

## PolymerPlace Notes

*A plastics technology newsletter*

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### PROCESS/SERVICE DEVELOPMENTS

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- Twin-shot technologies is the developer of a process that permits co-injection molding of multi-materials

## CASE STUDY DATABASE

Polymerplace.com on a regular basis adds plastic case studies to the Application Case Study database available on the site. This month we have added four very interesting case studies: Go to

**DSM Somos™** used to develop a royal tiara- key words: tiara, or crown

**Twinshot Technologies** – Two-shot spatula- key words: two shot, Twinshot, nozzles

**Fortron™PPS** used in Fuel Cell plates- key words: fuel cell, Fortron

**Vectra™** replaces Polycarbonate in a DC-DC converter housing  
key words: Converter, Vectra

## What's New at Polymerplace?

In June we attended the MDM, Atlantic Design East, Plastec and EastPack shows held June 4-6 in NYC. We also attended the Maack Business Services Conference June 10-12 in Zurich, Switzerland.

We are adding a new feature this month to the newsletter. We will note which case studies we have added to the Application case study database that we have on the Polymerplace site. The database is key word searchable and is a useful tool to learn about successful plastics applications.

We also want to take this opportunity to tell you that we offer market research through the Polymerplace site as well as in-depth market research through our partners, G.H. Associates and Franklin International. If you want to understand the needs in your market for product improvements, new technology or need a boost to your business development, we would like to help you! For more information please e-mail us at [info@polymerplace.com](mailto:info@polymerplace.com) or [info@gh-associates.com](mailto:info@gh-associates.com)

## FEATURE STORY

### Highlights from the Maack Business Services Conference June 10-12<sup>th</sup> 2002 Zurich, Switzerland

This conference treated the entire materials and technology chain as progressively interlocked, each segment affecting the others. The most interesting and important pieces of information that we came away with were:

- China has overtaken the United States as the world's largest synthetic fiber producer in the past year. China's per capita usage is still well below that of developed countries, suggesting that its fiber usage high growth will continue for perhaps five to ten years to come.
- In virtually every major regional market other than China, nylon fiber growth rates have dropped below GDP rates, but nylon engineering plastics usage is growing at two to three times GDP rates. Nylon fiber's principal competitors in carpeting are polypropylene and polyester, which are significantly cheaper. As a result, nylon fiber producers are now targeting specialty markets, but some of these are fashion-oriented and prone to be somewhat volatile.
- Nylon 6 is growing faster than nylon 66, driven by cost and processing advantages. The cost differential between the two nylon types is increasing as manufacturing technology improvements for producing caprolactam and nylon 6 are advancing faster than are technology improvements for producing adiponitrile and nylon 66.

- Nylon 66 producers are a relatively small group of very large chemical companies that have undergone a number of restructurings and now treat their business as more of a commodity than a specialty. Nylon 6 producers cover a wide range of large to small companies, a number of whom are non-integrated, and who treat their business as more of a specialty than a commodity. This may be observed in the high-temperature nylon market, where smaller producers, such as Ems, will tailor-make polymers in the reactor for specific end uses, while larger producers appear to be limiting their product variations to compounds.
- Nylon carpet recycling is a viable business in Germany, at Polyamid 2000 AG, it was reported. Evergreen Inc., the US nylon carpet recycler is temporarily shutdown while improvements are made to the process for handling and separating feedstocks. The shutdown was made to coincide with a down cycle in caprolactam prices, but as these are now headed up again, so Evergreen will restart as soon as the modifications are completed. Evergreen is a joint venture of Royal DSM and Honeywell.

Imerys Minerals reported that recent advances in surface treatment have made mineral-filled nylon compounds “comparable” in properties with glass fiber-reinforced nylon compounds, but at lower cost and without the isotropy found with fiber-reinforced compounds that can lead to warpage and differential properties in parts.- Roger Jones, Franklin International.

## **POLYMER END MARKETS**

### **Construction**

[Geocell Systems Inc., a San Francisco-based developer of flood control technologies, has demonstrated here a modular plastic wall which it claims that could replace the burlap sandbags now used for flood control.](#)

The new product, known as the Rapid Deployment Flood Wall, is an expandable, stackable structure. It is made of a thermoplastic copolyester. It can be filled with sand or other locally available material. To manufacture the wall, Geocell is partnering with Eastman Chemical Co., which supplies the resin pellets, and Spartech Plastics, which extrudes the pellets into sheets at its Cape Girardeau, MO, facility.

