



# Thermoforming Quarterly®

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A Journal of the Thermoforming Division of the Society of Plastics Engineers

**25TH  
CONFERENCE  
ANNIVERSARY  
EDITION**

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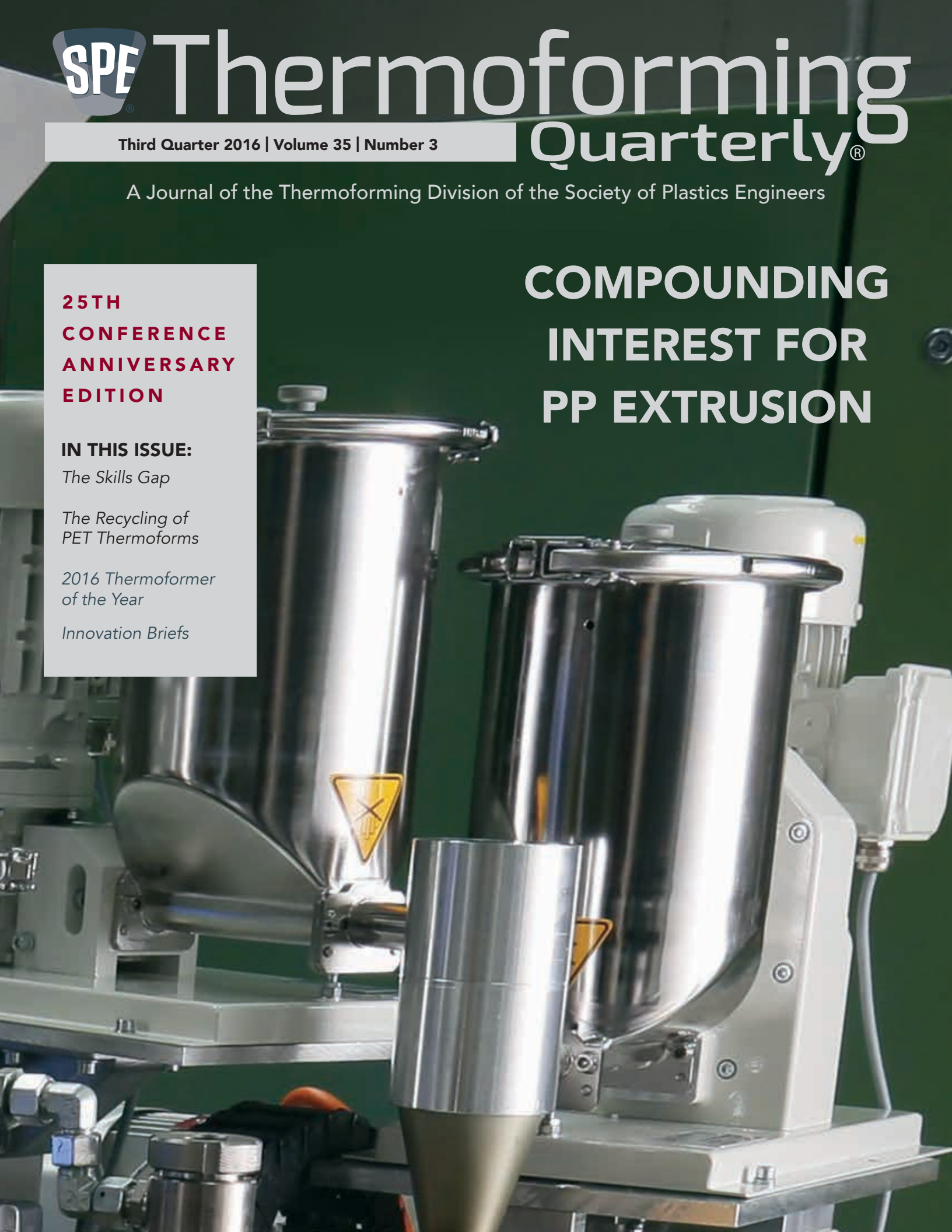
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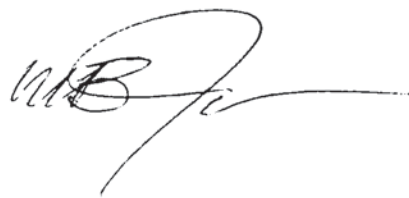
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## How Far We've Come

Anniversaries offer the opportunity to reflect on the past and prepare for the future. As we look forward to the 25th Annual Thermoforming Conference next month in Schaumburg, we should look at how far we have come. Many respected thermoforming practitioners have graced convention halls around the country over the past quarter century, imparting wisdom and sharing hard-won lessons with colleagues. Ian Strachan, one such pioneer, is honored this year as the 2016 Thermoformer of the Year (see profile on p. 32). Our division continues to arm the industry with knowledge and networking so the next generation of practitioners can excel for the next 25 years.

The Thermoforming Division started by sponsoring technical sessions at ANTEC back in the late 1970s and early 1980s. In 1992, the division hosted an inaugural official conference in The Dells, WI with 180 attendees. Nowadays, we regularly host 800 people over a 3-day period with full booths, running machinery and separate technical programs for thin- and heavy-gauge forming.

Our industry has seen some major changes since the 1990s, too. Machinery and technology have continued to evolve, offering processors greater efficiencies and flexibility to create new and innovative parts. Robots have replaced radial arm saws for trimmed parts and they could soon replace the old stacking mechanism on inline machines. New films with multilayer structures, TPOs and oxygen-scavenging barrier materials (see story on p.38) are

just a few of the advances in plastic materials. Processes are smarter, faster, with more data available. More data means more rigorous analysis and ultimately, better parts. Quality control systems and lean manufacturing techniques are becoming the norm. Competition has also driven innovation, both locally and globally, and it is also driving consolidation with increased amounts of financial capital entering the industry. Speaking of global matters, 2016 also marks a "K" year, the world's largest plastics tradeshow in Dusseldorf, Germany. Thermoforming takes up an entire hall at the massive Messe on the banks of the Rhine. Many of our colleagues, suppliers and customers from the US will be exhibiting and walking the halls in October.

One area of particular importance is also beginning to show results – education. With workforce development very much on the mind of companies, professional associations, student, parents and policy-makers, we can be proud of the fact that accredited college courses specifically on thermoforming are available today. I am always inspired by our scholarship winners, 3 of whom are profiled in this issue (see p.20).

I look forward to seeing you all next month as we celebrate a milestone for our industry, our division, our conference, and our future. |

Bret Joslyn

## Have an idea for an article?

### Submission Guidelines

- We are a technical journal. We strive for objective, technical articles that help advance our readers' understanding of thermoforming (process, tooling, machinery, ancillary services); in other words, no commercials.

- Article length: 1,000 - 2,000 words. Look to past articles for guidance.

- Format: .doc or .docx Artwork: hi-res images are encouraged (300 dpi) with appropriate credits.

Send all submissions to Conor Carlin, Editor, at [cpcarlin@gmail.com](mailto:cpcarlin@gmail.com)

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## Medical Packaging Designer, Thermoformer Barger, Wins AmeriStar Award

### Medical isotope packaging combines safety and ease of use

by *PlasticsToday Staff*

JUNE 10, 2016 – Medical device packaging designer and thermoformer Barger (Elkart, IN) has received a prestigious AmeriStar award in the medical device category from the Institute of Packaging Professionals (IOPP; Oakbrook Terrace, IL). Its fifth AmeriStar award in four years, the company was recognized for the design of intuitive PETG thermoformed packaging that protects the NorthStar Medical Radioisotopes Radiogenix Isotope Separation System during its full life cycle.

