

## PolymerPlace Notes

*A plastics technology newsletter*

By Margaret Baumann, G.H. Associates

Volume 3

January/February 2002

800.207.7659

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Polymerplace continues to offer plastic application development information services. We would appreciate if you would fill out our on-line survey to help us determine your needs better (See link on home page). As an added feature we will be offering opportunities to participate in on-line surveys/focus groups from time to time. These surveys might be along your areas of interest and expertise. We invite you to join our survey participants group. Please go to [www.polymerplace.com](http://www.polymerplace.com) to register. We will only contact you if the topic fits your areas of expertise and interest.

We attended the SPE Topical Conference in Houston (January 28-29, 2002). We presented a paper on *Application Design Advances through Thermoplastic Elastomers (TPES)*. The presentation is available on the site at in the "What's New and Studies".

### Feature Article

[Tips on Merging or Selling Your Company](#)

The Plastics Industry Mergers & Acquisitions Forum was held Dec. 6 and 7 in Chicago. Although down from the levels of 2000 and 2001, acquisition of companies involved in plastics still is seen as having great potential.

Plastics is still a relatively young industry. But as you might expect, values have dropped and it is now a buyer's market. Another problem is that there are still too many injection molders in the business and it is fragmented.

Many potential sellers are entrepreneurs who are finding it difficult to compete. There are too many small to midsize molders that lack specialized skills needed to distinguish themselves.

Some experts suggest, basically, that within a five-year period, you will be left with two basic types of injection molders: the mass, large injection molders with 100 or more machines who are able to produce products at a low cost and the specialty guys, who are really going to be focused on smaller volumes and specialty items that are not going to be made abroad.

Three years ago, manufacturing business owners could expect to sell at about 7.4 times their firms' earnings before income tax, depreciation and amortization — or EBITDA. Now that price is less than five times EBITDA, with further cuts for problem operations.

There are some steps that anyone looking to sell their operations should follow, experts said:

- Organize the paperwork involving proprietary systems and patents.
- Involve key management in the sales discussions and make sure they are on board with the pending change. Strong leadership is a key ingredient for private investment groups looking for growing companies
- Know about any potential problems that could pop up and address them before beginning the sale. Make certain new machines are running smoothly. If there are long-term concerns that cannot be fixed immediately — such as future ground contamination problems — inform potential buyers up front.
- Get the right advisers involved early in the process.
- Make certain that customers are informed of the plans to sell. You do not want them to find out from someone else!

### **Researching Patents as a Product Development Tool**

Solutions and breakthroughs come to those who are prepared. A six million volume encyclopedia (i.e. US Patents) is at your fingertips via the Internet. "How-to" information on anything from hanging pictures to precision injection molding is included. The essence of our technological wealth is in these Patents --- if you can find it.

The US Patent Office now has all US patents on their website. From 1976 and on this listing includes a full text version as well as the verbatim copy that can be accessed with TIFF software. The earlier patents are only available as verbatim copies.

All this information is available free. Not many are aware of this fantastic resource. As of June 5, 2001 over 6 million US patents have been published. This means anyone on the internet, has a 6 million chapter encyclopedia at their finger tips for free. This is a technical resource that defies the imagination.

As an information resource, patents have a bad rap. At first glance they are difficult to read. They are written by lawyers as legal documents often to obscure rather than enlighten. However, the legal nature of the patent makes them valuable literature in spite of the writing. To get a license to produce a product and prevent others from doing the same, the patent holder must describe in detail how the invention works and explain its uniqueness.

Because of the legal requirements, the patent always provides the following.

#### **1. Review:**

Each patent must be unique. The background shows how it is unique compared to the past. It is usually short and to the point including definitions. For those interested in saving time, these backgrounds should be what the doctor ordered. Furthermore the topics are very applied and often not available in any other literature. These reviews can be valuable and interesting to the novice and expert alike.

E.G. the June 5 patents gave excellent reviews on vertebrae disk reformation, seed sheets for planting, glass reinforced plastics for lining tanks and electrochromic materials.

2. Specific:

Inventions are very specific because they must do something specific. Where else can one find information on the latest on shear rings, shredders as well as liquid crystal polymer for catheter balloons. In addition the patent must describe exactly how to do it including specific materials and how they are assembled.

3. Examples:

One criticism of much literature is that there is not enough "how to" detail. Again because of the legal requirements, very detailed examples are given. The examples are detailed to the point of listing specific materials and how they are handled.