Sandbags only last about 30 days, while the modular wall can reportedly be dismantled and re-used multiple times. In its first use the cost of the plastic wall is about 90% that of a comparable sandbag wall when volunteer labor is used, and about one-third the cost when re-used.

According to Geocell, a U.S. Army Corps of Engineers report showed that a 4-ft-high section of the new plastic wall pounded by flood waters up to 3.33 ft in height showed water seepage of only 22.8 gal/hr per foot of wall. At this rate, the company says, a small 3-hp gasoline pump could drain nearly 400 ft. of wall.

The partners in the plastic floodwall system have asked the U.S. government for \$12 million to fund a demonstration project that would involve building about 16 miles of the wall. Meanwhile, Geocell says that future orders for wall will be filled by Spartech at its Cape Girardeau facility.

### **Medical**

Researchers from Victrex subsidiary Invibio, Lancashire, U.K., presented data recently regarding long-term animal in vivo testing of its Optima polyaryletheretherketone polymer that the company says confirms its broad potential in artificial joints, heart valves, and other growing internal medical devices. The results of the PEEK study were contained in a paper delivered at the annual American Society for Artificial Organs conference.

[PEEK recently replaced titanium in a series of cervical and lumbar spinal implants](#) made by

Scient'x, Guyancourt, France. In these applications, according to Victrex, PEEK is tailored to provide mechanical strength closer to the characteristics of bone than metal. The result is a better interface between the bone and implant cage, which improves bone fusion, says Scient'x.

Although prototype and some commercial medical devices are produced from machined rod stock, the potential for injection molding and extruding artificial organ components represents a fast-growing opportunity for processors. Demand for artificial joints including acetabular caps used in hip and knee replacement is growing because people are living longer and the joints are wearing out.

UHMWPE (ultra high molecular weight polyethylene) is used in these applications today but UHMWPE cannot be molded or extruded. PEEK offers conventional plastics processing for these applications, and testing on hip simulators thus far indicated that the PEEK may have better long-term performance.

According to Invibio, cardiovascular devices offers another opportunity area. For example, AorTech Internal plc in Scotland has specified PEEK for its next-generation synthetic tri-leaflet heart valve.

A typical human heart valve opens and closes 40 million times per year. Acetal, which has long been used in this application needs improvement in creep resistance. The U.S. Food and Drug Administration is currently revising valve testing standards that may rule out the use of acetal in this application. PEEK looks like a material that can overcome the clinical problems associated with mechanical valves that require patients to undergo daily anticoagulant treatment.

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At the recent MDM (Medical Design and Manufacturing) show in NYC, [material suppliers introduced some new products for the Medical device and disposables market](#). Cyro Industries, Rockaway, NJ, displayed the "second generation" of its acrylic-based, alcohol and lipid-resistant injection molding compound for disposable medical devices. The first product in the series, Cyrolite Med, was exhibited at last year's MD&M East show. Unlike most other acrylics, the newly introduced product, Cyrolite Med 2, is even more resistant to alcohol and lipids than the first entry. According to Cyro data, a sample of the new Cyrolite Med 2 resin under 2% strain in isopropanol for 5 hours displayed twice the elongation retention as the Cyrolite Med resin. The new material also possesses a cost advantage over polycarbonate.

Dow Chemical's engineered films and laminates business exhibited Covelle HF radio-frequency weldable films. The material employs a copolyester adhesive that allows it to be laminated to substrates that are not inherently radio-frequency weldable, such as polypropylene; polyester non-woven, natural and synthetic woven fabrics; polyamide fabrics; and polyurethane foam. Dow claims that the new grade of weldable film, Covelle 4200 HF, is suitable for processing with standard RF equipment and hot-roll laminators. The new film is targeted at medical applications – for example, hot and cold therapy gel packs.

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## Packaging

At the recent Plastec exhibition in NYC, [Kraton Polymers, Houston, promoted its styrene block copolymers \(SBCs\) in U.S. markets as alternatives to plasticized PVC](#) for food packaging applications. The company asserts that its SBCs, which are already used in food wrapping in Europe and Asia, are safer and environmentally more desirable than PVC.