“The unique packaging design resulted from NorthStar’s desire to consolidate a number of key components into one module and Barger’s ability to make concepts a reality,” said Ray Heasty, Mechanical Engineer for NorthStar in a prepared statement. “The resulting reagent pack is easy to store, install and dispose of after use while performing in contents’ inspections, providing a real benefit for customers using NorthStar’s RadioGenix System.”

The packaging assembly is designed to hold and protect product contents during shipping and handling as well as during use. As an integral component of NorthStar Medical Radioisotopes’ technetium-99m generation process, the package and product work together to create critical and commonly used isotopes for use in medical diagnostic and imaging procedures. After use, the package holding depleted product consisting of three liquid reagent bags, one being caustic, tubing and couplers are discarded together, ensuring handler safety while providing functionality, ease of use and disposal.

Describing Barger’s approach, Mike Motl, Senior Product Designer, said, “The customer is fully supported through the design cycle from concept, prototyping, tooling and specification to product development. Team members are involved early in the design cycle to fuse the customers’ expectations with manufacturing capabilities and end-user requirements. This planning assists in incorporating

unique features such as the [360 degree perforated panel] used in the NorthStar package. With our design approach, innovation can really enter the design cycle at any point in the collaborative process.”

A division of Placon, Barger is certified to ISO 9001 and ISO 13485. Located strategically near Warsaw, IN, known as the orthopedics capital of the world, Barger has more than 40 years of custom pharmaceutical and medical packaging experience. The company offers design, cleanroom prototyping, tooling and thermoforming services and produces turnkey, non-sterile and sterile barrier packaging systems out of its Madison, WI, and Elkhart facilities.

## CMT Materials Introduces Material for Heavy Gauge TPO Thermoforming

### New tooling material is formulated for custom cast and complex geometries

by *Clare Goldsberry, Plasticstoday.com*

JUNE 22, 2016 – CMT Materials (Attleboro, MA), a designer and developer of syntactic foams for use as plug-assist materials, has developed a new grade of syntactic foam designed specifically for cut-sheet thermoforming of TPO and capped materials.

HYTAC-LPXT is impregnated with PTFE to provide a smooth, no-stick and mark-off-free surface. It is formulated to meet the requirements of the custom cast and cure approach typically used for large, complex part geometries in the heavy gauge thermoforming industry. Custom cast and cure provides a part in either a near-net shape requiring minimal machining or a final shape requiring only polishing for frictional modifications. A crack-arresting additive ensures product life for cycle-after-cycle and year-after-year performance, said CMT.

“HYTAC-LPXT now makes it possible for heavy gauge thermoformers to form engineered plastics such as TPO without mark-off or thin spots while improving cosmetic appearance,” said Conor Carlin, Sales and Marketing Manager for the company.

The syntactic foam structure of HYTAC-LPXT maintains

low thermal conductivity while providing the release characteristics associated with PTFE. HYTAC-LPXT is available as a solid syntactic or as the outer layer of a two-part system consisting of a core of epoxy-coated large, hollow composite spheres and an exterior of high-performance syntactic foam. It has been designed to enhance the cosmetic appearance of parts made from TPO and other capped materials.

## Nelipak Corporation Acquires Medical Thermoformer

### Global Leader in Thermoformed Healthcare Packaging Expands Presence in Puerto Rico, the Dominican Republic and Caribbean Regions

by Marketwired, Nelipak Corporation

JULY 7, 2016 – Nelipak® Corporation (“Nelipak”) announced today that it has closed on the acquisition of Tegrant Alloyd Brands of Puerto Rico, Inc., (“TABPR”) a subsidiary of Sonoco Products Company, a thermoforming company based in Juncos, Puerto Rico. The business will be owned by Nelipak and operate under the name of Nelipak® Healthcare Packaging.

TABPR is a manufacturer of thermoformed rigid packaging primarily for the medical market whose customers include some of the best known medical device and pharmaceutical customers in Puerto Rico and the Dominican Republic. The company’s packaging products include trays, clamshells, and blisters. Under the Nelipak® Healthcare Packaging brand, TABPR will further develop its thermoformed packaging products and service capabilities for the healthcare market. The employees and suppliers of TABPR have played an integral role in the company’s success and will continue to do so in the future.

This acquisition strengthens Nelipak’s commitment to the North American healthcare market and will allow Nelipak to take advantage of growth opportunities in Puerto Rico, the Dominican Republic and the broader Caribbean regions. TABPR’s customers will have access to Nelipak’s award winning design teams and modern cleanroom manufacturing throughout its global locations.

A 60-year brand, Nelipak is a global leader in the healthcare thermoformed packaging industry with a world class reputation for quality and service. Nelipak, 100% focused on the healthcare market, continues to invest in best-in-class manufacturing and cleanroom facilities delivering high end packaging to leading medical device manufacturers and pharmaceutical companies.

“We are thrilled to expand our global manufacturing footprint and gain greater access to the Puerto Rico and Dominican Republic healthcare markets with the acquisition of Tegrant Alloyd Brands of Puerto Rico,” said Mike Kelly, President and CEO of Nelipak. “This acquisition enables us to better support our global customers since many of them have operations in Puerto Rico. Additionally, the Tegrant Alloyd Brands of Puerto Rico’s team and customer base complement our current capabilities.”

## Patrick Industries has acquired LS Manufacturing for \$11 million

### Looks to further expand its presence in the growing plastics market

by - Kari Embree, Automotive and Mobility Business, Thermoforming

JULY 6, 2016 – Patrick Industries Inc. (Elkhart, IN) has finalized its acquisition of Elkhart, Indiana -based Vacuplast LLC, which operates under the name of L.S. Manufacturing Inc. (LS Mfg.) as Patrick looks to further expand its presence in the “growing plastics market.” LS Mfg. is a manufacturer of a wide variety of thermoformed plastic parts and components, primarily for the recreational vehicle (RV) market, as well as certain industrial markets. LS Mfg. had about \$12 million in annual sales through May of this year.

“The acquisition of LS Mfg. allows us to capitalize on its value-added manufacturing capabilities, products, and expertise as a supplier and manufacturer of quality, customized thermoformed plastic products and components,” said Todd Cleveland, CEO of Patrick. “In addition to increasing our RV content per unit, complementing our existing product portfolio at our Charleston operations, and bringing new and innovative

product lines, the acquisition of LS Mfg. allows us the opportunity to further expand our presence and capabilities in the growing plastics market.”

“LS Mfg. has a solid reputation for innovative customized thermoformed plastic components, flexibility, and quality customer service,” said Andy Nemeth, President of Patrick.

“We are excited about bringing our two companies together to increase our value proposition to the RV and industrial markets. Consistent with our previous acquisitions, we will support LS Mfg. with a financial and operational foundation that will allow it to capitalize on its core competencies, while preserving the creative entrepreneurial spirit and brand value that have been so important to its success.”

The net purchase price for LS Mfg. of approximately \$11 million was funded under the Company’s existing credit facility and includes the acquisition of accounts receivable, inventory, and machinery and equipment.

Patrick says LS Mfg. will continue to operate as a stand-alone business in its existing facility.

