technology
- (2) vulcanized and catalyzed TPVs, metal-like medical-grade PA-I, fast-cure high-wet-out composites, volatile free multilayer polyurethanes, high-performance twin-screw extrusion, specialty molding technology, Sumitomo's direct-drive all-electrics, large-tonnage all-electrics update, Qatar Plastic Products evolving, and systems-level integrated mold making
- (3) office products handwriting conversion system, specialty olefinic barrier bottle packaging, Dow Automotive's captive Tier 1 molding, design-optimized golf cart, emerging electroactive smart surface technology, European electronics recycling platform, construction demolition best practices, high-temperature industrial engine polymers, consumer product smart surface technology, and high-tech government infrastructure products
- (4) magnesium metal injection molding, global metal resource center, synthetic rubber industry tech focus, rubber industry knowledge building, pulp and paper technology monitoring, global paper industry networking, plastic-based fireproof ceramic, and prioritizing ceramic industry trends
- (5) Foma Engineering's high-value plastics waste separation and 3D System's technology-leading selective laser sintering
- (6) K Fair new technology highlights and material highlights of the K Fair.

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**LEADS**

**Ultra-Performance PEEK Polymer**

Product design and market demands are continuously growing while materials of the future, in particular high performance plastics are creating new possibilities for innovative products. High performance plastics materials maintain 25% or better of their room temperature properties at 310°F, are stronger, and have important characteristics such as chemical resistance, stiffness, fire retardance, composite processability, and others to stretch the boundaries of plastics applications.

Victrex plc is known for its ongoing global excellence in applied research and development as well as commercial market development of PEEK (polyetherether-ketone) high-performance materials. PEEK is a high-performance engineering thermoplastic resin with superior chemical and water resistance. It can be used continuously to 250°C and in hot water or steam without permanent loss in physical properties. The firm has fully commercialized a new material, PEEK-HT. Compared with standard PEEK polymer, unreinforced PEEK-HT’s high-temperature performance surpasses that of the standard material. It also maintains physical and mechanical properties at 30°C higher temperatures and boasts up to three times the wear resistance of PEEK polymer (PEEK 450G grade) at high temperatures, has a substantially higher tensile strength and flexural modulus at 250°C and possesses improved compressive strength versus standard PEEK. Additional benefits of PEEK-HT include long-term creep and fatigue resistance over a wide temperature range. Like standard PEEK this material has exceptional resistance to chemicals, solvents, and fuels; inherent low flammability; low smoke emission; good electrical properties; excellent hydrolysis resistance; and also consistent ease of processing.

Victrex views PEEK-HT polymer as a premium material that is both a cost-effective and a lightweight alternative to metals. Key industries where there is a demand for extreme heat-resistance applications include automotive, aerospace, and engineering, with typical applications encompassing engine compartment parts, aircraft components, subsea connectors, heat exchanger elements and industrial valve linings. The company anticipates producing even higher temperature grades as the market demands them and is also placing increased emphasis on the development of specialty grades such a silicone modified PEEK, which provides toughness and impact performance approaching polycarbonate, filled PEEK grades with up to five times the wear life of unfilled PEEK and an ultra-high purity grade with order-of-magnitude lower extractables. A version of PEEK Optima with better mechanical properties has also been introduced.

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## High-Value Optical Waste Management Separation

TiTech AS, the world's leading provider of technology solutions for the identification and recovery of high-value material fractions, has designed innovative systems to solve difficult problems in waste management. With unique patented technology for electro-optical waste management, its equipment can automatically separate a wide range of waste fractions, i.e., color-sort transparent or nontransparent materials; PVC (polyvinyl chloride), PE (polyethylene); mixed plastic polymers, paper, and cardboard or extract undesirable plastics from compost streams. Models are available in scanning widths of 500–2800mm (millimeters), with processing rates of 1.2–4.5 tonnes/hour, hit rates of 90%–95% , and sort purities of 90%–97% , depending on input composition.

TiTech's automated sorting systems are based on the use of NIR (near-infrared light) and color and image analysis technology. Using these technologies and advanced software, the TiTech sorting systems can determine parameters of objects in the waste stream, such as type of material, color, size, and shape, as well as position on the waste conveyor. Items to be separated are ejected from the waste stream by a row of computer controlled, high-pressure air valves.

TiTech products can be tailored to client needs according to the amount and type of waste to be sorted and programmed to extract single or multiple fractions. High-resolution color cameras are used to analyze each object according to optical criteria including shape, color, texture, and image. Light illuminates the objects to be sorted, enabling analysis of their composition to distinguish between materials and colors. Air jets controlled by high-precision technology eject selected items from the stream. Data for each object is carefully assessed to activate exactly the right combination of jets. Jet positions and airflow then can be customized to eject objects of varying weights and sizes. The system can be set to extract clear, blue, yellow, green, red, or opaque materials. It is also possible to separate a combined fraction of, for example, transparent blue with clear bottles. A series of separating phases provides even more powerful functionality. Color analysis is based on two techniques: reflection and transmission. Analyzing the colors in reflected light makes it possible to separate fractions such as very light blue from clear PET (polyethylene terephthalate). Transmission analysis, which involves transmitting light through the object, can be used to extract the natural PE milk jugs widely used in the UK and USA from pigmented PE detergent containers and similar items. TiTech AS is part of the Tomra Group, a large European recycling technology solutions provider.

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## PLASTICSLINE

### Specialty Thermoplastic Vulcanizates Emerging

Teknor Apex's Uniprene compounds make the outstanding performance of TPV (thermoplastic vulcanizates) elastomer compounds available at very low hardness levels. While 45 Shore A hardness is the softest in conventional TPVs, three grades in the Uniprene 2000 series have Shore A hardnesses of 15, 25, and 35. Until now, producers requiring good softness for grips, gaskets, or weather stripping were limited to non-cross-linked thermoplastic elastomers such as SBCs (styrene block copolymers). The Uniprene 2000 compounds provide comparable softness and perform better at elevated temperatures. The outstanding rubber-like properties are attributable to their highly cross-linked elastomer component, which is finely dispersed in a thermoplastic such as PP (polypropylene). The grades are tough and rubber-like at both temperature extremes and outperform standard SBCs of comparable hardness.

Dow Elastomers' Nordel MG EPDM represents the fusion of gas-phase polymerization and metallocene catalysis. Metallocene gas-phase EPDM technology has opened new areas of use for very high Mooney polymers that previously had limited application. With gas-phase technology, metallocene (m) EPDM is playing a role in TPV compounding. Dow's Nordel MG gas-phase EPDM grades 47130, 46140, and 47100 have very high Mooney viscosities (>100) but do not need oil extenders. The high Mooney grades are well suited to formulating polypropylene TPVs. Their granular form eliminates a compounding step as no bale grinding is needed.

