

PolymerPlace Notes

A plastics technology newsletter

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What's New at Polymerplace

It is that time of year when we turn the clocks back and get ready for the Holiday season and long winter. Hope you are having a “colorful” Fall.

In the last month we have attended several conferences including the CDMA Fall Meeting where we conducted a workshop on Researching Online and the Sustainable Packaging Forum.

The Sustainable Packaging Forum was held October 17-19th and was organized by Packaging Strategies, a consulting firm that specializes in the packaging industry. Two announcements were made that were significant. Wal-Mart has already started using Polylactic Acid Polymer (PLA), a biorenewable,

compostable polymer for several packaging applications using Wal-Mart brands and announced that they intend to phase in more applications by year-end as part of their environmental responsibility. The other significant announcement was that Akzo Nobel, a prominent chemicals and polymer producer in Europe, has taking a partnership interest in Evco Research (<http://www.evco-research.com>), an Atlanta firm dedicated to zero footprint applications for packaging. For more details please e-mail us to get our Biotechnology in Plastics newsletter that is published every other month. We will be writing more about this in the next issue.

Unfortunately the Management Day sponsored by the Chicago section of the SPE for October 13, 2005 was cancelled but will be re-scheduled for a later date. We will keep you informed.

In November we will be participating in the first Radiation Processing of Polymers conference sponsored by the SPE and the North American Radiation processing SIG (Special Interest Group). The one-day program is scheduled for November 10, 2005 in Philadelphia. For more information visit <http://www.4spe.org>.

Goodbye, Katrina and Rita – Goodbye US-made Polyolefins? By Roger F. Jones

The one-two punch of Hurricanes Katrina and Rita has been headlined by the popular press primarily in terms of the human dimension. The extensive economic damage to the plastics industry has been mostly ignored, appearing only in trade publications. Anyone who uses polypropylene or polyethylene already knows that things are not good – substantial price increases have been instituted immediately and more are likely to come. Suppliers are saying openly that they expect to do more than merely recover their increased raw materials costs. Polyolefin suppliers are reported as refusing to guarantee price quotations for more than five days. It's very much a sellers' market today.

What's behind this situation? Obviously, hurricane damage to polyolefin production plants, but these are being quickly repaired and put back on line. The real problem is that a number of Gulf Coast oil and gas wells were shut down by damage to gathering facilities and ocean platforms. These will take much longer to bring back on stream, but much worse, the recoverable reserves of oil and gas in these fields are usually diminished by shutdowns. The situation is far more serious in natural gas than oil. The US produces about 85% of the natural gas it consumes (the rest comes from Canada and Mexico, with a tiny fraction imported as liquefied natural gas – LNG). Even though Congress has finally taken some baby steps to rectify 20 years of dysfunctional legislation that have promoted gas for power generation while sharply limiting the development of additional reserves and transmission pipelines, it will take years before real relief will be felt. This winter is forecast to be relatively mild, but if this turns out to be wrong, existing law requires that natural gas supplies will be allocated – yes, that means *rationed* – by putting power generation and building heating uses at the head of

the line. Natural gas prices jumped *one-third* to \$11+ per million BTUs, following Katrina-Rita. A cold winter will send them still higher. While prices may back off a bit with the arrival of warmer weather next spring, it is highly unlikely they will go down to the levels of this past summer.

These conditions are going to keep PP and PE prices high – and supplies are likely to remain tight unless demand eases sharply. Some processors are complaining that polyolefins producers are selling their products in China at cheaper prices than in the US. Frankly, this is nonsense. Producers have not been under any pressure to sell in China at lower prices than in the US because demand in China has been in substantial excess of local capacity. Demand in China is beginning to ease now that the Chinese government's efforts to "cool" growth rates, including the July revaluation of the yuan, have taken effect. What *will* bring prices down in the US, however, is when those huge Middle East polyolefins plants, now under construction, come on stream. While their output has been targeted at China, there will surely be excess for export to the US. When this happens, there will be enormous pressure on domestic polyolefin producers; very likely a number of them will be forced to shut down, because they cannot possibly compete with Middle East producers whose raw materials costs are *one-tenth* that of US producers. That will not really be good news for US polyolefin processors, however, because depending on imported raw materials is hardly risk-free. The implications for such major polyolefin end use markets, such as automotive and packaging are enormous.