This is the latest in a series of acquisitions for Patrick. The company closed on its acquisitions of Mishawaka Sheet Metal LLC in June, Cana Holdings Inc. in May and The Progressive Group in March.

## Sabert Corporation Acquires Mullinix Packages, Inc.

JULY 18, 2016 – Sabert Corporation, a leading global food packaging company, announced today that it has completed the acquisition of Mullinix Packages, Inc. (Mullinix) from Mason Wells. Mullinix is a leading U.S. provider of plastic packaging solutions to food processors and the foodservice industry.

Operating primarily out of Fort Wayne, Indiana, Mullinix extrudes and thermoforms products using a wide array of materials including PP, APET, CPET, PLA and barrier materials. A dominant player in the solid case-ready meat tray market, Mullinix provides over 200 customers with innovative packaging solutions and advanced technology in barrier packaging and extended shelf life. Mullinix provides a mix of custom and stock products to the

foodservice and food processor markets including hinged containers, deli containers, microwavable/ ovenable trays, drink cups, sleeved cups and trays for the case ready and prepared foods markets. With the addition of Mullinix, Sabert’s annual sales will exceed \$500 million.

“We are very excited to have Mullinix as part of the Sabert organization,” said Albert Salama, Founder and Chief Executive Officer of Sabert. “Mullinix has an experienced and talented team with superior technical capabilities. Their market-leading position with food processors combined with Sabert’s product offerings, global presence and resources will allow the new organization to deliver even greater value to the market.”

“Joining Sabert is a great opportunity for both our customers and our workforce,” said Gene Gentili, the Chief Executive Officer of Mullinix. “Both companies have a long history of developing innovative solutions and quality products to meet the evolving needs of our long-standing customers. We look forward to working with the Sabert team to build a powerful packaging company on the strengths of the combined organizations.”

Mesirow Financial served as Sabert’s exclusive financial advisor and Gibbons P.C. served as Sabert’s legal advisor.

## Packaging Company Rohrer Buying CardPak

by Jim Johnson, *Plastics News*

JULY 19, 2016 – Rohrer Corp. didn’t have to look far to find an acquisition that expands the packaging company.

The Wadsworth, Ohio-based company is acquiring CardPak Inc. of nearby Solon. Both are in Northeast Ohio, about 40 miles apart.

“The acquisition of CardPak increases Rohrer’s presence as a leader in the packaging industry by adding expanded printing, coating, and thermoforming capabilities,” Rohrer said in a statement.

CardPak was owned by Rick and Lisa Thomas and brings locations in Solon and Aurora, Ohio, to Rohrer. Those two new sites will adopt the Rohrer name, the company said.

Rohrer calls itself a leader in the blister, skin and



thermoformed packaging markets. The company now has seven manufacturing sites, including existing Rohrer locations in Wadsworth; Buford, Ga.; Huntley, Ill.; Lewistown, Pa.; and Mesa, Ariz.

CardPak was founded in 1965 and celebrated its 50th anniversary late last year. Rick and Lisa Thomas took ownership of the company from founder Paul Baisch in 1997, according to the company's website. The company's first thermoformer was installed in 2014.

## Placon Buys Brookdale Plastics, Adds to its Medical, Retail Packaging

by Gayle S. Putrich, *Plastics News*

JULY 20, 2016 – Packaging thermoformer Placon Corp. has purchased custom packaging manufacturer Brookdale Plastics Inc. for an undisclosed amount, the companies announced July 20.

Brookdale's focus on retail and medical markets, and its location — close to the booming biomedical businesses of Minneapolis — make it a logical choice to continuing to grow Placon, which focuses on food, retail, and medical packaging and is best known for pioneering and patenting clamshell packaging in the 1960s.

"The acquisition will advance Placon's leadership position in both the medical and retail industries," said Dan Mohs, Placon chairman and CEO. "By combining Brookdale's cost-effective tooling solutions with Placon's world-class matched metal, high-precision tooling, we will become the first supplier of choice for custom packaging solutions in the industry."

Brookdale is a privately held custom thermoformer founded in 1963. Brookdale's 74,000-square-foot facility in Plymouth, Minn., west of Minneapolis, houses 3-D printers, an in-house tooling department and a Class 100,000 clean room, employing 78.

Placon is 17th in the most recent Plastics News rankings of North American thermoformers, with \$135 million in annual sales. The company is headquartered in Madison, Wis., and has facilities in Springfield, Mass., focused on injection molding and Elkhart, Ind., for medical work. It has about

500 employees.

In June, Placon secured a patent for a tamper-evident clamshell that prevents packaging from being reused with counterfeit retail goods. Already in use by the company, the clear plastic clamshell has a snap feature on the inside of the lid, holding a graphic card in place. When opened, perforations are broken and the card is locked in place and it is obvious to the consumer that the package has been previously opened. |

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## The Skills Gap: A National Issue that Requires a Regional Focus

### Supply-and-Demand Analysis of Middle-Skill Occupations for the 100 Largest Metros

**Editor's Note:** *Economic Modeling Specialists International (EMSI) is an advisory firm specializing in economic development and the student-to-employment journey. The company uses a combination of data and local market information to provide insights for employers and workforce development professionals. This whitepaper was published in cooperation with JP Morgan to provide a picture of the potential skills gaps with a supply-and-demand outlook for the 100 most populous US metro regions. More information is available at [www.economicmodeling.com](http://www.economicmodeling.com).*

#### Introduction

The skills gap has been a constant source of conversation and debate in the U.S., and for good reason – it's a national issue, with implications for employers, educators, and the competitive standing of the country itself. The U.S. economy, however, is complex and consists of hundreds of metropolitan and rural areas, with different regions facing different workforce challenges. Thus, the most effective approach to overcoming the skills gap is the development of regional strategies grounded in local data and local context about education providers, workers, and the needs of businesses.

To provide a region-oriented picture of potential skill gaps across the U.S., Economic Modeling Specialists International (EMSI) narrowed in on the supply-and-demand outlook for the 100 most populous metros in three sectors: technology and engineering, the skilled trades, and business and finance. For each of these sectors, we focused on middle-wage jobs – those that typically require less than a bachelor's degree or pay between \$13.83 and \$21.13 per hour.<sup>1</sup> These jobs have generally been in decline but still play a vital role in improving many Americans' prospects for upward mobility.

#### Approach and Note on Data

EMSI's analysis illuminates the supply-and-demand picture for the 100 most populous metro areas by comparing 2012 graduates in regional educational programs to EMSI's estimated annual job openings in each metro from 2013 to 2015. Although some workers in these fields, especially those in the skilled trades, rely on on-the-job training

and don't receive formal job training, the number of graduates in programs tied to these occupations serves as an approximation of estimated supply, while annual job openings serves as projected labor market demand. Further, we looked at the age of workers in the skills trades, as well as in health care and transportation – two other in-demand sectors with large shares of mid-skill workers – to get a better grasp on potential shortages in particular metros.

Data on graduates by classified educational programs comes from the National Center for Education Statistics, via its Integrated Postsecondary Educational System (IPEDS), which contains data on all public and most private institutions in the United States. The occupation data used in this report comes from EMSI's 2013.4 dataset for salaried employees. Estimated annual job openings through 2015 are a combination of projected new jobs and turnover.

#### Defining the Skills Gap

What exactly is the skills gap? Simply put, it's the perceived mismatch between the needs of employers for skilled talent and the skills possessed by the available workforce. While more than 11 million Americans are unemployed and millions more are underemployed or have dropped out of the workforce, businesses say they can't find the skilled workers they need.