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### **High-Performance Micromolded Metal Replacement**

Solvay Advanced Polymers' Torlon PA-I (polyamide-imide) has the advantages of a thermoset, including high performance in most severe service environments, but can be processed like a thermoplastic. The resin combines exceptional strength at high temperature with excellent resistance to creep, wear, and chemicals. However, parts made from Torlon are lightweight, a major advantage over metal parts. Precision components made from Torlon PA-I are said to be virtually indestructible, making them a strong performer for demanding electronic handling operations.

Now, Torlon PA-I is being used in precision micromolding. In a technological breakthrough, Chicago-based micromolding company RapidWerk is molding a very complex 4.2-mg miniature component that has metal-like performance. The TORLON 4203L precision micromolded component is part of a medical device used in cardiovascular repair procedures. Fabrication is easier and costs 70%–75% less than machining a stainless steel part. Torlon resin's unique ability to combine high strength at temperatures up to 260°C with excellent resistance to creep and wear helped make this possible. Since the component operates at several thousand rpms under a load, RapidWerk needed a low-friction material that provided exceptional strength and wear resistance, and, as much heat is generated during the procedure, they also needed a material that was stable at high temperature.

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### **Ring-Opening Metathesis Polymerization**

Materia, an R&D firm with close ties to the California Institute of Technology, has introduced a new ruthenium-based catalyst system to accomplish ROMP (ring-opening metathesis polymerization) of inexpensive DCPD (dicyclopentadiene) cyclic olefin monomer to yield resins that exhibit remarkable impact and corrosion resistance. The clear to amber unfilled resins have low shrinkage and low moisture absorption, and they can be dyed, pigmented, filled, and machined. Materia's proprietary technology cures liquid DCPD into a tough, clear thermoset polymer in one step, unlike other processes that first make a high-viscosity prepolymer from the DCPD. As a result, the water-like viscosity DCPD can wet out very high filler loadings up to 89 wt%. Through the use of Materia technology, DCPD is easily processed into complex end-use products and serves as an excellent matrix resin for a variety of composite fibers such as Kevlar, spectra, fiberglass, and carbon for use in defense and aerospace, sports and recreation, marine, and microelectronics. Materia's unique poly-DCPD resin system imparts beneficial properties from increased toughness to ease of fabrication. Very large castings can be made in one pour. Materia's poly-DCPD resin system can also penetrate wood, creating, for example, super-strong impregnated baseball bats guaranteed against breakage. Materia's system can also be used in conjunction with glass and thermoplastic microspheres to produce high-quality foam products. Poly-DCPD-based foams are 80%–90% as dense as other resin systems, are exceptionally durable, and are essentially void free.

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### **Volatile Free Structural Urethane**

BaySystems, a division of Bayer MaterialScience, has developed Baytec RS, room temperature curing multi-layer polyurethane spray technology for spraying up large shapes without the need for glass fiber, other reinforcement materials, or a thermoformed acrylic shell to produce all-polyurethane products such as spas, baths, and whirlpools. This eliminates the need for hand roll-out of the fiber and reduces cycle time. Most hand labor is eliminated through automated spraying of the three-component Baytec RS water-based PUR (polyurethane) into an open mold. The VOC-free (volatile organic component-free) process sprays a PUR sandwich of two solid skins around a cellular layer that is 0.75 in thick overall. Pot life is only a few seconds, and thus the PUR does not run off perpendicular surfaces. It gels within two minutes and can be milled, ground, or drilled after 15–20 min. No postcuring is required. Baytec RS material can be applied onto a gel coat in a mold or serve as a backing for preformed acrylic or acrylonitrile butadiene styrene

(ABS) parts. Lower-cost tooling with one polished surface or a thermoformed piece of plastic is used instead of having a two-sided mold, the press, and clamping pressure with the associated costs. The Baytec RS sandwich structure can be used for reinforcement of thermoplastics to give low weight in combination with high stiffness. Such construction is of particular advantage at the bottom of a bath, as it eliminates the need to support the base. The Baytec RS sandwich structure also has high resistance to knocks and blows, as the concentrated energy that impacts the polyurethane surface is distributed over a large area into the rigid foam (the central layer of the PUR sandwich).

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### **Turnkey Twin-Screw Extrusion Systems**

For small technical profile extrusion applications such as trim moldings, cable ducts, and cornering strips, American Maplan, a market leader in twin-screw rigid PVC (polyvinyl chloride) extrusion technology, has the AMC Compact system. This turnkey system, with a price about 30% less than that of the components sold individually, has the flexibility to extrude a broad range of products with a small footprint at an attractive cost. Simple to use, maintenance friendly, and powerful, the integrated extruder line features a choice of four interchangeable extruder units and a matched set of downstream machines, including calibrating table, belt haul-off, and saw, with a combined line length under 28 ft. The base frame is equipped with a visualization screen and control panel, control cabinet, PLC, and drive.

Berstorff has unveiled a lower-priced co-rotating twin-screw extruder, the ZE Basic aimed at small and midsized compounders targeting applications like color compounding, alloying, and mixing of fillers and reinforcements. The ZE Basic twin-screw extruder, priced about 25% less than the more powerful ZE UTX models, gives slightly less throughput at significantly lower cost. Berstorff was able to reduce costs by using a high degree of standardization in components and assemblies, such as a new design of the barrel sections, the drive train, ancillary equipment, the machine base, and electrical equipment. The ZE Basic, like the ZE UTX, also comes with the new second-generation advanced control system and new operator interface.

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### **Inline Compounding Molding Technology**

Direct or IMC (injection molding compounding) is an innovative technology that integrates the use of continuous compounding extruders with injection molding machines. The process makes it possible for molders to tailor mix their own materials, including formulations with high filler/reinforcement content, fibers, recyclate, blowing agents, and other additives. IMC might even allow molders to create their own high-modulus commodities and combine the physical properties of various materials. Processing to order makes purchasing separate raw materials more cost effective for the processor, compared to ready-made compounds. The result is a dramatic reduction in material costs, a major component of manufacturing cost. First introduced by Krauss-Maffei, in-line or direct compounding immediately upstream of a standard injection molding machine became feasible when a solution was found that couple a discontinuous process (injection molding) with a continuous process (extrusion). On Krauss-Maffei's injection molding compounder, plasticizing is carried out not by a single screw but by a twin-screw extruder that plasticizes and compounds the melt ready for injection into the mold. At high plasticizing rates, it is possible to compound the materials "to order" during the injection cycle. The melt is routed via a buffer-store into a shot-pot injection unit. From there the material injects into the mold. The design allows plasticizing to be continuous even during the injection stroke. IMC is particularly gentle to the material being processed, so high filler loadings are possible, and long fibers can be introduced into the structural component without damage.