This voluminous information source has its difficulties. For one thing, how does one find things? Unfortunately, only the Patents from 1976 on can be searched by subject.

Maro Patent Links was developed to make this resource more available and at the same time use it for current awareness. Each week the 100 to 300 polymer and plastics related patents are selected from the 1000 to 4000 patents published and classified. The patent number and title is listed on a webpage according to subject. At the same time an email message is sent to the subscriber with links to that page. The subscriber at his/her convenience clicks on the link and jumps to the webpage. At the beginning are major topic categories, click on them, jumps the reader to that topic and he can review the listed patents. If a patent is interesting, click on the number or title jumps the reader to the full text version of the patent on the US Patent Office site. The patent may be read or printed out. A verbatim copy is available if free TIFF software has been loaded on the reader's computer. When through, a click on Back takes one back to the Maro site for further review.

The key benefits of this service are speed and timeliness. The Patent Links are published within a week of publication. To try this out, readers are invited to the Maropolymeronline site.

## **Developments in Polymer End-markets**

### **Automotive**

The auto industry's design teams are taking note of plastics. While metal still rules the road in production vehicles, [designers' concept cars also look to carbon fiber, aramid fiber and a range of composite technology for body panels and structural components.](#)

On the inside, there are thermoplastic elastomers and urethane to provide a "soft touch" feel while plastic laminated glass is used in windshields.

Most of the concept vehicles exhibited at the North American International Auto Show in Detroit never will make it into production, but the design programs are influencing the way carmakers look at what they can do, and these new machines provide an introduction to new products.

A lot of times the designers want a look and are told by their engineering staffs that it isn't possible.

However Solutia worked extensively with designers during the past few months to introduce them to Vanceva Color, a new brand of automotive glass carrying an inner layer of polyvinyl butyral specially designed to provide a tinted palette to the industry.

Solutia's work paid off when General Motors exhibited a concept sports car called the Pontiac Solstice with laminated glass featuring a Vanceva tint to match the paint. Vanceva made it onto four concept vehicles that debuted in Detroit: Ford Motor Co.'s F-350 Tonka truck, Ford's GT40 performance car, GM's Bel Air sedan and the Solstice.

The GT40 also represents a composites study by Ford, building the lightweight body over an aluminum frame. GM turned to carbon fiber and Kevlar aramid fiber for the body and chassis on

its Cadillac Cien two-seat concept vehicle, while carbon fiber also goes onto the body of DaimlerChrysler AG's Jeep Willys 2 design.

The biggest holdup in bringing the molding technology into production remains finding an affordable, aesthetically attractive replacement for painting. We have heard this echoed again and again during interviews with automotive industry design engineers. Researchers now are studying in-mold decorating using an extruded film finish and conductive plastics.

Some concepts do make it to production. Solutia's Vanceva Color PVB layer is making its first appearance on a street vehicle with the Porsche 911 Targa, which made its debut in Detroit. The sports car has a retractable roof that uses a gray-green Vanceva blend for its look and safety aspects. Vanceva Color is slated to make its way into two other cars later this year.

DaimlerChrysler AG is going for pure power in its new Performance Vehicle Operations.

The Dodge SRT-10 high-powered truck was introduced at the North American International Auto Show in Detroit. The Dodge Viper, in production since 1996, is the first official member of the PVO unit, which also will take in the firm's motor sports and high-performance parts units in addition to specialty vehicles.

The Viper makes extensive use of reaction injection molding to make its body panels. Concepts introduced in Detroit build on the Viper engine and add new styling concepts. The SRT-10 truck builds on the Dodge Ram pickup as a performance vehicle and gives it a composite hood, cowl module and tonneau cover.

A Viper SRT-4 convertible concept, meanwhile, has a hood with a series of cooling vents, likewise produced through polymer technology.

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When Airtex Products in Fairfield, Illinois (USA), developed six new water pumps for cars made by U.S. automakers, it chose Fortron<sup>®</sup> polyphenylene sulfide (PPS) for its impellers rather than aluminum or cast iron. Fortron PPS from Ticona, the technical polymers business of Celanese AG (NYSE: CZ), enabled Airtex to develop complex impeller geometries that enhance efficiency and provided the needed mechanical integrity and dimensional stability in the face of continual immersion in aggressive coolant solutions at temperatures to 130°C.