Some refer to the skills gap as a compensation gap, claiming that employers are unwilling to bump up wages to bring in the talent they need. Others call it a training gap, claiming that employers aren't doing enough on-the-job training, or that educational institutions aren't in tune with employers' needs. Regardless of the name given to this phenomenon, 39% of employers in the U.S. have difficulty filling jobs, according to Manpower's 2013 Talent Shortage Survey.<sup>2</sup> Further, a recent study by CareerBuilder found that an even higher percentage of HR managers (45% of those surveyed) can't find qualified candidates to fill their open positions.

#### Major Findings

##### 1. Three Metros Have Particularly Large Projected Mid-Skill Talent Shortages

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# The Business of Thermoforming

Washington, D.C., Houston, and Dallas have a projected shortfall of close to or more than 5,000 middle-skill workers in technology and engineering, the skilled trades, and business and finance over the next two years. After these three metros, Boston, Chicago, New York City, and Seattle are poised to face the next-largest deficits of these critical middle-skill workers. All have an estimated gap of at least 2,000 workers per year.

The projected shortfall is most pronounced in D.C., where estimated job openings outnumber graduates in these fields by 6,404. Nearly two-thirds of the projected gap is in business and finance occupations. It's important to note that a sizeable portion of Washington D.C.'s potential workforce is trained outside of the District of Columbia. However, the figures in this analysis correspond to the expansive D.C. metro, which includes Alexandria and Arlington in Virginia, as well as parts of Maryland and West Virginia.

In Houston, the gap of mid-skill workers is projected to be 5,135 each year – mostly in the skilled trades and business and finance. In Dallas, the projected gap of 4,549 is evenly distributed between all three sectors.

Unemployment in Washington, D.C. (5.4%), Dallas (6%), and Houston (6.1%) is lower than the national rate.<sup>3</sup> Still, more than 170,000 people in D.C. are unemployed, and in even more are out of work in Dallas (189,600) and Houston (205,600), all while 5,000 or more mid-skill jobs are projected to go unfilled each year through 2015 in the

three sectors we've analyzed. The gaps, and their impact on unemployment, are likely to be much larger across all hard-to-fill sectors in each of the metros.

Looking more broadly, 20 metros have projected mid-skill worker shortages of at least 1,000 annually through 2015. This includes smaller metros (e.g., Salt Lake City and Austin), as well as metros that struggled through the recession (e.g., Detroit and Tampa-St. Petersburg).

## 2. Regional Industry Drivers Help Indicate Potential Shortages

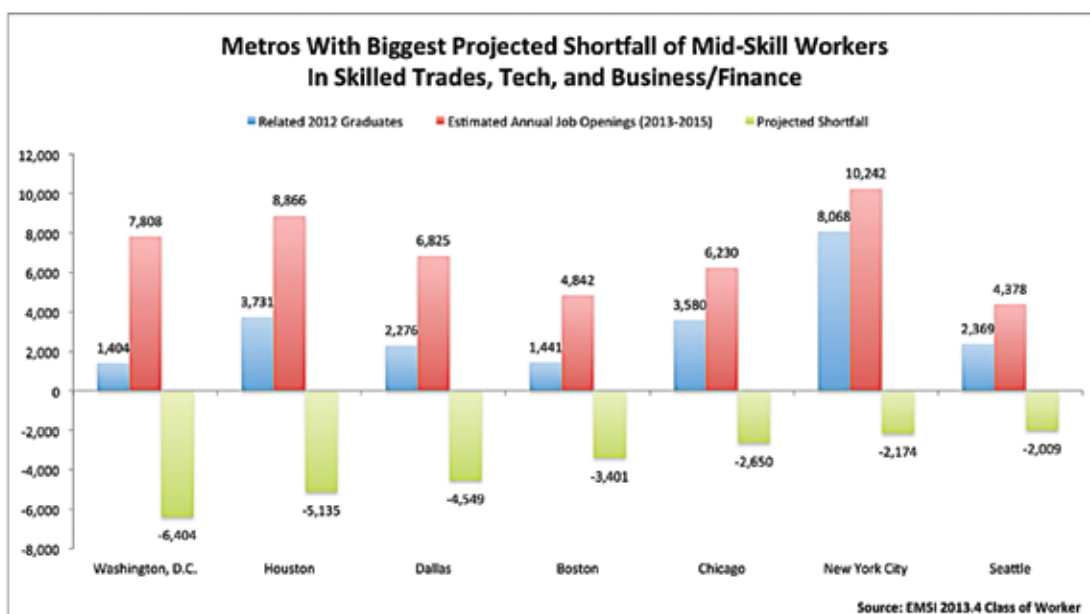
Skill gaps might be hard to diagnose at the national level, but look closely at particular regions and examine the industries that they specialize in, and talent shortages begin to emerge.

The San Francisco economy, for example, is driven by technology and professional services. Sure enough, the most acute projected labor shortage among the occupations groups analyzed for the San Francisco metro are in mid-level technology and engineering technician occupations, where demand is expected to outstrip supply by nearly 1,000. Skilled trades workers, meanwhile, are not expected to be nearly in such high demand in San Francisco, but more of them are projected to be needed in manufacturing-oriented Chicago and energy-driven Oklahoma City.

## 3. The Aging Workforce is Exacerbating the Issue

If the skills gap has yet to be felt in some regions, it could

just be a matter of time – especially in a number of key sectors (such as skilled trades, health care, and transportation) that rely on an increasingly aging middle-skill workforce. The issue is twofold: a large number of older workers in middle-class jobs are nearing retirement, and many high school graduates are not pursuing the vocational or two-year training needed to enter many of these mid-skill fields.



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# The Business of Thermoforming

There are many examples of metros where the effects of an aging workforce are already or will soon be felt:

- In Seattle, New York City, and Cleveland, more than 60% of all machinists – an in-demand skilled trades occupation – are at least 45 years old. Meanwhile in Chicago, nearly a third (29%) of machinists are 55 and older. As these workers begin to leave the workforce and a disproportionately small number of students or displaced workers train to become machinists, the manufacturing firms that rely on these workers could struggle to find talent.

- In Houston, 51% of tractor-trailer truck drivers are 45 or older, while 45% of skilled trades workers are 45-plus. Employers in Houston will be hard-pressed to replace retiring skilled trades workers, given the small pipeline of new entrants into the workforce in these occupations and the perception among students that they're not stable, well-paying careers.

- In the Washington, D.C. metro, 15% of mid-skill health care workers are 55 or older, and another 22% are 45 to 54. That's a large segment of an in-demand group of workers who are on the verge of retirement.