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### **Next-Generation All-Electric Molding**

Sumitomo's all-electric SED Series with next-generation direct-drive technology provides the high speeds and pressures of high-performance hybrid and hydraulic machines, the exceptional energy efficiency and cleaner molding environment of other all-electric machines, and ultra-high precision and repeatability that exceed belt- and pulley-driven all-electric machines. Available in sizes from 20 to 198 tons, the SED Series features four direct-drive AC servo motors with full closed-loop control and digital sensors. All four motions—plasticizing, injection, clamping, and ejection—are controlled by these motors. All four motors are beltless, providing superior mechanical efficiency, repeatability, and durability. Among other features, the SED provides up to 50-ms velocity response for narrow-pitch connectors and micromolding; new clamp design with increased platen rigidity and improved force distribution; faster, quieter clamp open/close speed; added width between tie bars; and easy-to-use N-VIII control with 12-in touch screen, internal memory for mold setups, and full SPC/QC (statistical process control/quality control) capabilities. Sumitomo's new Center Press Platen clamp design and SED's increased platen rigidity provide improved force distribution, elimination of short shot and flash problems, and improved mold protection. The horizontal clearance between tie bars has been extended, allowing for the installation of larger mold bases and ease of mold changeover. Connecting ejector rods from the mold to the knockout plate is also easier due to added access space and a new feature that absorbs the impact of the ejector helps prevent parts from sticking to the ejector pins.

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### **Energy-Efficient, High-Tonnage Molding**

Toyo/Maruka USA wants to change its image as the maker of only small and midsize injection molding machines. The company unveiled its largest all-electric injection press, a 750-ton machine in its new SI-II series. (The series ranges from 35 to 750 tons). The machine was the largest-tonnage all-electric to be displayed at recent trade shows. Toyo's SI-II series is replacing the company's SI all-electric line. The 750-ton Toyo is said to compare favorably with electric presses that have 900 tons of clamping force. The platen is 60.6 × 60.6 in, and the distance between the tie bars is 45 × 45 in. Its shot capacity ranges from 131.5 oz to 159.2 oz. The SI-II machines are powered by a belt-and-ball-screw mechanism. The presses feature a rigid, strong, vibration-resistant machine frame called the Rasma-L and developed by Toyo. A double nozzle-touch mechanism and use of nozzle-touch ball screws eliminate shock at nozzle touch while maintaining the load balance on the bars during mold movements. A highly rigid clamping mechanism and a double roller-supported moving platen are other Rasma-L features. The Toyo electric presses require one-third of the electric power needed by hydraulic machines. Maruka USA handles sales and service of presses built by Toyo Machinery & Metal Co. Ltd. of Japan.

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### **Mideast Backintegrated Plastics Packaging**

Qatar Plastic Products Company (QPPC) is a joint venture of Qatar Petrochemicals Company (QAPCO), the Qatar Industrial Manufacturing Company (QIMCO), and Italy's FEBO SPA, each of which holds a one-third share. The company is the first of its kind in Qatar to produce heavy-duty plastic bags, foam filling, sealing film, stretch hoods, building and construction webbing, shrinkable films, and other plastic products for industrial purposes. QPPC uses polyethylene and other inputs available in the State of Qatar. QAPCO supplies LDPE (low density polyethylene) resin to QPPC, with around 70% of QPPC production absorbed by QAPCO under an off-take agreement. The balance is sold in the surrounding Gulf Cooperation Council (GCC) countries and, with FEBO's assistance, in Europe and other markets.

QPPC reached a production capacity of 10,000 t per year of packaging materials. This increased production was the result of a major expansion to meet the growing demands of its customers, including QAPCO. QPPC says stretch hood film is a key market. Such elastic hoods help prevent stacked pallets from sliding during trucking operations on rough roads. Moreover, outside storage requires hoods with added protection against UV light from the sun's rays. Products are extruded on Windmöller & Hölscher blown film lines,

and all operations are controlled by a sophisticated computerized system that automatically checks the thickness and width of the film.

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### **Highly Integrated Moldmaking Systems**

Moldmaker Gefit SpA does not sell molds in the traditional manner but rather supplies integrated systems. The global supplier is a solutions provider to small and medium-sized enterprises, particularly in emerging markets. The firm's core moldmaking technology is its 2-component nonrotating closure mold to produce caps for carbonated beverages. The molds produce 7,600–28,000 PE (polyethylene) or HDPE (high density polyethylene) caps including the TPE (thermoplastic elastomer) ring liner per hour. The two-component injection does not require mold or platen rotation. Avoiding these costly rotating elements eliminates rotation time, reducing mold cycle time. Shorter cycle times can mean millions more closures a year. Recognition that cycle time depends on the total production system led Gefit to become a system provider. The firm is also involved in product design; creating a closure that weighs 1.5g (grams) compared to 1.7g for earlier designs a large saving when producing 30 million caps per year. The cycle time/material savings has led several multinationals to switch to Gefit technology. Synergies between Gefit's plastics and automation divisions have also led the firm to become a PET (polyethylene terephthalate) bottle system supplier (molds, manipulators) for the PET container market. Gefit's line of cavity molds, which yield 1000-14,000 preforms/hour for bottles ranging in size from 0.125–10 L, is a good fit for developing economies. The company has also developed several patented manipulators to remove preforms from the mold and cool them in stages. The automation division makes both preform/bottle handling systems and conveyors to move them.

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## **MARKETWATCH**

### **OFFICE PRODUCTS**

#### **Advanced Digital Writing Solutions**

Logitech and its industry partners are creating a variety of digital writing solutions based on the Logitech io<sub>2</sub> Digital Pen and this summer introduced a Bluetooth wireless technology enabled version. With Logitech's award winning Logitech io<sub>2</sub> Digital Pen, it is possible to take notes at a meeting with pen and paper, return to the office and transfer the handwriting to computer. The application provides development opportunities for polycarbonate, PPO/PS (polyphenylene oxide/polystyrene), as well as soft touch TPE (thermoplastic elastomer) type engineering plastics. The retail Logitech io<sub>2</sub> package includes the pen, a USB port cradle and recharging station, pen software compatible with Windows 3.0 or higher, special preprinted digital paper, an AC adaptor and five ink refills.

An optical sensor positioned beneath the electronic pen's ballpoint tip captures the handwritten notes by recording a pattern of dots created when the pen is used to write on special digital paper created by printing a proprietary pattern of very small dots on paper that is perceived by the eye as slightly off white in color. The printed dot pattern locates words and images on the paper and assures they appear in the same place in digitized files. The pen, which is used as a regular ballpoint pen, is activated by removing the cap and deactivated by replacing the cap. The captured writing can then be transferred to a computer by placing the pen into a dock connected to the PC via a USB port. The handwritten images can be pasted into various applications including word.