I suggest that you write your congressman and senators, now! Tell them that your livelihood is threatened by Congress's failure to fix the laws that severely restrict drilling for oil and gas in the US and to lay pipelines. Not to be a doomsayer, but we are approaching the proverbial eleventh hour – we don't have a lot more time to fix this situation before the results of inaction will be irreversible.

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Global TPE Markets

TPE markets in CHINA, as well as EUROPE/U.S./JAPAN are analyzed in a series of new Robert Eller Associates, Inc. multiclient studies. The China TPE study covers TPVs, TPOs, styrenic TPEs, TPUs and metallocene plastomers/elastomers. The competition between these TPEs and the incumbents (PVC, thermoset rubbers, engineering TPEs and engineering thermoplastics are analyzed.

Work for the study has revealed that North American and European suppliers are already late to the China market as compared with Asian suppliers and will run into competition with local Chinese compounders. Some of the Western TPE compounders that are serving the China TPE market are listed in the following table:

WESTERN TPE COMPOUNDERS WITH RECENT CHINA CAPACITY

COMPOUNDER	TPE TYPES	NOTE
RTP	TPV	ALSO CONDUCTIVE COMPOUNDS
POLYONE	SEBS	ALSO NYLONS
NOVEON	TPU	
BASF	TPU	
OPTATECH	TPVs	VIA JOINT VENTURE
GLS	SEBS	RECENT ANNOUNCEMENT
KRAIBURG	SEBS	RECENT ANNOUNCEMENT

SOURCE: ROBERT ELLER ASSOCIATES, INC

- REA indicates that the Chinese TPE market is important not only because of its large size and continued rapid growth potential but also because: The intra-TPE competition occurs at different price points (e.g. plastomers and SBS compete against SEBS and TPV)
- A parallel supply chain of domestic Chinese compounders is evolving and will challenge the large multinational TPE compounders seeking a foothold
- Japanese, Korean and Taiwanese compounders and neat resin suppliers have a stronger presence than in N. America and Europe
- Many TPE end user sectors are shifting to Chinese production, thereby changing the global footprint of the industry
- Fabrication technology shares are different (for example insert molding instead of two shot molding)
- Intellectual property issues are difficult to enforce
- Local family ties often decide supplier/customer relationships.
- Agents have a strong role in the path to market for TPEs
- Local and national government have a role in the supply chain structure.
- The end user sector share structure for TPEs is different from that in N. America and Europe

Many TPE end user sectors are shifting to Chinese production, thereby changing the global footprint of the TPE supplier industry for example China has the following shares of global production of some target TPE markets:

China Share of Global TPE Markets

MARKET SECTOR	GLOBAL MKT SHARE, %	NOTE/IMPORTANCE
DVD PLAYERS	90	GRIPS/SOFT TOUCH, BUTTONS
MICROWAVE OVENS	80	
AIR CONDITIONERS	70	
TOOTHBRUSHES	70	-MAJOR SOFT TOUCH SECTOR
COLOR TVs	60	
CAMERAS	50	GRIPS/SOFT TOUCH, BUTTONS
FANS	50	MINOR TPE USE
TELEPHONES	50	
LAPTOP COMPUTERS	40	

MARKET SECTOR	GLOBAL MKT SHARE,%	NOTE/IMPORTANCE
MOBILE PHONES	35	-GRIPS/SOFT TOUCH, BUTTONS -EARLY PENETRATION FOR SOME SUPER-TPVs
REFRIGERATORS	32	
VCRs	30	
WASHING MACHINES	30	OPPORTUNITIES FOR OLEFINIC TPVs IN COMBINATION WITH FILLED TPVs
DESKTOP COMPUTERS	26	
AUTOMOBILE	5	-RAPID GROWTH SECTOR -EXPORTS STARTING

REA also recently published a multiclient study focused on automotive interior soft trim. For more information contact: Robert Eller Associates, Inc., 4000 Embassy Parkway, Suite 230, Akron, OH 44333 USA. Phone 330.670.9566. Email bobeller@prodigy.net. Web [http:// www.robertellerassoc.com](http://www.robertellerassoc.com)

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Polymer Markets/Applications

Automotive

Fortron[®] PPS Provides Thermal Stability and Impact Resistance in Auto Parking Brake Actuator and Gears

Automotive electronic parking brake systems call for tough materials that meet challenging conditions. This is especially true of the actuators at the rear wheels, where carmakers like Audi, Volkswagen, Bentley, Bugatti and Lancia have begun using Fortron[®] linear polyphenylene sulfide (PPS) for actuator housings and the gears that help transfer power from the actuator motor to the brakes.