Kraton polymers can be blended with polypropylene and co-extruded with EVA to form multilayer structures suitable for food wrap applications. Kraton polymers report that

these structures offer an "excellent" balance of properties, combined with a low density that allows down-gauging of films to reduce packaging costs.

SBCs do not contain plasticizers, eliminating concerns about possible migration of these additives into food from PVC wrapping. Other claimed benefits for the materials in food packaging include relatively high elasticity and strength, puncture resistance, low permanent set (which prevents finger marks due to handling), high oxygen permeability, moisture barrier properties, and cling.

## Transportation

[DuPont has launched a new web site that gives automotive designers and engineers resources to meet the demands of emerging 42-volt automotive systems.](#)

The web site, [www.42volt.dupont.com](http://www.42volt.dupont.com), provides general and detailed information about challenges and opportunities posed by the shift to higher-voltage electrical systems in the next generation of cars. 42 volt systems will allow automotive designers to install additional and improve existing electronics that increase fuel economy, reduce emissions, enhance car entertainment options, and improve comfort, safety and performance.

The web site covers technical issues in six specific automotive systems, including electrical distribution, electronic controls, integrated starter-alternators, thermal management, air conditioning, and other "X-by-wire" systems such as steering, brakes or throttle control. The site includes information on arc resistance, electrical insulation, EMI (electromagnetic interference) shielding, flame-retardant technology, high-temperature performance, and miniaturization. These are of importance across the six automotive system areas. The plans include regular updates and enhancements to keep the site useful over time.

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[Sumitomo Rubber Industries \(SRI\) and Dow Polyurethanes Japan Ltd. have signed a joint development agreement to develop polyurethane support technology for the PAX System, an integrated tire/wheel system](#) that allows a vehicle to run on a flat tire safely for up to 200 kilometers, or 125 miles. The system features a vertically anchored tire, specially designed wheel, flexible run-flat support ring, and tire pressure sensor. The agreement focuses on Dow's capabilities to supply a finished polyurethane support. SRI will help drive the adoption of the new system with auto makers in Japan and throughout Asia. Licensed from Michelin, The PAX System is being developed and promoted by Michelin, Pirelli, Goodyear Tire and Rubber, and SRI.

The system provides improved safety, extended mobility, enhanced performance, and fuel efficiency. The complete system includes tires, specially designed wheels, support ring, and pressure detector. The incorporation of the PAX system eliminates the need for a spare tire, freeing up increasingly valuable real estate in the auto interior.

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[Airbus is expanding its use of composites](#) based on Ticona's polyphenylene sulfide (PPS) in its new A380 Super Airbus aircraft. Fiber-reinforced composites (FRP) based on the high-performance polymer are already employed in the wing leading-edge nose on the Airbus' series A340-500 and A340-600 aircraft. Ticona's Fortron PPS is now slated for use on the same part on Airbus' double-decker jet, slated for launch in 2005. Other parts are also being evaluated, according to Ticona spokesman Paul Reichenbacher. [The PPS composites, which replace aluminum, provide lighter weight](#) and an overall cost reduction, according to the Frankfurt-based resin supplier. Switching from aluminum to PPS composites also made it possible to change the profile of the parts. Instead of the traditional "D-nose," the composites enabled designers to create a more efficient "J-nose." Its design allows it to house electrical, de-icing and other systems. The J-nose elements are reinforced by arch-shaped ribs so that they are rigid in the flight direction, while at the same time they can follow the motion and vibrations of the wings in the transverse direction. Ticona supplies the resin to a plastic film manufacturer who produces PPS film. The films are in turn used as the matrix for the glass-reinforced or carbon-reinforced

composites, which are then thermoformed into the leading-edge nose. About 20% of the components for the Super Airbus, which will carry 550 passengers, are expected to be made of fiber-reinforced plastics, according to Ticona. Ten Cate Advanced Composites, the Netherlands company which makes PPS composite sheet, estimates that approximately 1 metric ton of composite materials are used in A340/500 and A340/600 planes.

For information on Fortron® PPS, visit <http://www.ticona.com> or contact:

**In the Americas:**

**In Europe:**

Tel: +1-800-833-4882

Tel: +49-(0)180-584-2662

### **Portable Electronics**

Fujitsu Ltd. and Fujitsu Laboratories Ltd. have developed the first notebook computer housing which uses a plant-based biodegradable plastic. The technology will be used for some of the components in Fujitsu's FMV-BIBLO NB computer with plans to expand the use of the biodegradable plastic to the entire housing in fiscal 2004.