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### **PACKAGING**

#### **Enhanced Barrier Blow Molding**

Alcan Inc. manufactures single and multilayer polyolefin barrier bottles using both extrusion and injection blow molding processes. The barrier bottle technology leader is an expert in designing and making packaging for 'hard-to-hold' products. These are foods and beverages that are sensitive to oxygen, have high carbonation levels, and are products filled at high temperatures or cooked in the container (known as retort).

Alcan manufactures 3-layer PP/EVOH/PP (polypropylene/ethylene vinyl alcohol/polypropylene) oriented barrier bottles on modified Sidel rotary reheat SBM equipment. The PP skins are modified so they adhere strongly to the EVOH barrier without tie layers. The patented Gamma Clear multilayer, oxygen barrier OPP (oriented polypropylene) containers have glass like clarity and 205°C heat resistance for packing food products at a lower cost than multilayer PET (polyethylene terephthalate). The company's focus is to replace glass in applications requiring extended shelf life, good oxygen barrier, and higher hot-fill temperatures. The wide mouth jars are ideal for high-acid products including tomato based sauces, salsa, jams, jellies, and fruits. The initial target is pasta sauce packaging, now typically in glass and hot-filled at 195°C. This package would otherwise require a costly heat-set barrier PET bottle. PET bottles can be designed for hot-filling at up to 180°C by using vacuum-resistant panels and pinch-grip designs. Yet OPP bottles can survive hot-filling at even higher temperatures without these features, liberating label space and offering a marketing edge.

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## **AUTOMOTIVE**

### **Captive Materials Molding Integration**

Dow Automotive, a Dow Plastics business unit and a leading supplier of plastics, adhesives, sealants, plastics enhanced products, and body engineered systems for the global automotive industry, serving tier, OEM and aftermarket customers is also filling the role of Tier 1 supplier to Ford Motor Company's assembly plant in Brazil where it injection molds and assembles automotive parts and modules, a plastics resin supplier first.

Dow says its "pellet-to-part" service supports its role as "materials integrator" at the Ford site and aligns it with a strategic customer at one of the automotive industry's leading industrial parks. Dow operates twenty-five 350- to 2,700-ton Engel injection presses to produce forty-five different parts for a version of the Ford Fiesta designed for the South American market. Also in place is glass bonding equipment using Dow's Betaseal polyurethane adhesives, two welders and a paint line. Dow uses its own materials including PP (polypropylene) resins and compounds, TPOs (thermoplastic polyolefins), plus glass and talc filled PPs compounded at a Dow facility near Sao Paulo to manufacture the parts. The parts molded by Dow are front/rear fascias, interior/exterior trim, floor consoles, instrument panels, wheel well liners, and radiator grilles. Parts are delivered on a just-in-time basis to the adjacent Ford assembly line. It also delivers instrument panel components to Visteon, another on-site Tier 1 supplier. Dow supplies 50 kg of moldings per car (25 kg of PP). The assembly line produces 900 Fiestas daily.

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## **RECREATION & LEISURE**

### **Feature Optimized Golf Cart**

Innovative plastics design and molding firm Meese Orbitron Dunne (MOD) Co.'s American Rotational Molding (ARM) Group redesigned and manufactured a rugged golf club merchandising cart for golf products manufacturer Titleist. The merchandising cart, a key element in Titleist's custom club fitting system, enables PGA (Professional Golfers Association) teaching professionals to store, transport and easily access up to forty-eight different clubs during the sizing and fitting of custom Titleist and Cobra clubs.

When formerly made from sheet metal in twenty parts fastened with metal hinges, bolts and spot welding, the merchandising cart often collapsed around the casters. MOD/ARM increased structural strength and

durability by replacing the myriad metal parts with five rotationally molded plastic parts (LLDPE, linear low density polyethylene) while eliminating several costly assembly steps. Security enhancements were also built into the design. The merchandising cart, which may hold \$6000 or more in golf clubs, features a sliding, protective cover that locks when the cart is not in play. The dent, scratch and weather resistant MOD/ARM merchandising cart was molded in an attractive silver gray to eliminate secondary painting and prevent chipping that quickly discolored the original cart. Additionally, by molding in the Titleist logo and other graphics during manufacture, engineers eliminated labor intensive secondary labeling operations while ensuring the graphics' longevity.

Details: Gordon Sanden, General Manager, American Rotational Molding Group, Meese Orbitron Dunne Co., 16404 Knott Ave., La Mirada, CA 90638; Phone: (888) 724-1228; E-mail: [american@modroto.com](mailto:american@modroto.com); URL: [www.modroto.com](http://www.modroto.com)

## **EMERGING**

### **Electroluminescent Surface Film Technology**

Bayer MaterialScience is developing luminescent films (Smart Surface Technology) in partnership with Lumitec AG. The wafer-thin electroluminescent film glows when an electrical current is passed through it, and can be shaped to fit any surface. Luminescent film has numerous advantages as a source of light. It is less than half a millimeter thick, can be made into virtually any shape and does not produce any heat, making it potentially interesting as a source of light in a number of applications, particularly automotive where the flat light will appear inside luxury cars.

The film consists of several layers, the most important of which are two electrically conductive layers as electrodes and, in between them, the actual luminescent layer. The luminophor emits light as soon as alternating voltage is fed between the electrodes. The electrodes must be transparent if the light is to be visible. Baytron P, an electrically conductive, thermoformable polymer from Bayer's HC Starck subsidiary serves as the electrode layer. The entire structure is only about 50 micrometers thick, thinner than a human hair. The substrate film, Bayer MaterialScience's Bayfol, onto which all the other layers are applied also acts as an electrical insulator. The resultant total thickness of the luminescent film is about half a millimeter. That is thin enough to be incorporated into clothing.

Details: Eckard Foltin, Creative Center Head, Bayer MaterialScience, 100 Bayer Rd., Pittsburgh, PA 15205; Phone: (412) 777-2000; E-mail: [eckard.foltin@bayermaterialscience.com](mailto:eckard.foltin@bayermaterialscience.com); URL: [www.bayermaterialscience.com](http://www.bayermaterialscience.com)

## **ELECTRICAL & ELECTRONIC**

### **EU WEEE Recycling Consortium**

Under the European Union WEEE (Waste from Electrical and Electronic Equipment) directive, electrical and electronic equipment manufacturers will be obliged to comply with stringent rules in terms of collecting and recycling their end-of-life products. In anticipation of this new legislation, global appliance manufacturers Braun, Electrolux, HP and Sony, have established ERP (European Recycling Platform) the first ever pan-European take back and compliance scheme for waste from electrical and electronic equipment. These four founders account for 15% of the pan-European WEEE take back market. Negotiations are taking place with a number of other companies interested in becoming ERP Members. To administer the scheme, the companies have created ERP. Two general contractors have been chosen by ERP to manage operations (collection/treatment) for nine European countries. Geodis, ranked among the top 5 of Europe's major transport and logistics companies, is managing Western Europe (France, Spain, Portugal, Ireland, and UK). The second general contractor to ERP, CCR Logistics Systems, will run take back systems in Germany, Austria, Italy and Poland. CCR, with long term experience in running take back systems in the automotive sector, will ensure legal compliance and environmentally friendly recycling. ERP will take back WEEE from municipal and other collection points, such as retailers, in order to provide the best service for customers and to ensure compliance for ERP Members.