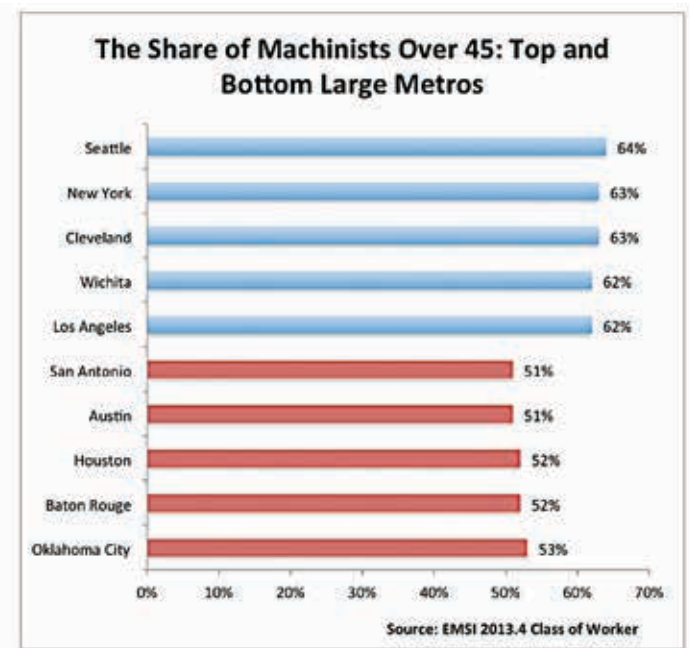
- In Boston, 20% of skilled trade workers are 55-plus, and another 30% are 45 to 54. Among tractor-trailer truck drivers, more than half (52%) are 45 and older.

## 4. Not Every Metro is Facing a Deficit of Mid-Skill Workers

EMSI's metro-by-metro analysis identified large cities that will soon be hurting for new mid-skill workers. But we found a number of metros on the other side of the ledger; cities with a projected surplus of workers in the skilled trades, technology and engineering, and business and finance.

Two metros among the 100 largest have a projected oversupply of at least 500 potential new workers per year – Tulsa, Okla. (632 more graduates than openings) and Baton Rouge, La. (524). Both metros are large-scale producers of certificate holders in the skilled trades, specifically in welding. Note that a portion of these grads will move elsewhere for jobs, specifically since there are much bigger skilled trade labor markets than Tulsa's or Baton Rouge's.

Beyond Tulsa and Baton Rouge, five metros have a surplus of at least 200 graduates across the three sectors: McAllen-Edinburg-Mission, Texas (384); Los Angeles (349); Dayton,



Ohio (328); Toledo, Ohio (314); and Jacksonville, Fla. (211). We excluded the Phoenix metro from this list because the presence of the University of Phoenix skews the regional graduate total, specifically for programs (e.g. computer programming) in which a large number of online degrees are awarded nationally but are counted in Phoenix.

Some metros, meanwhile, have a projected excess of graduates in one or two of the sectors analyzed, but under-supplies in others. St. Louis, for instance, produced more than 1,100 skilled-trade graduates in 2012, while EMSI estimates just 727 new graduates will be needed each year through 2015. But St. Louis is expected to have a significant shortage of mid-level business and finance graduates (604 more openings than graduates) and a slightly smaller projected gap of technology and engineering graduates (202).

Conversely, in Rochester, N.Y., educational institutions produced twice as many mid-level tech and engineering graduates as the projected need indicates for the next two years. But in the skilled trades (particularly machinists and electricians), Rochester faces a substantial under-supply of new workers entering the job market.

## The Consequences of the Skills Gap on Regional Economies

As we've shown, focusing in on local data reveals clear shortages of mid-skill workers in Houston, Dallas, Washington D.C., et al. The important question raised

by this is the impact on affected metro economics. What are the economic consequences of the skill gaps in these regions? And how does filling a skills gap affect the overall level of income in their area?

The most obvious effect of a local skills gap is that local industries can't perform at their full potential. And when key industries aren't operating at peak potential, the regional economy suffers, both because of the loss of sales revenues and because of the reduction in local supply-chain purchases.

From a microeconomic perspective, the impact of a skills shortage depends on the degree to which the gap reflects an efficiency constraint (i.e., employers are operating in a less than optimally efficient manner because they can't find necessary talent) or an output constraint (i.e., opportunity exists for a firm to expand output and perhaps market share, if it were not for a shortage of key workers). Either way, a skills gap has consequences for employers, local industries, and the region itself.

To illustrate the effects of a local skills gap, let's examine the outlook for machinists – a growing mid-skill occupation – in Houston. Although the number of machinists has declined 4% nationally since 2007, the machinist workforce in Houston has grown 21% over that time. From 2013 to 2015, Houston is expected to have 745 annual job openings for machinists based on growth and turnover, while Houston-area educational institutions produced just 62 machinist graduates in 2012 – a gap of 683 workers if educational output and labor market demand hold. In addition, more than half of the 14,500 machinists in Houston are at least 45 years old, and nearly 25% are 55 and over.

What would be the economic impact of filling the projected shortfall of machinists in Houston? Here are a few estimates:

- The average machinist salary in Houston is \$41,000 per year, while experienced machinists make over \$60,000. Unskilled workers in Houston make perhaps \$20,000 per year, so filling the skill gap by training one new machinist increases regional income by at least \$21,000 (\$41,000 - \$20,000). We say "at least" because there will be some occupational movement among unskilled workers (e.g., when a waiter takes a machinist job, it creates another waiter opening).

- Close to 45% of machinists in Houston work in two industries – machine shops and oil and gas field machinery and equipment manufacturing. The jobs multiplier for these two industries is 2.34 and 3, respectively, meaning that at a minimum each job added in these industries leads to the addition of 1.34 to 2 jobs in other industries in Houston. We say "at a minimum" because filling the machinist gap provides new revenues at least equal to the machinists' salaries and the added input purchases that result. But the effect could be higher. If it permits a general expansion of output, then machinist-employing firms expand output generally, and the added multiplier effects apply not only to newly hired machinists but to all the newly hired employees.

### **Examples of Regional Strategies to Combat Skills Gap**

With its shortage of skilled trades workers, Rochester, N.Y., serves as a good example of a city whose leaders have worked to address a specific, local skills gap in a meaningful way. Hit hard by layoffs at Kodak, Xerox, and Bausch & Lomb, the Rochester area has lost much of its once-large manufacturing base. But dozens of smaller manufacturers have surfaced in recent years, many of which have trouble filling open machinist positions. Monore Community College in Rochester, after conducting two comprehensive surveys of local businesses and looking at local data, identified the particular gap and developed an accelerated machining certificate program to produce as many as 15 additional entry-level machinist graduates every six months.<sup>4</sup>

Other examples of regional strategies to combat skills gaps are plentiful:

- **Siemens** has established successful apprenticeship programs throughout the U.S. to develop a qualified workforce where the German-based company is located. In Charlotte, Siemens partnered with local colleges and universities, including Central Piedmont Community College, to help staff a new gas turbine plant. "This is really helping to fill the skill gap that we've seen," Eric Spiegel, president and CEO of Siemens USA, told Bloomberg Television.<sup>5</sup>
- **Southwire Company** developed a cooperative education program called 12 for Life in Carrollton, Ga., where it is headquartered. The program works to equip high school students with manufacturing skills, give them real-world job experience, and reverse the local high school dropout

# The Business of Thermoforming

trend. Since the program started in 2007, 635 students have earned high school diplomas as a result of its efforts.<sup>6</sup>

## Conclusion

EMSI's analysis shows that middle-skill gaps do indeed exist, and it's vitally important to understand them at the local level. With 1,100 classified industries spread across more than 300 metro areas, the U.S. economy is too diverse and unwieldy to fully assess skill gaps for the entire country. But particular sectors (e.g., the skilled trades in Houston and Dallas, technology and engineering in San Francisco, business and finance in Miami) have significant shortages of middle-skill graduates to meet estimated demand. This trend in some sectors, especially the skilled trades, transportation, and health care, will likely worsen because of a rapidly aging workforce.

