

## PolymerPlace Notes

*A plastics technology newsletter*  
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### PolymerPlace Update

2006 has been a busy year. Certainly an NPE year qualifies as a busy one. Roger Jones through Oxford University Press has published the book "Globalization in the Plastics Industry" and has presented several papers during the year. Maggie Baumann has made several presentations at conferences: SPE ANTEC, A Topcon, LES (Licensing Executives Society) Spring Meeting and the World Congress on Industrial Biotechnology. The year has flown (which I never like to admit...).

In this issue we include another summary of the book, some observations on NPE, and the China Forum recently sponsored by Plastics News.

We wish you a wonderful Holiday Season and a healthy and happy 2007.

### Preview of New Book on Globalization – III Roger F. Jones

The American Chemical Society's Book Publications Department has recently completed production of a new book titled, *Globalization and the Chemical Industry*. It is being published as one of the ACS Symposium Series (Oxford University Press), inasmuch as it is based on a

symposium of the same name presented at the ACS National Meeting in March 2005, San Diego, CA, and cosponsored by the Business Development and Management Division and the Committee for Economic and Professional Affairs. The writer organized this symposium and is the editor of the book as well as author of the first section. The book is offered through Amazon.com and through both ACS and SPE websites at membership discounted prices; an additional 5% discount will be offered to ACS Business Development & Management Division members who purchased it at the ACS National Meeting in San Francisco, September 2006.

In the last two newsletters, I have reviewed the first section, on the chemical industry overall, and the second section dealing with the pharmaceutical (“pharma”) industry. This month, I will review the final section, which discusses the matter of China, the focus of most discussion on globalization. The author, Dr. Timothy Weckesser, is a “China old hand,” heading up Sino Consulting, W. Conshohocken, PA. He starts with the big picture, putting China in context with the other large countries of the world in terms of population, area, GDP, and exports. China’s rapid economic growth has now reached the point where it is forecast to leapfrog ahead of France, the UK, and Germany within the next five or so years, to become the third largest economy in the world. This accomplishment will be virtually without precedent. However, this is only one side of the picture. China has the largest population of any country in the world and its economic output per capita, in contrast, is only 26th in the world. Furthermore, most of this buildup of wealth is in the coastal areas – the interior provinces of China are largely mired in grinding poverty, essentially, a subsistence economy, further heightening the contrast.

China has become a major manufacturing location seemingly overnight. In such products as cell phones, it dominates world production – and consumption. While one might think of India when computer software is mentioned, Chinese software is growing mightily, too, aided by government programs to foster this area of their economy; on the dark side, there are many problems with illegal copying of patented or copywrited software without the niceties of licenses and royalties. Anything that has labor as a major part of the cost is likely to be made in China or soon will be.

All of this growth has fueled (pun intended!) Chinese demand for raw materials, such as cement for highways and buildings, metals for machinery and construction, polymers for plastics processing, and crude oil for refining into fuel and chemicals. The escalation of gasoline prices in the US is one of the byproducts of this rising demand in China (the Chinese can only supply about a third of their crude oil requirements from domestic production). China is now the world’s largest importer of plastics scrap for reprocessing, pinching US recyclers who have to scramble for supplies and pay more for them. The growth is also straining Chinese energy production, which is hard-pressed to expand rapidly enough to keep pace with demand, leading to frequent “brown-outs.” China is building large hydroelectric projects, but is mostly relying on its huge coal deposits to feed its growing appetite for electricity. The rapid growth has also lead to major pollution problems.

The Chinese government has ownership in almost every major company and many of the smaller ones. It plans to divest gradually in those industries that are not considered be essential to “national security,” e.g., anything to do with energy, oil and gas, aerospace, etc. This ownership helps companies that would not be considered good credit risks in Western nations to obtain bank financing, particularly if the companies involved are creating jobs rapidly. This emphasis on employment over profitability has lead many economists to believe that as much as half of all bank debt in China is effectively uncollectible, and a serious problem. This is perhaps the most critical reason that the Chinese government has been so reluctant to revalue the yuan upwards, for fear of initiating deflation and an accompanying banking crisis.