Electromechanical parking brakes are operated by a switch in the passenger compartment that activates actuators at the rear brake calipers via electric wires. These brakes prevent a car from rolling on inclines as steep as 30 percent and remain active until the car has enough forward speed not to roll back.

Each PPS actuator housing is made up of an injection molded body and cover. While the size of the housing varies somewhat with the vehicle, it generally measures about 130 mm long, 50 mm wide and 80 mm high. The two components are ultrasonically welded to create the final assembly. The PPS spur gear within the actuator has a diameter of about 30 mm and is driven by a belt from an electric motor. The gear then drives a transmission that actuates the brake.

The key requirement that led to the selection of Fortron PPS in the actuator is its ability to remain dimensionally stable at temperatures from well below 0°C to 180°C. It was also chosen because it withstands the impact of stones thrown up by tires from the road surface and it has excellent resistance to brake fluid and other automotive chemicals. Fortron PPS also flows well in molding to create low-flash parts, which eliminates the need for costly secondary finishing steps, especially for the gears.

Fortron PPS is a high-performance plastic having inherent flame retardancy, high hardness and rigidity, and continuous service temperatures to 240°C. It also has excellent chemical and oxidation resistance, minimal water absorption and low creep, even at elevated temperatures

For information on Fortron PPS contact: Ticona, Phone: 1-800-833-4882. Email: prodinfo@ticona.com. In Europe: Ticona GmbH, Professor-Staudinger-Straße, D-65451 Kelsterbach, Germany. Phone: +49-(0)180-584-2662 (DE) or +49-(0)693-051-6299 (EU). Email: infoservice@ticona.de. Or visit: www.ticona.com.

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Invision™ sheet materials, under development since 1997, are a significant departure for Schulman, which traditionally has supplied color pellets, resins and related plastic materials that other companies form into finished products.

Invision™ sheets are a finished, layered plastic product that mimics exactly the look and gloss of painted metal.

Schulman's first target is auto applications. "The automobile industry has been looking for paint replacement items for years," said Jay Waddell with the South Carolina consulting firm Plastic Concepts & Innovations. The firm worked with Schulman to develop the machinery that makes Invision sheets. "It's cost and environment," Waddell said. "Paint lines are expensive to run and there are a lot of environmental issues."

Invision's products can compete with paint, said Bob Eller, head of Robert Eller Associates, a consulting firm that works with plastics and polymer companies in the greater Akron area.

"There are advances in thermoforming technology that allow you to make high-quality parts," Eller said.

The first Invision product will be sold primarily to so-called Tier 1 auto suppliers, the ones who sell finished products for automakers to assemble into cars and trucks. The prototype production line can make a sheet 20 inches wide; the next step will be a manufacturing line that can make 40-inch-wide sheets.

The Invision plastic works well at temperatures as low as 30 degrees below zero, but it does not yet meet high temperature performance standards. That will limit its application to exterior car and truck parts that typically are not in direct sunlight, such as rocker panels below doors and on bumper parts, and eventually grill facias. One plus for its exterior use is that it can resist small dings and being hit with such things as kicked-up gravel better than other materials.

Schulman intends to expand uses in non-automotive industries, including large appliances, such as refrigerators.

For more information visit: www.schulman.com.

Healthcare/Instrumentation

TPEs (thermoplastic elastomers) have become widely accepted for improving the aesthetic appeal of a variety of products. But, designers are finding that TPEs

often are crucial to enhance the performance and acceptability of a variety of non-mainstream products as well.