Regions that are confronted with significant skill shortages face potentially damaging effects to their economies if they can't close the gaps. Employers that are unable to fill key positions aren't as efficient as they would be otherwise, and their output suffers. This means the industries they're associated with aren't operating at full potential, and the regions they're located in are losing out on additional local

income and the benefits to other industries that result from the spike in hiring.

## References

1. The middle-wage range was derived from the National Employment Law Project. Some selected occupations pay above this range but typically require an associate's degree, while others typically require a bachelor's but pay in the middle-wage range.
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## Developing Your Workforce with Interns

By Sarah Metzger, Marketing Coordinator, PMC/Rowmark

**Editor's Note:** *Workforce development is a major strategic topic for the Thermoforming Division. We strive to deliver quality information, case studies, articles and industry data about how companies are managing their personnel development, including hiring and skills training. This article discusses one approach taken by Plastics Material Concepts (PMC) in Findlay, OH. We invite readers to submit their own experiences.*

Developing a workforce is a critical component of growing and nurturing a business. PMC has found great success in this area through the hiring of interns. Identifying next-generation employees, whether permanent or temporary, cost effectively and without long-term risk, is a major benefit. Hiring interns is a great way to discover passionate and enthusiastic talent for immediate needs but, more importantly, to evaluate for a long-term fit.

The students who make up the potential intern pool are using this short-term employment opportunity to gain experience, meet school requirements, generate income, and even test drive a specific company to see if there is a good match. If you decide to hire, it can be a win-win for both the company and the student. There are many ways in which interns can contribute to the development and success of your company. Here are a few reasons to consider interns in your future recruitment plans:

■ Interns are highly motivated and eager to prove themselves, especially in a challenging work environment. Interns commit to assigned tasks and work hard at completing them quickly and efficiently. This motivation is usually driven by the intern's hope to land a full-time position with the company so they will work to impress.

■ Interns can bring that extra manpower needed during peak times. If your business is seasonal or growing, interns can help pick up the extra workload to ensure projects, production or market research can be completed on time. Interns are usually available throughout the year so with some planning and foresight, you can arrange for the extra help when you need it the most.

■ Gaining fresh ideas and new perspectives from interns can be priceless. With the ever-changing landscape of technology, business processes and methods, interns

provide access to the latest knowledge and skills learned through their education. They haven't yet been jaded by the "that's how it's always been done" mindset which we all suffer from at some point. Interns can provide an out-of-the-box approach and are keen to contribute even if their education major is not directly aligned with your business. There are many skills that cross over into different areas of business as well as in life. Interns will learn a lot from your company and in many cases your company will learn just as much from them.

■ Interns are low-cost employees. Their salaries are significantly lower than existing employees and generally do not require full benefits which can reduce their cost to you by up to 22%.

Interns are a great low-risk way to recruit successful future employees. Having the ability to train and observe an intern through a manageable trial environment allows you to reduce future recruitment costs and excessive time and money put into their long-term training. There is usually an end date with an internship so if it turns out to not be a fit for them or the company, there is an exit strategy already in place.

By working with local colleges and universities who will be able to communicate the details of the internship to students, the process of finding interns can be relatively simple. Word of mouth is also a valuable tool.

Over the years PMC has hired several interns as full-time employees and it has paid off many times over. We have full-time employees who were once interns in IT, graphic design and accounting. In fact, Christy Kisseberth, an accounting intern from 14 years ago, is now the Director of Accounting and has held numerous positions at PMC along the way.

Currently, PMC is benefiting from the work of two interns, Patrick Shaw and Grant Hildreth. Patrick is an electro-mechanical engineering intern and will receive a degree in mechanical engineering technology when he graduates. Grant is studying chemical engineering while interning as a PMC quality engineer.

Interns should be treated similarly to any new hire and should go through an interview process in the initial stages.

Interns prepare for interviews through role-playing, but they appreciate the opportunity to practice these skills in practical settings. At the completion of the internship, if all expectations have been met, the company should provide an official recommendation for the intern and contact information for future employers who may consider their application. This is valuable to someone entering a competitive job market.

Do NOT let them slip by with mediocre work. Expect more than you think you should and push them to ask questions and learn. The more you expand and improve their skill set during this time, the more independent and productive they will be in the future. If you find areas of weakness and opportunity, let them know so they can grow.

If your company isn't currently reaping the benefits that come with hiring interns, consider giving it a try. Though you may not see an immediate impact due to the learning curve, the long-term benefits are extensive. When a successful match between a company and an intern is established, the development to the company workforce begins. |

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If you or someone you know is working towards a career in the plastic industry, let the SPE Thermoforming Division help support those education goals.

Here is a partial list of schools and colleges whose students have benefited from the Thermoforming Division Scholarship Program:

- UMASS Lowell
- San Jose State
- Pittsburg State
- Penn State Erie
- University of Wisconsin
- Michigan State
- Ferris State
- Madison Technical College
- Clemson University
- Illinois State
- Penn College



# 2016 Student Scholarships



## **Thermoforming Division Memorial Scholarship Winner**

Vincent Chee, from Queens, NY, is currently a senior at Rutgers University. He is planning to graduate in December 2016 with a bachelor's degree in Applied Sciences Engineering with a concentration in Packaging.

As a packaging engineering co-op at Janssen Pharmaceuticals, a major producer of medicines, Vincent has been supporting new product launches and strategic initiatives through the execution of cold chain solutions and package material evaluation.

In the past, Vincent has collaborated with major suppliers of plastic on a variety of productivity and quality improvement projects. During the summer of 2015, Vincent interned with Mondelez International, one of the world's largest snacks companies. He learned the critical attributes of flexible films that affected a product's shelf life and package integrity.

Vincent is actively looking for opportunities to increase the rate of PET bottle recycling within his school campus. He has completed a thesis on "Reducing Packaging Waste at PepsiCo" and has given a presentation at Rutgers University in 2014. He is a member of the SPE and NIPHLE. Vincent wants to continue his education by earning a Master's Degree in plastics engineering. In the future, he hopes to be part an organization that is focused on sustainable material sourcing. Aside from school, internships, and plastic interests, Vincent enjoys cycling and playing badminton.



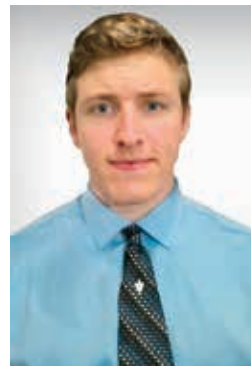
## **Thermoforming Division Memorial Scholarship Winner**

Austin Howard grew up in Alger, MI. Now a sophomore at Kettering University in Flint, MI, Austin is studying Mechanical Engineering. His first experience in the thermoforming industry was at a Vantage Plastics in Standish, MI,

where he interned during his senior year of high school. His primary duty was to assist the engineering design of thermoformed products as well as extruding of raw material.

At Kettering, Austin has continued to work in thermoforming. He is a member of SPE and the leader of Kettering's thermoforming team. The group is working on various projects including the production of an in-house thermoformed part made from recycled material.

Austin is now an intern at Nexteer Automotive in Saginaw, MI. His experience in the plastic industry has helped him tremendously and he looks forward to furthering his education in conjunction with being an active SPE member.



## **Bill Benjamin Memorial Scholarship Winner**

Logan Tate grew up in Williamsport, PA. He is currently an undergraduate Plastics and Polymers Engineering Technologies student at Pennsylvania College of Technology. Although new to the plastics program, he is not a typical undergraduate student.