The author goes on to give valuable advice about doing business in China and with companies there, how to structure business relationships, significant business culture differences between China and the US, and business strategies. He ends with a political and historical overview that is reassuring in that he believes the Chinese have never shown an appetite for territorial expansion outside of its historic areas (which could mean future trouble for currently independent

central Asian states and parts of Russian Siberia). Nevertheless, he notes that the treatment of the people of China by their Communist masters has been and continues to be brutal and uncompromising.

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We re-printed the following article this month after we attended the China Forum sponsored by Plastics News. The following represents some of the arguments for “if you didn’t get into China and still want to play in the blossoming Asian economies, look at India.” (note to Maggie—insert some of the data).

### **India May Offer More Opportunities than China Now - by Roger F. Jones**

*We recently attended the China Forum Sponsored by Plastics News. Manufacturing opportunities and issues in China and India were discussed and compared during the conference. Realizing that we had published the following article in the Spring of 2006 we decided to re-publish it this month.*

Many companies, particularly smaller ones, missed the big rush to establish a business in China. By now, it may be too late to “get in on the ground floor.” Take heart – if you waited too long to go to China, you would likely be better off going to India now.

Actually, India has a number of things going for it that make it potentially a better business opportunity than China for the long-term. First is that India’s government is a functioning democracy with a judiciary modeled after Great Britain’s – China is laboring under one of the very few remaining Communist governments, with a weak judiciary that has a reputation for administering justice “unevenly.” Second, India’s economic growth rate is only slightly less than that of China. Third, India has a middle class that is reportedly more than twice the size of China’s middle class – and, in the absence of the mandatory birth control policy of China, India’s total population size will overtake that of China within one to two generations and be significantly younger. Fourth, India has made genuine progress in steadily improving relations with its neighbors, particularly Pakistan, while China is escalating its rhetoric about taking over Taiwan by force and has yet to apply serious pressure on North Korea to give up its nuclear weapons program.

Doing business in India is no guarantee to riches, however. Any country with a population of over one billion, with literally dozens of languages spoken and strained relations between half a dozen religious factions, has plenty of problems and opportunities for trouble. There are significant cultural differences between regions in India, broadly on a north-south axis. However, these same problems exist in China – a multiplicity of languages, religions, and cultures. India is more geographically concentrated than China, which makes transportation easier and faster (but still not what we are used to in western countries).

An Indian company, The Chatterjee Group, wanted to take a substantial minority interest in the recent purchase of Basell, a sign that Indian chemical and plastics companies see their future growth as being in both domestic and overseas trade. Even though this situation did not work out, they will undoubtedly be looking for additional opportunities. Countries that see their future in a balance of trade, rather than trying to be self-contained, are more prosperous and less militaristic. India has limited natural resources (other than people and talent!) and will need imported materials, machinery, and services with which to make its economy grow.

Some may be waiting for business growth to take off closer to home, in Mexico and Brazil, but these countries have yet not shown the political maturity to trust their private sectors to grow their economies. In my opinion, India looks like a good place to be doing business for at least the next two decades. And that would be true, even if you were already in China.

Disclosure – these thoughts will also appear in my forthcoming book for the American Chemical Society, tentatively titled “*Globalization and the Chemical Industry*.” Publication was the second

quarter of 2006. Additionally, I presented these thoughts and others as an invited speaker at the SPE Europe Thermoforming Conference, Salzburg, Austria, March 17, 2006, in a paper titled "Managing in an Era of Great and Accelerating Change."

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Since we have not done a newsletter since NPE, we are including our review of NPE in this month's newsletter.