The water pumps, which are 4 to 15 inches in diameter (10 to 38 cm) and 3.5 to 8 inches wide (9 to 20 cm), circulate coolant through the radiator and engine at rates of 30 to 100 gallons/min. (110 to 380 liters/min.). The pumps are powered by a belt off the crankshaft and operate when a thermostat indicates engine temperatures above a threshold value. The impellers have diameters of 2.5 to 4 inches (6 to 10 cm) and widths of 0.2 to 1 inches (0.5 to 2.5 cm). They rotate at rates as high as 8,000 rpm.

"Impellers made of Fortron PPS are practically trouble-free," says Curt Ulm, Director of Engineering at Airtex. "This is impressive because they must retain their size and strength in a tough chemical environment."

"Today's glycol 'long-life coolants' contain organo acid inhibitors that prevent particulate formation and so extend coolant life to 100,000 miles. Unfortunately, these inhibitors can attack aluminum and many plastics. In developing the impellers for these pumps, we considered resins such as polyphthalamide and several nylon derivatives, but these did not perform as well as PPS."

Ulm says Fortron PPS withstands the mechanical stresses of rapidly changing RPMs in this high-heat, acidic environment. "The polymer's dimensional stability keeps the impellers from deforming under the high rotational torque and uneven pressures in the pump. This can involve a 30 to 40-psi differential across the face of the impeller."

### **Design Flexibility and Future Applications**

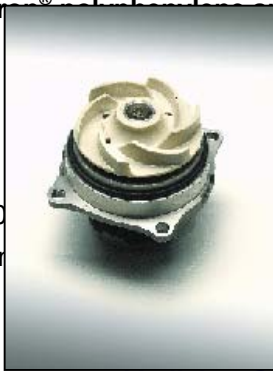
“The design flexibility we get with Fortron PPS is also important. It enables new geometries that promote efficient interaction between the impeller and the fluid. It also helps us fit our pumps into

**Additional information on Fortron® and Ticona® is available from:**

**Europe Contact:**

Peter Radden, Fortron Team  
Ticona GmbH  
Industriepark Höchst, C657 / R30  
D-65926 Frankfurt am Main, Germany  
Tel: +49-(0)69-305-16087  
Fax: +49-(0)69-305-81030

[Radden@ticona.de](mailto:Radden@ticona.de)



**Americas Contact:**

Fortron Team  
Ticona  
P.O. Box 100  
901, USA  
Phone: 618-4209  
Fax: 618-4319

[ed.hallahan@ticona.com](mailto:ed.hallahan@ticona.com)

the underhood space auto designers define for them.”

“PPS is likely to play an expanded role in our future water pumps,” says Ulm. “For instance, if automakers switch from mechanical to electrical water pumps, we may use Fortron in the pump housing instead of metal to reduce weight and gain production and design efficiencies. This switch is possible because electrical pumps, which are infinitely variable in speed, impose much less torque on the pump body than do today’s mechanical models.”

For information on pumps and other automotive components from Airtex Products, contact: Airtex Products, 407 West Main St., Fairfield IL, 62837, USA. Phone: 1-618-842-2111. Fax: 1-618-842-4069. E-mail: [airtexprodsales@airtexproducts.com](mailto:airtexprodsales@airtexproducts.com). Or visit: [www.airtexproducts.com](http://www.airtexproducts.com).

**Medical /FoodPackaging**

The U.S. Food and Drug Administration has approved Food Contact Substance Notification FCN 103, which encompasses both single-service use (for film, sheet and articles made from them) and repeated contact with all types of foods, including dry, wet, fatty, high-alcohol, acidic and basic foods, at all temperatures. This FCN gives food processors and packagers access to twelve Vectra® and four Vectran™ liquid crystal polymers (LCP) from Ticona, the technical polymers business of Celanese AG (NYSE: CZ).

The Vectra and Vectran LCPs covered by FCN 103 range from unfilled to 50 percent glass-filled resins. This includes five industry-standard Vectra A-series grades (A115, A130, A150, A530 and A950) and Vectra B130, C115, C130, C150, E130i, L130 and L140 LCPs, which offer a wide range of stiffness and flow properties. The four Vectran grades (V100P, V200P, V300P, and V400P) are used primarily in films. FDA-compliant blue, red/pink, white and green color concentrates are available for the Vectra LCP family.

[Ticona’s Vectra and Vectran LCPs also meet a variety of medical and pharmaceutical standards.](#) Many Vectra grades have passed U.S. Pharmacopoeia Class VI requirements and International Standards Organization (ISO) 10993 biocompatibility testing. The company has established both a Drug and a Device Master File for Vectra LCP at the FDA. It also has established an FDA Drug Master File for Vectran LCP for drug packaging.