In 2015, Logan graduated from Lock Haven University of Pennsylvania with a B.S. in Physics.

At Penn College, Logan is the SPE Student Chapter President. He is also employed by the Plastics Innovation & Resource Center (PIRC). Being able to gain valuable experience and knowledge at the PIRC has translated to higher confidence and leadership skills that he applies in classes and labs. He is among a handful of students that has the opportunity to gain an education at an ABET-accredited plastics program, while also working for a globally recognized leader in plastics education and training.

Logan is expected to graduate in December of 2018. In the future, he hopes to combine his degrees and become a leader in the plastics industry. He strives to be at the forefront of innovation and progress. |

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## Thermoforming Technical Problems I Wish I Could Solve: Still Giving Away the Store

By Jim Throne, Dunedin, FL

### Prologue

Welcome back. In the first part of this diptych “we” discussed our largesse when it came to giving our customer far more than he/she needed to meet his/her customers’ needs. We learned that even if we could achieve wall thickness of, say,  $\pm 10\%$ , we would need to give him 20% more material to achieve his requisite mechanical strength. But that was the absolute minimum gift. What about all the extra plastic in non-critical areas?

### So, what is the problem?

First and foremost, unlike injection molders who can squirt plastic into both thin and thick areas with great accuracy, we are stuck with a technique known technically as ‘differential biaxial stretching of a viscoelastic membrane.’ In other words, when we pull on a portion of our sheet with, say, a plug or just vacuum, essentially the entire sheet reacts. The operational word is ‘connectivity’ and it’s our bane, our albatross.

I believe that we could accept this if (and only if) we could guarantee consistency. By that I mean that all aspects of each forming cycle and each incremental step of each forming cycle were identical. Not similar. Identical. Of course, that guarantee is problematic when we consider the myriad of parameters – material properties, sheet thickness, sheet temperature, temperature gradient through the sheet, time-dependent air pressure, air temperature, mold temperature, mold cavity pressure, mold venting rate, plug rate, plug temperature, and on and on.

So, while finite analysis can predict local wall thickness to the nth decimal (over and over and over again), comparison of ideality to reality is a sometime thing. Many have analyzed parametric interactions through design of experiments – Taguchi, Pareto, signal-to-noise ratio, full factorial, half-factorial. And some progress has been made in determining dominant and dependent factors in thermoforming. But let’s face it, folks. Very few of us have the time, money, and/or energy to vet parametrics on each and every product.

So the only thing we can do is give away plastic?

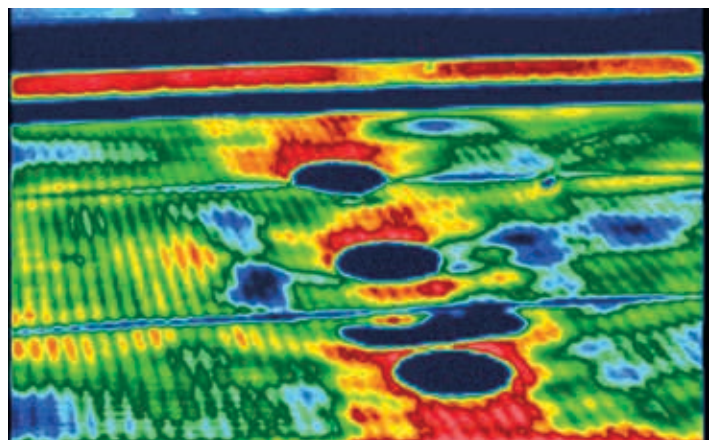
No. There are extensive efforts underway to monitor and perhaps control individual cavity differential sheet stretching. Major projects are underway to match plug design and plug material design to specific product shapes and material characteristics. And thermoformers are making substantial inroads in working with material suppliers on critical properties such as viscosity, molecular weight and molecular weight distributions. And with sheet extruders on final sheet orientation in both machine direction and the more critical cross-machine direction. These factors aid in minimizing wall thickness variation.

### So nothing else is needed, right?

Wrong. It is well-documented that local, instant sheet temperature is a critical parameter in the forming process. Yet many operations simply monitor oven heater temperature. Some monitor sheet temperature using either single-spot or linear sweep infrared devices. While some sheet temperature monitoring is better than none, none of these methods is adequate to determine sheet surface temperature at the instant the sheet is ready for shaping.

### So what needs to be done?

I envision a two-pronged approach. First, we need to measure sheet temperature at the time of forming. At every cycle, not just once in a while. It would seem to me that for thin-gauge forming, a spot IR measurement at the center of each clamped-off sheet on a multicavity tool would be sufficient. For thick-gauge forming, a snapshot of the entire sheet surface is warranted. This could be done with the growing availability of low-cost thermal imaging devices with false color imaging, and data storage capability. Like this:



That's the first prong. The second focuses on the heaters themselves. Of course, we already have zone heating and pattern heating for thick-gauge sheet. But we are setting these zones and patterns in an Edisonian fashion. We need to be able to feed back the local sheet temperature to these devices through thermal imaging. This info is instantaneous and available for immediate implementation. In my opinion, slow response heaters are essentially no response heaters. Sure, it's hard work and expensive but right now 'we're flying blind,' so to speak.

What about thin-gauge? How on earth can we do zone or pattern heating when we're dealing with dozens to hundreds of cavities? We need to rethink the heater configuration. Consider our standard cup product. Instead of this...



Why not use these? Why not position one of these over (and under) each portion of the sheet that will be formed into the cup? Let's call it 'spot heating'. In fact, we can now heat only that part of the sheet that is to be formed into products. After all, grandma didn't bake the whole sheet before she cut out the pfeffernusse, did she? Better yet, why not build these 'bulb' heaters in a way that allows temperature-controlled differential stretching as the plug moves into the sheet? Let's make the sheet hotter at the

bottom of the cup and just below the rim, say, where we are now giving away plastic.



**What will 'we' gain by all this added expense?**

Let's say we can improve just wall thickness uniformity to +/- 5%. So instead of giving away 20% more plastic than required, we only give away 10% more. Sure it's gonna cost \$\$\$ to do this, but here's what we get in return. Let's say, our 10g drink cup now weighs 9.2g. We can down-gauge the sheet. Our material costs are lower. Our heating times (a function of sheet thickness) and overall cycle times are shorter. Our shipping costs are differentially less, and because the customer pays the same amount for the item that still meets his stiffness requirement, our profit is greater.

In short, I think we need to be more intelligent when it comes to thermally preparing the sheet for forming. As I said, we are making great strides elsewhere in the process. Why not focus on improving this portion of the process as well?

Keep in touch. |

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## Twin Screw Extrusion System Developments to Process Bioplastics

By Charlie Martin, Leistritz, Somerville, NJ

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### Introduction

Twin screw extrusion is a preferred manufacturing methodology to compound bioplastics with fillers, additives and fibers. Materials include PLA, PHA, PGLA and TPS which are converted into a variety of products, such as film/sheet for packaging, fibers and foamed parts, as well as medical devices such as sutures and ligament anchors. PLA, which is heat and shear sensitive, as well as torque intensive, is the most prevalent biopolymer processed today.