## **NPE 2006**

**By Roger F. Jones and Maggie Baumann**

The triennial NPE (the initials are now formally the name of the show, replacing the "National Plastics Exposition") was held at Chicago's McCormick Place (as always), June 19-23, 2006. This show was marked by the continuation of those changes noted at the last NPE in 2003. For example, polymer producers were notable by their absence: only *eight* large firms thought it worthwhile to have exhibits this time: Asahi Kasei, BASF, Basell, DuPont, Dyneon, Ems-Grivory, Lanxess (former Bayer), and LG Chem. Dow had no booth but did have a presence through sponsorship of the educational program and a hospitality suite (at a hotel). These exhibitors were also in much smaller stands than previously; as a result, neither the lower exhibit levels in McCormick East nor the back half of the lower level in McCormick North were in use (the back half of the upper level was only partially filled). Machinery producers looked to be also following the trend toward smaller stands. McCormick West will be opened next year, and could likely bring the closure of the older East building in the face of these cutbacks.

Attendance, at 64,051, was reported to have grown 2% from 2003, but the overseas component (mainly from Asian countries) went from 24% to 33% – meaning that the number of domestic visitors *dropped by nearly 5,000*. Considering that this is the third full year of economic growth since the end of the last recession, this report is very troubling inasmuch as it may be the best evidence yet that there has been a significant decline in the US domestic plastics industry. This not simply a drop-off in people coming simply to collect free plastic parts – those folks were winnowed out three years ago. As before, the attendees at this show were visibly interested in the technology on display and willing to buy the fruits of the improvements offered – it's just that there were significantly fewer of them. The cause, of course, is most likely that fewer firms have been able to withstand the competitive changes driven by the forces of globalization. "Commercial plug" – "The Chemical Industry and Globalization" is now in print – go to [www.oup.com/us](http://www.oup.com/us) and type in promotion code number 25527 for a 30% discount on the American Chemical Society Symposium Series book, edited by yours truly.

Some of the highlights from my viewpoint:

1. **Materials.** Many compounders exhibited and these companies now comprise by far the bulk of this category of exhibitor. RTP announced that it was expanding its long-fiber compounding capacity in China, with two new lines. RTP also revealed its sales revenues for the first time, stating that it had sales in excess of \$200 M in 2005, and was experiencing double-digit growth, so that \$250 M is forecast for 2006. This clearly makes RTP the world's largest independent compounder; LNP, the former #1, has been completely absorbed into GE Plastics for more than a year, with little left of it other than a logo on a manager's business card (rather like the Cheshire Cat's smile in *Alice in Wonderland!*). Ems-Grivory announced a 5 MM lb. specialty nylon plant expansion, together with a new technical center.

DuPont claimed it would start producing some thermoplastic elastomers based on corn sugar next year, but would not disclose volumes or cost comparisons; it may be recalled by some of us old-timers that DuPont produced significant quantities of nylon intermediates from corn-derived furfural in the 1950s, but the economics of this bio-based material never became competitive with oil and gas-based feedstocks; the Niagara Falls, NY, plant was then converted to other products,

but was eventually shut down. DuPont also conceded that earnings from nylon and other performance polymers had dropped 35% in 1Q 2006 vs. a year ago while sales were going up 6% – both reflecting DuPont's inability to pass on more than a fraction of increased raw material costs. A number of people in the field do not believe that biopolymers can achieve commercial success in the near future without government mandates or subsidies. Let's hope that does not happen – just look at the market distortions caused by political dictates in gasoline; the “oil companies” did not cause the gasoline price run-up this summer, Congress did, by favoring ethanol producers through formulation mandates, subsidies, and a stiff tariff on imports, while continuing (until very recently) to deny all domestic gas and oil exploration and development in the most promising areas off the coasts of California and Florida.

Solvay, which had showed off its newly-acquired Gharda Chemicals' sulfone-based polymers at K 2004, did not exhibit here (a surprise), but Gharda showed a new high-performance line of fluorinated sulfone polymers that it has in development and which was not included in the sale of its PES & PEEK business to Solvay.

### **Bio-Based Materials made their presence known**

Spartech announced its “Rejuven8” modified PLA materials made for thermoformed packaging. The “Plus” grade in this family (for printed applications) is made from 95% Natureworks PLA, and its formulation and secondary processing are said to enhance its properties to better match those of Standard PET. Its heat resistance exceeds 150 degrees F which is higher than standard PLA's maximum range of 105 degrees F-120 degrees F.