Details: Hans Korfmacher, President (Braun Environmental Affairs Representative) ERP, Frankfurter Str. 145, 61476 Kronberg, Germany; Phone +49-800-2728-6463; E-mail: [info@erp-recycling.org](mailto:info@erp-recycling.org); URL: [www.erp-recycling.org](http://www.erp-recycling.org)

## **BUILDING & CONSTRUCTION**

### **Demolition Waste Procedures Standardization**

The British Plastics Federation (BPF) is leading a project to find the 'best practice' solutions to collect and manage PVC (polyvinyl chloride) construction/demolition waste in the UK. In a Thames Valley pilot collection initiative, PVC materials from the flooring, window, pipe and guttering markets have been targeted with all BPF members and associates encouraged to participate. BPF and Vinyl 2010 awarded a six-month contract to Axion Recycling Ltd. The project is a key recommendation of a report by the University of Bradford, commissioned by the BPF and funded by the Government's Waste and Resources Action Program (WRAP). Most of the material will be collected from the construction sector. PVC window, pipe and flooring installers, major construction sites, trade waste sites, and construction waste transfer stations will be targeted initially. The trial will test methods of collection; sorting, separation, bulking and processing to provide vital basic data for future recycling initiatives. Axion has engaged the services of a waste management expert with thirty years of experience in the recycling and waste industry specifically to oversee the collection and help collate the data produced from the trial. Process outlets are being sourced in conjunction with BPF with the aim to develop outlets for recycling these waste streams in the future. Also collaborating in the project is the National Federation of Demolition Contractors.

Details: Mercia Gick, Project Coordinator, British Plastics Federation, 6 Bath Place, Rivington St., London, EC2A 3JE, UK; Phone: +44-20-7457-5000; E-mail: [bpf@bpf.co.uk](mailto:bpf@bpf.co.uk); URL: [www.bpf.co.uk](http://www.bpf.co.uk)

## **INDUSTRIAL**

### **Ultra Performance Engine Materials**

Solvay Advanced Polymers, LLC, a subsidiary of Solvay America, Inc., produces high-performance polymers used in a wide range of demanding applications including automotive. Several recent automotive under-the-hood application developments have expanded the use of Solvay's high-performance polyphthalamide (PPA) in this market sector. Carburetor expert, Willy Krup has developed a unique fuel pickup tube for use in oval track racers to compensate for the effect of the nearly constant left turns pushing fuel to the right side of a carburetor's float bowl. Krup developed a fuel pickup tube that assures constant fuel flow, and consistent power, through even the fastest turns. When machining the part in aluminum proved to be cost ineffective, the designer turned to Amodel AS-1133 HS, a heat stabilized, glass reinforced PPA that combines a high heat deflection temperature with high flexural modulus and high tensile strength. Elsewhere, TechLine Coatings, Inc. California, a company specializing in coatings for the high-performance auto market is expanding PPA's window of opportunity in high-temperature under-the-hood applications with a new coating designated IC-105. The coating which provides thermal reflectivity when applied to the surface of parts made of PPA is the first designed by Techline specifically for application to plastic. In testing, PPA samples coated with IC-105 and subjected to direct contact with a heat source at 600°F remained at 400°F even after extended exposure.

Details: Jim Doty, Global Marketing Manager, Solvay Advanced Polymers LLC, 4500 McGinnis Ferry Rd., Alpharetta, GA 30005; Phone: (770) 772-8460; E-mail: [jdoty@solvay.com](mailto:jdoty@solvay.com); URL: [www.solvayadvancedpolymers.com](http://www.solvayadvancedpolymers.com)

## **CONSUMER PRODUCTS**

### **Electroluminescent Light Surface Technology**

Smart Surface Technology (SST) developed by Bayer MaterialScience in partnership with the Swiss firm Lumitec AG, a specialist in electroluminescence (EL) and precision electronic components offers new technology for new designs. The SST can be used to manufacture thin, 3-dimensional plastic parts which, when alternating current is applied, light up evenly over the entire surface area, including the edges. Production involves printing several layers on a transparent polycarbonate film by a highly sophisticated screen printing process. The layers consist of a transparent polymer based electrode separated from a counter electrode by a nonconductive material. The light emitters, special inorganic crystals, are embedded in the nonconductor. This film can then be shaped 3-dimensionally and backmolded with thermoplastic by film insert molding. As they do not need any light emitting diodes, these molded parts do not require additional assembly steps and have a long service life. The color spectrum of the light will range from blue to green, and from orange to white. No heat is generated. One application example of this new technology is a heating and ventilation control display panel. The part is manufactured in a single step. Using

conventional methods, five components had to be assembled. The leather and bag specialist BREE has created the first illuminated business handbag with SST. The EL film embossed with the BREE logo lights up the interior compartment at the press of a button.

Details: Eckard Foltin, Head SST Development, Creative Centre, Bayer MaterialScience AG, D-51368 Leverkusen, Germany; Phone: +49-214-30-25363; Fax: +49-214-30-66426; E-mail: [efoltin@bayermaterialscience.com](mailto:efoltin@bayermaterialscience.com); URL: [www.bayermaterialscience.com](http://www.bayermaterialscience.com)

## **GOVERNMENT**

### **Public Works Enhanced Infrastructure Products**

Dow's Continuum ([www.dowcontinuum.com](http://www.dowcontinuum.com)) bimodal PE (polyethylene) resins offer the opportunity to install a new, virtually leak free pipe system, or to cost effectively rehabilitate an existing public infrastructure system using trenchless technology. The Continuum bimodal PE resins made by proprietary Unipol II process technology are a family of performance differentiated PE resins developed for the underground construction market. These PE resins offer improvements in long-term strength, temperature performance, and resistance to slow crack growth and rapid crack propagation compared to traditional PE pipe materials. Sekisui Chemical has developed high-strength composite 3-layer PE pipe that allows significant reduction of wall thicknesses and raw material costs that more than offsets higher production costs. Marketed under the name Eslon PE Ultra, one area of focus is on water and sewer pipeline installations. The pipes consist of inner and outer layers of HDPE (high-density polyethylene) sandwiching a sheet of highly stretched (twenty- to thirtyfold), highly oriented, spiral-wound Ecosurf HDPE sheet. The inner layer is first extruded, and the sheet then wound round this inner layer, which is next fed through a special extrusion die to add the final layer. Cost effective for pipes with outside diameters of 200 mm (millimeters), or greater, a 200 mm Eslon PE Ultra pipe has half the wall thickness of single layer PE pipe.