This is especially the case for products developed for those with vision impairments where function rather than aesthetics are paramount. In this product category, TPEs have caught on at an amazing rate. Freedom Scientific Blind/Low Vision Group of St. Petersburg, FL and their custom molder, Caprock Manufacturing of Lubbock, TX, have an excellent example of such a product. It is from the product line of Focus 40 and 80 brand Braille Displays. Focus brand Braille Displays from Freedom Scientific are portable and affordable systems comprised of several components to enable visually impaired individuals to work seamlessly in today's computer workplace and environments.

Focus Braille Displays enables those with impaired vision to smoothly navigate Windows® and other modern computer environments. Freedom Scientific chose the DYNAFLEX G7960 compound as the optimum way to go for the platform bezel and their G7980 compound for the foot that holds the computer onto the Freedom product.”

For more information on products and services for the visually impaired, contact: Freedom Scientific Blind/Low Vision Group, St. Petersburg, FL Tel: 800-444-4443. Fax: 727-803-8001. Web: www.freedomscientific.com. E-mail: sales@freedomscientific.com.

For molding services, contact: Caprock Manufacturing, Lubbock Texas Tel: 806-745-6454. Fax: 806-745-9441. Web: www.caprock-mfg.com. E-mail: caprock@caprock-mfg.com.

For further information on TPEs contact: In the U.S., contact: GLS Corporation, Marketing Department, GLS Corporation, McHenry, IL. Telephone: (815) 385-8500 or (800) 457-8777. Fax: (815) 385-8533. E-mail: info@glscorp.com Web: www.glscorp.com.

In Europe, contact: Mr. John Simons, Business Development Manager E-mail: jsimons@glscorp.com.

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Laser Structurable Vectra® LCP Forms Molded Interconnect Device in Acuris® Hearing Aid

As hearing aids grow more powerful, accessing new technologies to miniaturize their components becomes vital. A molded interconnect device (MID) in Acuris® P hearing aids from Siemens is a good example of this. This MID, a key part of the unit's microphone module, was made with Vectra® E820i LDS liquid crystal polymer (LCP), a novel plastic that allows complex, fine-line circuit patterns to be

laser etched and then plated. Vectra LCP is made by Ticona, the engineering polymers business of the Celanese Corporation.

Acuris P hearing aids are designed to help those who have moderate to severe hearing loss. The MID is part of a multi-channel, adaptive directional microphone system containing up to three microphones. This system improves the wearer's ability to understand speech by automatically reducing noise from multiple moving or stationary sources. The MID, which measures about 3 mm wide and 25 mm long, connects the microphone module to other electronic components in the unit.

Vectra E820i LDS can be molded into thin-walled parts and then processed by laser direct structuring (LDS) to create the intricate circuitry needed in hearing aids, sensors and other electronic components. LDS involves a three-step process that first injection molds the LCP part and then 'draws' a conductor track layout on the part's surface with a computer-controlled laser. In the final step, metal is electroplated on the conductor tracks to create a three-dimensional circuit board on the LCP surface. The laser direct structuring process is available from LPKF Laser & Electronics AG, Garbsen, Germany.

The LDS process allows for fine conductor patterns in almost any layout, which provides for better space utilization to aid miniaturization, as seen in the new generation of Acuris P hearing aids. It also offers advantages for producing cell phone antenna modules and developing and implementing new mechatronic systems. LDS and Vectra LCP are an ideal combination that can support many of the innovations needed for the next wave of high-tech miniaturization. For information on Vectra E820i LDS LCP, contact: Ticona, 8040 Dixie Highway Florence, KY 41042, USA. Phone: 1-800-833-4882. Email: prodinfo@ticona.com. In Europe: Ticona GmbH, Kelsterbach, Germany. Phone: +49-(0)180-584-2662 (DE) or +49-(0)693-051-6299 (EU). Email: infoservice@ticona.de. Or visit: www.ticona.com.

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Material Developments

Low Gloss Grades of Vinyl TPE yield rubber-like matte appearance and inherent anti-block property

Plastics processors now can impart a rubber-like matte finish to products made with Flexalloy (R) compounds while still obtaining the advantages of these high-performance vinyl thermoplastic elastomers (TPEs) over conventional flexible vinyl and other TPEs, it was announced in October by Teknor Apex.