Ecoflex Biodegradable polyester from BASF is being used by Heritage Bag (Carrollton, TX) to produce compostable bags for food waste disposal. Heritage's BioTuf bags are approved by the Biodegradable Products Institute (NY) and are certified via ASTM D6400-04 for their ability to biodegrade within 30 days in an industrial composting facility. The bags use Ecoflex polymer and Calcium Carbonate (Minapol) to offer good melt strength and toughness. Modern Plastics Magazine interviewed Peter Klaich of Heritage Bag during NPE; he indicated that the biodegradable bags are still 2-2.5 times more expensive than polyethylene bags but the system cost is lower when you consider composting costs. They are significantly lower than paying dumping fees in landfills.

Korea-based Econeer Company offers two plant-based biodegradable materials that are currently available for thermoformed plates and trays and coatings. Kondorax is a cellulose material made from wheat flour, various straw fibers, cotton fiber by-products and water formed into sheets for thermoformed plates. Ecopol is a biodegradable polyester derived from agricultural products. As a coating it can moisture proof Kondorax and other paper products.

**2. Machinery.** Krauss-Maffei displayed its 1000 ton clamp D-LFT molding system, but this was the same one shown in 2003; the only thing different this time appears to be a substantially smaller price tag. PlastiComp (disclosure – I am the non-executive board chairman of this company) showed off its Pushtrusion™ D-LFT modular molding unit at the Engel and MGS Manufacturing stands. Since Dieffenbacher was not exhibiting, Krauss-Maffei and PlastiComp/MGS/Engel were the only displays of the integrated process that has now taken over *half* of the long fiber thermoplastic market in Europe (mainly automotive). Larger and more sophisticated robots from such firms as Kuka, SAS, and Motoman were on display to respond to the need for productivity gains. The increasing cost of energy was addressed by Novatec and other dryer manufacturers who offer more efficient equipment.

It was a good show but for the disquieting attendance data.

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## **Polymer Markets Packaging**

### ***Packaging and Biorenewables***

This past year, PLA and other bio-based polymers were more visible at tradeshow and conferences than ever before. The escalation in energy costs and sudden increase in polymer prices has definitely been a factor. In addition, the leadership of the retailer Walmart and other “green” product marketers has also been a major factor. Numerous converters are actively promoting their involvement with PLAs (likely on recommendation of their customers.)

### **Converters working with Bio-based Materials**

The following is a partial list of converters and compounders working with bio-based materials that we have seen at the various tradeshow in recent months. In the next newsletter we will update this list and include more detail.

#### **Film/Sheet**

- Gilbreth
- Seal It (shrink labels)
- Fuji Sericol (inks for use on PLA)
- Spartech
- Klockner
- Plastic Suppliers
- Extech
- Kama (Alcoa)

#### **Thermoformers**

- Buckell Plastics
- Lacerta Group
- Sabert Corporation—Newman’s Own Package

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**GLS Corporation, a leader in high performance thermoplastic elastomers is introducing a new TPE alloy technology suite that features excellent barrier properties.** Barrier materials continue to be necessary as plastic packaging penetrates more traditional packaging materials like cans and glass. Target applications include beverage closures, flexible food packaging films, and other storage containers, as well as medical applications requiring package barrier integrity such as vial stoppers and medical films for IV bags. According to GLS spokesman, Walter Ripple, Global Director of Sales and marketing, “Customers have been seeking TPEs with barrier properties for some time,. GLS has recently developed a multiple technology line of barrier TPEs that satisfy these requirements.

The key benefit of the technology is barrier to oxygen and moisture.(MVTR). The oxygen permeation coefficients of the new TPE alloys range from 2,000-20,000 cc.mil/m2.day.atm @23C. This compares to 50,000 to 90,000 cc.mil/.m2.day.atm and the MTRV is in the range of 2.3 to 3.8 g/m2.dayat 38C/100% RH.The use of the technology would provide a boost in 2X to 5X increase in shelf-life over conventional materials, and covers a broad range to accommodate packaging and storing in a wide variety of food, beverage and medical products.