Details: Makoto Osuga, Manager New Business, Urban Infrastructure/Environmental Products, Sekisui Chemical Co., 4-4 Nishitenma 2-chome, Kita-ku, Osaka 530, Japan; Phone: +81-6-6365-4122; E-mail: [Makota\\_Osuga@sekisui.co.jp](mailto:Makota_Osuga@sekisui.co.jp); URL: [www.sekisui.co.jp](http://www.sekisui.co.jp)

## **MATERIAL TRENDS**

### **METAL**

#### **Advanced Magnesium MIM Processing**

Husky is pushing the use of thixotropic molding, an innovative metal injection molding (MIM) process. The use of light metal alloys such as magnesium is growing in many important market sectors, including consumer electronics and automotive parts. Husky is showing plastic injection molders how they can take advantage of this emerging technology with minimal adjustments to their current facilities. The new THX500 magnesium injection unit is built to run on the Hyletric machine platform. Sharing most features with standard injection molding machines, Husky's thixotropic molding machines can be easily integrated into injection molding facilities. The process is simply an extension of injection molding. Thixotropic molding machines feature reflex platens to improve tonnage utilization and reduce mold wear, wide tiebar spacing for mounting oversized tools, energy efficiency, servo-driven extruders and reduced dry-cycle times. The units also come with Husky's Polaris control for highly accurate shot-to-shot repeatability and greater performance. Other design features include a large cradle that supports the extruder barrel, eliminating the transmission of injection forces through the barrel wall. This allows the use of a unique barrel design that enhances throughput capacity. The large mass of the unit, along with an innovative means of managing injection loads, results in the elimination of damaging recoil effects, such as excessive shock and vibration.

Details: Jeff Pocock, Engineering Manager, Husky Injection Molding Systems, Ltd., 500 Queen Street South, Bolton, ON, L7E 5S5; Phone: (905) 951 5000; Fax: (905) 951-5337; Email: [jpocock@husky.ca](mailto:jpocock@husky.ca); URL: [www.husky.ca](http://www.husky.ca)

#### **Metal Manufacturing Technology Resource**

METAV Düsseldorf, the world's fourth largest International Fair for Manufacturing Technology and Automation serves manufacturing professionals, engineers, metal/material suppliers, plastics processors and others with an interest in the manufacturing technology field. The trade show which takes place at

Messe Düsseldorf displays the entire spectrum of manufacturing technology for the metalworking industry, presenting everything in the fields of machine tools, precision tools, automation components and systems required by users. At the recent METAV 2007, The Trend and Innovations Forum for Tool and Mold Construction was one of the highlights covering new materials, high speed and hard machining, precision and micro mold making, laser integration, and automation/IT. More than 60,000 visitors from 32 countries attended to gain insights into the range of innovative solutions for metalworking, which was showcased by 1,000 exhibitors, spread over 58,500 sq m of exhibition space. More than one in ten visitors traveled from abroad with one in five from outside Europe. The Asian contingent was particularly well represented. The event is sponsored by Verein Deutscher Werkzeugmaschinenfabriken e.V. (VDW–German Machine Tool Builders' Association).

Details: Eva Teichmann, Marketing Director, Messe Düsseldorf Int'l, Stockumer Kirchstr. 61, D-40474 Düsseldorf, Germany; Phone: +49-211-4560-01; E-mail: [info@mdna.com](mailto:info@mdna.com); URL: [www.messe-duesseldorf.de](http://www.messe-duesseldorf.de)

## **RUBBER**

### **Rubber Industry Knowledge Building**

The International Institute of Synthetic Rubber Producers (IISRP) represents 40 corporate members who produce 90% of the world supply of synthetic rubber. It promotes standardization of synthetic rubber polymers and compiles/disseminates rubber related statistics. The association's present technical focus is (1) the "Evaluation of Butadiene and Chloroprene Health Risks," a 2½ day September symposium. The US EPA, the International Agency for Research on Cancer and the National Institute of Advanced Industrial Science & Technology-Japan are cosponsors of the international event. (2)"A Legacy of Progress...A Future of Possibilities" was the theme of the IISRP's annual general meeting, mid May in San Diego, CA. (3) The IISRP's 2008 edition of Worldwide Rubber Statistics will be available to interested parties in October. This 28<sup>th</sup> edition of the 100+ page book provides a comprehensive examination of world production and consumption of elastomers, a 5-year forecast of future consumption and an analysis of capacity. It also provides information about motor vehicles and tires in major regions of the world.

Details: James McGraw, Managing Director/CEO, International Institute of Synthetic Rubber Producers, 2077 South Gessner Rd., Houston, TX 77063; Phone: (713) 783-7511; E-mail: [jlmcgraw@iisrp.com](mailto:jlmcgraw@iisrp.com); URL: [www.iisrp.com](http://www.iisrp.com)

### **Rubber Technology Skill Building**

European Rubber Journal magazine (ERJ), has been reporting on the world's rubber industry since 1884. A key bimonthly trade journal for the tire and rubber industries, it is the world's leading publication specializing in the rubber industry in Europe. The magazine provides details of all important commercial and technical developments within one of the world's most globally integrated industrial areas, covering raw materials/machinery suppliers, rubber processors, the tire industry including tire makers, the automotive industry, automotive applications, hoses, belts, seals, anti-vibration systems and many other aspects of the rubber business. ERJ's main audience is senior managers in companies that manufacture rubber goods, and also their suppliers and customers. In addition to print copy, subscriptions to ERJ include unlimited access to the ERJ website and the annual *Global Tyre Report*. Sister publications include *Urethanes Technology* ([www.urethanes-technology.com](http://www.urethanes-technology.com) - ISSN: 0265-637X), and *Tire Business*, ([www.tirebusiness.com](http://www.tirebusiness.com) - ISSN: 0746-9071).