The application is in response to increasing environmental awareness of the disposal of computer and consumer electronics products. In Japan, in particular, several environmental regulations have been enacted in recent years, covering areas such as environmentally friendly procurement policies, recycling, and pollution controls. There appear to be directives in Europe tracking those in Japan especially for telecommunications suppliers.

Fujitsu has promoted recycling systems for magnesium and plastic housings used in notebook computers, for example. However some of these products never make it to recycling facilities. In addition there has been a goal to find a substitute raw material because petroleum-based plastic is based on a non-renewable resource according to Fujitsu.

The new biodegradable plastic consists of a polylactic acid (PLA) polymer derived from the starch of corn, potatoes, or other plants. The resulting resin has about the same strength and rate of shrinkage as PC/ABS, which is typically used in notebook applications, says Fujitsu.

Fujitsu notes that if the product bypasses recycling efforts and ends up in a landfill, the plastic is naturally metabolized by microorganisms into carbon dioxide and water. In addition, the material not only eliminates emissions of dioxins and other harmful chemicals if incinerated, it reduces the use of petroleum products from the outset. Furthermore, it takes less energy to produce - about half that of conventional plastic components - making the production process more environmentally friendly, and, by using all natural materials, contributes to lower consumption of petroleum.

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### **Process/Service Developments**

At the EastPack show in NYC earlier this month DuPont's packaging division announced it has enlarged its web site to include such new offerings as technical data sheets and applications sections divided by market segments. The division has also installed a blown-film line for coextruded flexible packaging at its European Technical Center in Geneva, Switzerland.

The [newly expanded web site, www.dupont.com/packaging](http://www.dupont.com/packaging), allows visitors to access commercialized packaging concepts arranged by market segment, material, and function. Packaging application information is organized by such end-use industries as cosmetics and health-and-beauty aids; meat, poultry, cheese and seafood; dry foods and snacks; hardware; and pharmaceuticals and industrial products. The site also includes links to multilayer packaging materials. Visitors can also print out material safety data sheets for the DuPont packaging resins and modifiers.

The new blown film line, supplied by Windmüller & Hölscher, runs as fast as commercial production lines and can produce films with up to five layers. Such films are useful in making flexible packaging for such products as meat, cheese, fish, and dry goods. The blown film line, reports Dupont, will improve its response time to customer requests and allow it to optimize packaging structures.

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**Twin-shot technologies is the developer of a process that permits co-injection molding of multi-materials** using a single screw with a 2-stage design similar to a vented extruder. They have recently introduced an alternate end-cap that puts materials out from two nozzles rather than one. This new design feature is ideal for molding two-color parts in the same cavity, overmolding with a rotating mold, or coinjecting with a dual hot runner.

Other multimaterial techniques available with the Twinshot hardware include complete encapsulation via co-injection, partial encapsulation, marbling and other multi-color effects.

According to Joel Thomson, inventor of Twinshot: "This is just one more way Twinshot adds value. Users of Twinshot will benefit from how we have continued to package our additional design features. Because all Twinshot options use the same screw and barrel we intend to keep our license policy the same - one fixed payment per machine - and allow customers to choose one or more techniques by simply buying additional low-cost parts. For instance, converting a standard Twinshot co-injection setup into this overmolding version might cost \$1000-\$3000 depending on barrel size, and installation can be done in only 1 or 2 hours."

Visit the company at its website: [www.twinshot.com](http://www.twinshot.com) or contact: Joel Thomson, 845-572-3452, [jthomson@twinshot.com](mailto:jthomson@twinshot.com)

Twinshot Version II is also represented by Spirex Corporation through an international licensing agreement authorizing Spirex to provide Twinshot's unique co-injection process to the retrofit market. Phone: 330/726-4000, Fax: 330/726-9437, E-mail: [Sales@spirex.com](mailto:Sales@spirex.com).

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**References:** The stories in PolymerPlace Notes come from a variety of sources including Company Press Releases, Interviews, the PR Newswire and trade publications, e.g. Plastics News.

[www.Polymerplace.com](http://www.Polymerplace.com)

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