There are injection molding, blow molding and extrusion grades available. Some of the grades offered are translucent which could be a great value in aesthetic appeal of packaging and are easy to color. The hardness ranges from A40-90.

If a standard grade isn't optimum, GLS will tailor the compounds to ensure a perfect barrier and other properties.

GLS specializes in the manufacture of application-specific custom formulated soft and ultra-soft thermoplastic elastomers (TPEs) for injection molding and extrusion. GLS has supplied specialty TPEs to the industry since 1979 and is recognized as a global leader in TPE technology solutions.

Their tradenames include: Dynaflex<sup>®</sup> based on Kraton<sup>®</sup> polymers, Versaflex<sup>®</sup>TPE, Versalloy<sup>®</sup>TPV alloys and Versollan<sup>™</sup>TPU alloy compounds.

For more information on the barrier TPE alloys, contact: marketing department GLS Corporation. Phone: 815-385-8500 or 800-457-8777. info@ glscorp.

## **Polymer Developments**

### **Additives to improve the performance of Bio-based polymers**

Dupont recently announced the development of an additive that strengthens polylactic acid based polymers(PLA). Biobased plastics can lack impact strength, flexibility and melt stability/viscosity. The new additive name is Biomax Strong and is available as a pellet for addition to PLA to improve those properties. Biomax is an ethylene copolymer. It is especially useful in rigid applications like cast sheet for thermoforming and injection molding. At 5-10% levels, it has minimal impact on transparency. The additive also does not interfere with the compostability of PLA. The first grade (120) is available but only for applications where food compliance is not needed. A grade that will perform in those applications is about 6 months away.

### **Developments in High Performance Polymers---SPS, PEEK**

#### **SPS**

Idemitsu Kosan Co, LTD (Tokyo) started production near Warrington, England of syndiotactic polystyrene, a heat resistant engineering thermoplastic independently developed by Idemitsu. SPS' excellent heat resistant properties are obtained by using metallocene as a catalyst to give polystyrene a syndiotactic structure. Idemitsu began supplying SPS in 1997.

Dow's decision to discontinue SPS (Questra<sup>™</sup>) in NA and Europe gave Idemitsu the opportunity to expand globally. Idemitsu's product Xarec<sup>™</sup>was sold primarily in Japan and Asia.

Idemitsu started producing SPS resin compounds in NA in January 2006. The applications include: lead free solder compatible connectors for automotive electrical system components, IH (induction heating) cookers, washers and dryers, among other home appliances with heating components and antennas and other electrical components.

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#### **PEEK**

Several years ago there was only one supplier of PEEK—Victrex LLC. Recently both Solvay and Degussa have thrown their hat into the high performance PEEK market.

Solvay Advanced Polymers (SAP) is making a 1.1 million pound expansion in Panoli, India where Solvay bought a PEEK business from Gharda Chemicals LTD of Mumbai, India earlier this year. Commercial production is expected in early 2008. In the meantime SAP will supply customers KetaSpire<sup>™</sup> brand from a semi-commercial operation in Alpharetta, GA. SAP also makes Polysulfone resins in Panoli and is considering the addition of a new compounding site in China (at least somewhere in Asia). The PEEK market has been growing 15-20% per yea. India was chosen because of the growing Asian market.

Eight grades of KetaSpire including glass-filled and carbon filled will be available initially. Modified grades of PEEK will be sold under the AvaSpire<sup>™</sup> name. Applications for PEEK materials include: Applications in chemical processing, medical sterilization and electronics. The product also has best of class fatigue resistance in aircraft and aerospace parts.

Degussa AG is also setting up an organization to market PEEK. Degussa formed a 80-20 joint venture, JIDA Degussa High Performance Polymers Changchun, China. Jilin University is the 20 percent partner. The school developed the materials while Degussa contributes sales, marketing, project management and financing. The plant can produce up to 1.1 million pounds of polyetheretherketone annually and will produce 330,000-440,000 pounds in 2006-2007.