Details: David Shaw, Editor, ERJ, Crain Communications Ltd, 34 Southwark Bridge Rd., London SE1 9EU, UK; Phone: +44-20-7457-1400; E-mail: [dshaw@crain.com](mailto:dshaw@crain.com); URL: [www.european-rubber-journal.com](http://www.european-rubber-journal.com)

## **PAPER & WOOD**

### **Pulp & Paper Tech Monitoring**

TAPPI (The Association of the Pulp & Paper Industry) is a leading global technology information supplier particularly in emerging applied technical segments namely, (1) TAPPI Paper Expo held this May in Milwaukee, WI was the first in a new series of TAPPI Paper Expo exhibits that will rotate throughout the U.S. bringing the latest technology/educational opportunities close to the nation's pulp and paper mills. (2) "Nanotechnology for the Forest Products Industry: Vision and Technology Roadmap," a +100 page report

based on presentations and discussion by some 110 researchers who gathered last fall to explore the topic is available for free through TAPPI. (3) CPBIS, Center for Paper Business & Industry Studies including TAPPI, PIMA (Paper Industry Management Association), NPTA (National Paper Trade Association), and PPERA (Pulp and Paper Education and Research Alliance), have banded together to create the Forest Products Leadership Alliance (FPLA) to provide forest industry management and leadership professional development.

Details: Wayne Gross, Executive Director & COO, Association of the Pulp & Paper Industry, 15 Technology Pkwy South, Norcross, GA 30092; Phone: (770) 446-1400; Fax: (770) 446-6947; E-mail: [wgross@tappi.org](mailto:wgross@tappi.org); URL: [www.tappi.org](http://www.tappi.org)

### **Paper World's Meeting Place**

EXFOR, the world's largest annual exhibition of technology for the manufacturing of pulp and paper products and other allied industries, is sponsored by the Pulp and Paper Technical Association of Canada (PAPTAC). Every year, EXFOR attracts over 400 exhibitors and 10,000 registered papermakers, engineers and executives from 30 countries. Held in conjunction with Paper Week and the PAPTAC annual meeting, the 50th annual EXFOR is took place February 4–8, 2008 at the Palais des Congrès, in Montréal, PC, Canada. The event showcased the latest science and technology devoted to the manufacturing of pulp, paper and board products. The 94th Annual Meeting of PAPTAC featured close to 200 technical presentations from experts at more than thirty sessions covering a myriad of topics such as mechanical pulping, newsprint, alkaline pulping, research and development, professional development, engineering, multi-ply board, process control, fine and coated papers, bleaching. Paper Week is cohosted by PAPTAC, the Forest Products Association of Canada and the Canadian Pulp and Paper Products Council

Details: Carmie Lato, Events Manager, EXFOR, Pulp & Paper Technical Association of Canada, 740 Notre Dame St. W., Montreal, QC H3C 3X6, Canada; Phone: (514) 392-0265; E-mail: [clato@paptac.ca](mailto:clato@paptac.ca); URL: [www.paptac.ca](http://www.paptac.ca)

### **GLASS & CERAMIC**

#### **Fireproof Ceramic Polymer Compound**

Australia's CSIRO Manufacturing and Materials Technology, through its spin-off company Ceram Polymerik has commercialized what is claimed to be the first polymer that in combustion will melt to form a fireproof ceramic. Originally intended for wire and cable sheathing, the material is also under review for other applications in oil rigs, cargo ships, aircraft, tunnels, and office blocks. Ceram Polymerik's first export order of the proprietary material went to U.K. based profile extruder Lorient Polyproducts Ltd. to manufacture fire door-edge protectors. As the polymer melts and disintegrates in heat, the ceramic forms a solid protective insulating layer, preventing short-circuits in cables and enabling current to keep flowing. The material puzzle revolved around developing compounds that were stable between the degradation of the base polymer and the formation of the ceramic.

The industrial market target is to contain the movement of heat and smoke in a fire situation between building floors, rooms, or compartments by sealing penetrations, prolonging stability, or creating barriers to the passage of flames and smoke, thus allowing people enough time to escape. Ceram Polymerik sees this as a growth market totaling about \$12 billion globally within the passive fire-protection sector. The technology was originally developed by Australia's Cooperative Research Centre for Polymers with power cable manufacturer Olex Australia.

Details: Vince Dowling, Director, Ceram Polymerik, P.O. Box 1024, Waverley Gardens, Victoria 3170, Australia; Phone: +61 3 8508 9508; Phone: +61 3 8508 9508; Email: [\\_info@cerampolymerik.com](mailto:_info@cerampolymerik.com); URL: [www.cerampolymerik.com](http://www.cerampolymerik.com)

#### **Ceramic Industry Trends Prioritized**

The American Ceramic Society Bulletin (ACSB) is the official publication of the American Ceramic Society. An industry authority on new developments in the ceramics and glass industries ACSB provides coverage of established and emerging processing technology including R&D, manufacturing, engineering and marketing that will impact ceramic manufacturing around the world. This trade publication with a readership of 14,000 ceramics and glass experts in 50 countries has the largest paid circulation in the field. The ACSB focuses on materials/powders/coatings, firing equipment, refractories, fabricating/finishing

equipment, and testing/analysis instruments as well as the automotive, electronics, defense, energy, and construction industries. News coverage also includes environmental/governmental regulations, and manufacturing case histories. ACSB offers dual-media content with full-text features accessible online. The December issue includes *ceramicSource*, the industry's annual Buyer's Guide. In addition, quarterly installments of the *GlassResearcher*, is published exclusively in the ACSB. The American Ceramic Society also produces the *Journal of the American Ceramic Society*.

Details: Patricia Janeway, Editor American Ceramic Society Bulletin, 735 Ceramic Place, Westerville, OH 43081-8720; Phone: (614) 890-4700; E-mail: [pjaneway@ceramics.org](mailto:pjaneway@ceramics.org); URL: [www.ceramicbulletin.org](http://www.ceramicbulletin.org)

## IEWS and END NOTES

### Centrifuge Selective Waste Separation

Foma Engineering, which designs and manufactures custom made equipment for the plastics industry, has developed CENTREC, the first separating centrifuge to economically separate at least one fraction from a mixture of plastic of such purity (99.5%) that it can be re-used in high-value applications.

The centrifuge works on a sink-float technique using a liquid that has a density that lies between the two materials to be separated. Because of the characteristics of this liquid, one fraction will sink and the other fraction will float. By using the centrifugal force in the centrifuge, the separation speed is increased, improving both throughput and accuracy. To be effective, a density difference greater than 0.003 kg (kilograms)/liter for the plastics to be separated and a liquid to plastic ratio of 20:1 is required. Throughputs of at least 1000 kg/hr (hour) on granulate, and 600 kg/hr on foil material can be achieved. Separation costs using the CENTREC centrifuge are approximately € (Euros)0.05–0.15/kg.

Successful separations have been achieved for: PET (polyethylene terephthalate) bottles and PP (polypropylene) caps • PPO (polyphenylene oxide) and PVC (polyvinyl chloride) in car dashboards • PS (polystyrene) and PVC from refrigerators • PP and EPDM (ethylene propylene diamine) from irrigation pipes • PMMA (polymethyl methacrylate) and ABS (acrylonitrile butadiene styrene) parts of rear lights of cars • PP pipes and rubber gaskets from PVC pipes • Aluminum foil lids from PS cups • Polyolefin fraction from household waste.