While new Flexalloy 9750 Series compounds have processing and physical properties comparable to those of the general-purpose Flexalloy 9100 Series, Teknor Apex has formulated them for applications where a low-gloss surface may be aesthetically desirable, as in certain consumer products and furniture trim. In addition, while glossy products tend to "block" or stick to each other, the low-gloss Flexalloy compounds exhibit anti-blocking properties that ease handling of films such as bin liners, flexible "accordion" hose like that on vacuum cleaners, and mating parts such as weather-stripping for windows and doors.

Philip R. Morin, industry manager for Teknor Apex's Vinyl Division comments "Besides exhibiting the look, feel, and elasticity of more widely known polyolefin and styrenic TPEs, Flexalloy products surpass them in tear and tensile strength and resistance to flexural fatigue." "Equally important, they retain the traditional advantages of vinyl over TPEs, including much better resistance to oils and fats and wider formulation versatility"

Morin also adds "When compared with flexible vinyl compounds of the same hardness levels, they exhibit superior compression set, low-temperature flexibility, tear strength, and abrasion resistance."

New Flexalloy 9750 compounds are available in Shore A hardnesses ranging from 35 to 80. Extensive information on other Flexalloy products is available in the Vinyl Division section of www.teknorapex.com.

For more information contact Teknor Apex, 505 Central Avenue, Pawtucket, RI 02861 U.S.A. Tel: 1-401-725-8000. Fax: 1-401-729-0166. E-mail: vinyl@teknorapex.com.

Product Development and Design

In the largest accuracy study ever conducted for QuickCast™ parts, Chicago-area service bureau Express Pattern used Somos WaterShed® 11120 stereolithography resin to produce investment cast patterns resulting in a metal part yield of close to 95%—similar to yields achieved by traditional wax patterns made from tooling.

The company built more than 500 QuickCast™ patterns from WaterShed®, ranging in size from 1 to 20 inches. Each pattern was measured multiple times in three to four dimensions, ultimately making 4,300 individual measurements on finished patterns. Based on these efforts, Express Pattern was able to verify that over 98% of all measurements were within the acceptable tolerance band required by manufacturers.

"This study is significant in that it demonstrates the capacity of high-accuracy, high-stability stereolithography resins like WaterShed 11120 to be successfully used in demanding manufacturing applications like investment casting with greater yields than ever before," says DSM Somos Marketing Manager Eva Montgomery. "With the proper SL resin, so much more than just part prototyping can be achieved."

"QuickCast™" refers to a hollow build style used in stereolithography to create parts that are subsequently sent to foundries for investment casting. The hollow structure is needed in order to accommodate expansion of the material as it is heated during the casting process. This percentage of hollow space to solid space is referred to as the "void ratio." The higher the void ratio, the better the part's success rate will be at the foundry.

Tom Mueller, partner at Express Pattern, explains additional factors which led them to choose WaterShed for their study: "One of the key factors affecting the accuracy of QuickCast parts is their ability to resist growth when exposed to air moisture. In the past, we discovered that patterns would expand due to humidity before ever reaching the foundry, which substantially skewed the accuracy of the final product. WaterShed's high humidity-resistance provides a major advantage in this area."

Other WaterShed advantages include: high initial green strength to prevent distortion during the post-cure cleaning process, heat deformation characteristics conducive to the investment casting burn-out process, and the overall transparency of the resin. "During the finishing process, WaterShed's clarity aids in visually inspecting the models for any trapped resin remaining, says Mueller. "Trapped resin expands and cracks the shell if not removed properly and is one of the key causes of failure in the foundry process."

Based on their study, Express Pattern believes that the production use of stereolithography patterns will have a significant impact on the way investment casting is viewed and the applications for which it is considered. "Without the cost and lead-time required for tooling, investment casting can now be very attractive, cost-effective option for small quantities—even as small as one," says Mueller.

Those interested in learning more about Somos WaterShed 11120 are invited to contact Somos Marketing Manager Eva Montgomery. In addition, Express Pattern has written a manual for foundries on how to process QuickCast patterns. To obtain a copy, please contact Tom Mueller at Express Pattern (email: tmueller@expresspattern.com).

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

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