Vectra LCPs are high-performance polymers primarily used in injection molding that flow well in thin walls and have excellent dimensional stability and temperature and chemical resistance. They are inherently flame resistant and offer a low coefficient of expansion and high impact and mechanical strength. Typical food industry applications include conveyor belts components, baking trays and filtration media.

Vectran LCP can be cast or blown as monolayer or coextruded films having similar properties to those of Vectra LCP, as well as excellent oxygen and water vapor barrier properties. Vectran LCP typically is used in applications requiring excellent oxygen barrier under high humidity conditions, such as medical packaging, retort pouches, boil-in-a-bag and bag-in-box systems, frozen food packaging, food trays and lids. For more information go to [www.Ticona.com](http://www.Ticona.com).

### **Material Developments**

[A new high flow, high density polyethylene \(HDPE\) for thin-wall injection molding](#) is available from Equistar Chemicals, LP. Alathon®H5656, which has a melt index (MI) of 56 g/10 min and a density of 0.956g/cc, is higher in stiffness(170,000 psi) than most conventional high-flow HDPE resins(<150,000 psi). H5656 is ideal for molding a wide range of thin-wall products, including food containers, drink cups, and overcaps.

The higher stiffness and higher recrystallization temperature of H5656 allow moldings to set-up faster, which results in shorter cycle times.

H5656 also allows improvements in product design. Because its stiffness is about 20% higher than typical thin-wall HDPE resins, it offers the potential for reducing product weight. Also, for thin cups and containers, improved nesting/de-nesting is possible, because there is less product compaction, when they are made with H5656.

For more information, contact: Kelly McCarthy, Equistar Chemicals, 713-652-4518.

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[Ertalyte®TX has wear-resistance and dimensional stability, surpassing other common wear-grade plastics](#) and excellent resistance to many harsh chemicals, including aggressive food products, cleaning solutions and petroleum products. It outlasts unfilled nylons (PA) by a minimum factor of 8 and lasts a minimum of 50 times longer than unfilled acetals (POM). Even industry – standard wear materials, such as PTFE-filled acetal and oil-filled nylon, are no match for the performance of Ertalyte TX. Because of the material's unique composition, its wear resistance increases as bearing velocities increase. Adding to the product's strengths are its ability to maintain tight dimensions and close tolerances in wet environments, unsuitable for nylon materials.

Ertalyte TX has a FDA and USDA compliance thus it can be used for machined components for food packaging and processing equipment.

Ertalyte TX, developed and manufactured by Quadrant Engineering Plastics Products, is an unreinforced, semi-crystalline thermoplastic polyester (PET-P) with an integral solid lubricant for improved wear and slip–stick resistance. It is available from stock in many rod and sheet sizes. Quadrant will also manufacture custom sizes rod and stock as well as tubular shapes.

Quadrant also offers other performance enhanced materials with service temperatures up to 800° F (425°C).

For more information, visit [www.quadrantepp.com](http://www.quadrantepp.com)

### **Process Developments**

#### [Tire Makers Trade Technology](#)

Japan's Bridgestone has agreed to license its technology for run flat tires to Continental for three years and Continental will do the same thing, licensing its proprietary technology for run flat tires to Bridgestone for three years.

The two have developed alternative technologies that seek to eliminate the chance of a high speed blowout and allow the driver to continue to drive the car for a short distance after the tire is flat.

The feature is likely to be one of the most important selling features for new vehicles over the next decade.

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Marshall and Williams Plastics, Woonsocket, R.I. and a unit of Parkinson Technologies, announced today that it will build a [new extrusion film and sheet laboratory for experimenting and evaluating monoaxial and biaxial oriented systems](#). According to the company, a new Film and Sheet Orientation Lab/Pilot Line will be constructed in Woonsocket for evaluation of various formulations and production of samples for customer pre-evaluation.

The new lab will be equipped with three new extrusion lines including single layer and multi-layer dies, a multi-roll casting system, a vertical style MDO (machine direction orientation) and a new style TDO (transverse direction orientation), plus upstream and downstream equipment.

Marshall and Williams says the line will be ready for use later this year. For more information contact Phil Fox at 401 765-7770 or send e-mail to [pfox@mwplastics.com](mailto:pfox@mwplastics.com).

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

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January 2002