To operate the centrifuge, a stable liquid flow is first established. The outside rotor is accelerated to the required speed, after which the separation liquid is fed into the centrifuge. As soon as a stable liquid column is built up and a continuous flow of liquid is achieved through both the light fraction discharge and the heavy fraction discharge, the separation process is started by adding the mixed fraction to the separation liquid by transport augers and/or pneumatic transport. Under the influence of the centrifugal force, which is acting on the plastic particles as well as the liquid, the light particles flow to the surface of the liquid, and are removed on the upper side of the centrifuge. The heavy particles sink through the liquid column to the outside and are removed from the centrifuge via a baffled section to the bottom center outlet. The two fractions, the light and heavy fraction, are then separated from the liquid and transported to downstream equipment, such as a regranulator extruder and the liquid returned to a surge tank. It may be necessary to have a drying step before further usage of the material.

Details: Vally Hoogland, Product Manager, Foma Engineering, Machinefabriek G van der Ploeg BV, Plutoweg 13, 8900 CC Leeuwarden, The Netherlands; Phone: +31-58-2539999; Fax: +31-58-2539990; E-mail: [info@foma.nl](mailto:info@foma.nl); URL: [www.foma.nl](http://www.foma.nl)

### State-of-the-Art SLS Prototyping

Founded in 1986 with the invention of the first stereolithography rapid prototyping system, 3D Systems remains the leading provider of solid imaging solutions. The global company has fully commercialized a product LaserForm A6 steel for SLS (selective laser sintering). The material is a significant addition to the family of metals for use with SLS for the rapid, low cost manufacture of plastic injection molding tools, complex metal parts, prototype parts, and other applications such as die casting tools and thermoforming tools.

LaserForm A6 steel ideally satisfies the needs of the highly competitive tooling market for injection molding. To successfully compete in this market, rapid tooling must not only be faster, but must also

substantially improve throughput of injection molding equipment while meeting rigorous requirements for accuracy, surface finish, detail and durability. The new LaserForm A6 has excellent attributes for toolmaking and metal part production. Processed LaserForm A6 has a Rockwell c10–20 production tooling hardness and can be heat-treated up to HRC39. The material can be machined, EDM (electro discharge machining) processed, polished, etched, welded, and textured. To achieve this material breakthrough 3D Systems made optimal use of tungsten carbide for hardness/wear resistance, and developed a new binder system with outstanding green strength that allows fabrication of fine detail, complex geometry, and conformal cooling channels. The company has also introduced a high-purity proprietary infiltrant for improved part surface finish straight out of the process and a completely new scanning technology for consistent run-to-run system performance, mechanical properties and accuracy of parts/tools. LaserForm A6 will allow the tooling industry to design, develop and manufacture tools in a fraction of the time and cost required with more traditional methods.

Details: Abe Reichenthal, President and CEO, 3D Systems Corp., 333 Three D Systems Circle, Rock Hill, SC 29730; Phone: (803) 326-3900; E-mail: reichenthala@3dsystems.com; URL: www.3dsystems.com

## EVENTS

### K Fair New Technology Highlight

A prototype of the world's first fuel cell made entirely of engineered thermoplastics, said to lower fuel cell cost by 50% compared with previous designs in metals and thermosets, was introduced by Ticona at K Fair Dusseldorf. The proton exchange membrane fuel cell has bipolar plates molded of Ticona's Vectra liquid crystal polymer (LCP), and end plates of its Fortron PPS (polyphenylene sulfide). Both have high heat resistance, dimensional stability, and withstand aggressive chemical environments.

If mass-produced at a 20,000 2-kW (kilo Watt) unit level, the plastics based hydrogen fuel cell would cost just € (euro) 790kW (stack cost). The cost of the prototype itself was €3000/kW, significantly less than existing stainless steel fuel cells that cost €10,000/kW. The fuel cell technology is expected to be available for commercial scale production by 2010. The EU (European Union) has set a target of reducing stack production costs to €500/kW by that time. At €790kW, Ticona is already close to meeting the target.

The Vectra LCP (85% graphite loading) bipolar plates manufactured by SGL Carbon can be either stamped from rolls or injection molded. The fuel cell end plates and connection parts are molded from Fortron PPS. Ticona is working with German start-up Pemeas to incorporate the latter's polybenzimidazole (PBI) membrane material, which will enable higher operating temperatures of 120–200°C. Low temperature cells require complex water management systems to humidify membranes, whereas PBI does not require humidification. PBI membranes are also more tolerant of CO (carbon monoxide) contaminants in H<sub>2</sub> (hydrogen) reformed from natural gas, so gas purification is also simplified. Stainless steel based fuel cells cannot operate at such high temperatures because of corrosion issues. The first commercial applications for fuel cells were for portable devices such as mobile phones.

Details: Anne Meerboth-Maltz, Sr. Director, Public Relations, MesseDüsseldorf NA, 150 N Michigan Ave., Ste. 2920, Chicago, IL 60601; Phone: (312) 781-5180; Fax: (312) 781-5188; E-mail: ameerboth@mdna.com; URL: www.mdna.com

### K Fair Material Highlights

Key material related highlights from the recent K Fair in Düsseldorf Germany were significant. BASF launched three new grades of flame retardant nylon material including an Underwriters Laboratories (UL) rated 6/6 grade that is freely colorable and a new rheology modified PBT (polybutylene terephthalate) grade that flows twice as fast as conventional PBT. BASF officials said initial customer trials have resulted in cycle times being cut by 20%. Elsewhere, BASF and Permacoat Ltd. a British doormaker have developed Permaskin, a door laminating process using BASF's Luran S-brand ASA (acrylonitrile styrene acrylonitrile) polymer. A new grade of Styroflex styrenic copolymer for making packaging film with high resilience and strength was also introduced.

European polyolefins maker Borealis A/S has remained aggressive on the new product front. Recent Borealis advances are Borpact brand PP (polypropylene) for transparency and low temperature impact in

deep freeze display packaging, such as ice cream; Borcom brand PP for weight savings in appliances and interior automotive applications; random copolymer PP for hot and cold water pipe systems; and Borstar brand enhanced PE (polyethylene) for film used in undercover crop cultivation.

Polyurethane producer Merquinsa Mercados Químicos SL launched seven new Pearlthane grades of TPU (thermoplastic polyurethane) aimed at injection molding, extrusion, in addition to a Pearlcoat brand, which is used for calendaring. The Pearlthane products incorporate polycaprolactone technology, which allows for faster cycling time when molding components for a range of athletic shoes, sporting goods and auto parts. Pearlthane also improves high-heat performance in blown film. In addition, Merquinsa has commercialized its first halogen-free, flame retardant TPUs.

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