Degussa estimates that PEEK's global demand will double by 2015 to 8.82 million pounds a year, from about 4.41 million pounds in 2005.

This may sound like small number compared to other polymer families but PEEK is priced over \$50.00 per pound and in some grades (e.g. specialty medical grades) may run as high as \$1000.00 per pound.

## **Processing Developments**

### **Randcastle Extrusion**

Do you have any problem extrusion applications where the single screw extruder is not just providing a good enough mix? Randcastle, a manufacturer of lab-sized extruders, has introduced a new screw design that retrofits existing single screw extruders. The design is named "The Recirculator" and offers most of the benefits on twin screw extruders at a significantly lower cost. Although Randcastle now includes the recirculator with their new lab extruders, they have successfully manufactured and sold production sized screws (2 ½- 4 ½ inch) and are willing to run an evaluation of a product you want to try. For more information on the screw design and examples of applications contact us at [info@polymerplace.com](mailto:info@polymerplace.com) or contact Randcastle directly at 973-239-1150 Contact : Keith Luker, President.

### **Design and Development DSM Somos ProtoTool® 20L: Helping Barco Stay Ahead of the competition**

High-end display and visualization solutions provider Barco stays ahead of its competition by consistently leading the way in new product development. Whether it's high-tech cockpit displays for the Airbus A380 or the latest generation of digital cinematic systems and screens (Barco is one of only three Hollywood-approved providers), the company's winning development strategy includes the use of innovative, high-performance prototyping materials for its design projects, including the award-winning iCon H600.

Designed to simultaneously increase the quality and cut the cost of network visualization, the revolutionary iCon H600 was the first member of a new product family of high-definition 16:9 network centric projectors. The projector integrates a powerful display server which can be easily connected to the user's network infrastructure, enabling collaborative meetings between remote sites, real time interaction, file sharing and remote control and diagnostics. In order to optimize the fit between the electronics and hardware, as well as evaluate the design and software, Barco commissioned prototype optical frames made from DSM Somos ProtoTool 20L.

"I'm always on the lookout for new materials, both for production as well as for research and development," says Barco Technology Manager Bart Van den Bossche. "From the outset, ProtoTool struck me as being particularly interesting since it combined a high-degree of accuracy with a modulus of around 10,000 mPa and a working temperature resistance of up to 270°C, necessary for the area around the lamps. In terms of rapid prototyping technology, this is just about as close as we can get to imitating the polymers and alloys—such as magnesium and aluminum—that Barco uses in production. "

While the stiffness of ProtoTool proved invaluable in enabling Barco to evaluate the optical components of the iCon H600, Van den Bossche says he was most impressed by the material's stability over time. "In order to optimize and check out the software we ran the ProtoTool prototype iCon H600 for 200 days, 8 hours a day. Even at this level, the geometry of the housing remained constant, allowing us to continue using the same prototype for ongoing fit and function tests."

Access to advanced stereolithography (SL) materials such as ProtoTool 20L continues to help Barco cut the time and cost of bringing new concepts to life. In the case of the iCon H600, the company would have had to otherwise rely on investment casting for their prototype—adding 3 to



4 weeks to the process. Using ProtoTool has helped Barco stay one step ahead of their competition, which includes major global players such as Sanyo, Sony, Panasonic and Sharp.

“When Barco introduced its first LCD projector from the 5000 series at InfoComm in 1992, we had a total of three competitors,” says Van den Bossche. “Today, there are approximately three hundred. Designing with today’s most advanced prototyping materials continues to be a key strategy for our success.”

Barco, headquartered in Belgium, is a world leader in the development of display and visualization solutions for markets including medical imaging, defense and security, traffic management, avionics, media events, digital cinema, presentation, simulation and virtual reality, edutainment, traffic and surveillance, utilities and process control, broadcasting and textiles.

For information about DSM Somos ProtoTool 20L visit: [www.dsmsomos.com](http://www.dsmsomos.com)

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

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