Twin screw extruders (TSE's) utilize modular barrels and screws. Segmented screws are assembled on splined shafts. TSE motors transmit power into the gearbox/shafts and rotating screws impart shear and energy into the materials being processed. Free volume is an important design parameter for any TSE, and is directly related to the OD/ID ratio, which is defined by dividing the outer diameter (OD) by the inner diameter (ID) of each screw. With a smaller screw shaft, increased free volume is possible, but attainable torque is sacrificed.

Torque is also an important design factor, and typically limited by the cross-sectional area of the screw shaft, the shaft design, metallurgy and manufacturing technique. Deeper screw flights result in more free volume, but with less torque, since a smaller diameter screw shaft is mandated. Based on the use of a symmetrical, hammered splined shaft, a 1.55 OD/ID ratio has been deemed to result in the best balance of torque and volume.

Symmetrical splined shafts, formerly the industry standard, induce both tangential and radial force vectors into the power transmission train. The resultant force is not optimized, as the radial force is not applied in a beneficial direction. An asymmetrical splined shaft design is now available that isolates the tangential force vector and results in higher torque transmission with a smaller diameter shaft. Hence, a 1.66/1 OD/ID ratio with deeper flight depths, higher free volume and increased torque is now perceived as optimum by many. The deeper flights result in a lower average shear rate with increased torque, a combination particularly beneficial for PLA processing.

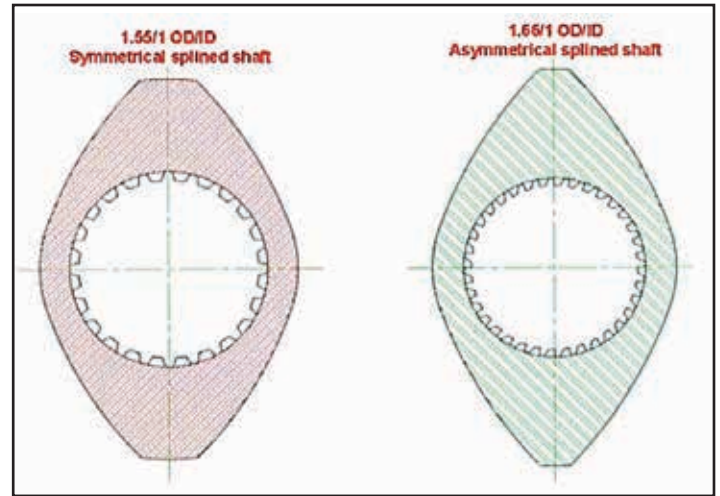


Figure 1: Comparison of 1.55 vs. 1.66 OD/ID TSE shaft/screw geometries

### Tests

Various TSE experiments processing PLA have been performed utilizing TSE's with a 1.66/1 OD/ID ratio, described as follows:

**Test #1- PLA pellet output rate checks:** Neat PLA (NatureWorks™ 2002D) pellets were processed on ZSE-27 HP model (27 mm dia. screws, 4.5 mm flight depth and 1.5 OD/ID) and ZSE-27 MAXX (28.3 mm dia. screws, 5.7 mm flight depth and 1.66 OD/ID). The TSE screws rpm was set at 300, 400, 600 and 1200. At each rpm the rate was increased until a boundary condition was encountered, which ranged from 60 kgs/hr (at 300 rpm) to 170 kgs/hr (at 1200 rpm). All samples were torque limited, not feed limited. The ZSE-27 MAXX yielded approximately 10% higher rates with lower melt temperatures as compared to the ZSE-27 HP model.

At elevated rpms the resultant melt became problematic with both models. It seems that the gentler melting mechanism inherent with the MAXX design consumed less torque and allowed slightly higher throughputs, while the lower average shear rate inherent with a deeper flighted TSE resulted in a lower specific energy and melt temperature.

**Test #2- Direct extrusion of filled PLA sheet:** Testing was





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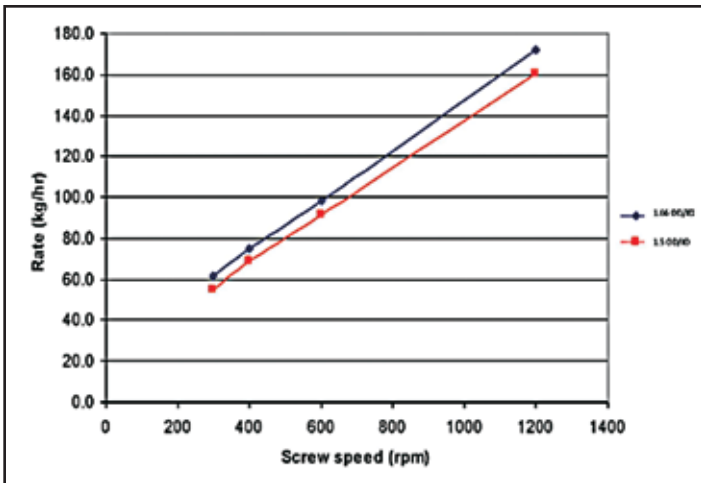


Figure 2: Maximum rate comparisons 1.5 vs 1.66 OD/ID ratios

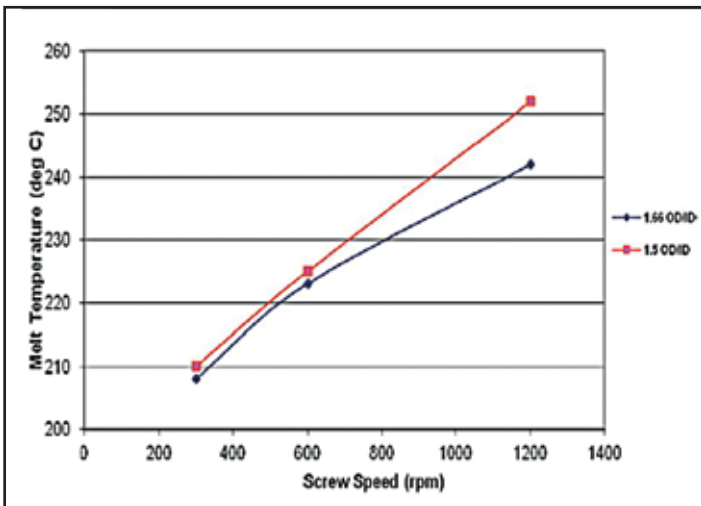


Figure 3: Melt temperature comparisons for same tests

performed to compound PLA (2003D) with 15-25% CaCO<sub>3</sub> (Specialty Minerals EM Force™) to develop a process to convert raw ingredients directly into a sheet, bypassing the pelletization step and avoiding an extra heat/shear history. No additives/dispersive aids were used.

Tests were performed at 40 kgs/hr and 200 screws rpm. Temperature zones ranged between 170 and 180 deg. C. The motor load was 67% and the melt temperature was 182 deg. C. The gear pump inlet pressure was 400 PSI, +/- 80 psi. The following equipment was used: 2 loss-in-weight (LIW) metering feeders; ZSE-27 MAXX (28.3 mm dia. screws) twin screw extruder with 1.66/1 OD/ID ratio and 40 to 1 L/D; side stuffer with 24 mm dia. twin screws;

gear pump (10 cc/rev) front-end attachment; 10 inch wide flexible lip sheet/film die; 3-roll stack with 14 inch wide and 8 inch diameter rolls and torque winding station.

Impact properties as measured by normalized Gardiner Impact MFE for the filled product increased by nearly a factor of 20 as compared to neat PLA. Analysis of the film/sheet samples indicated a well-dispersed product with acceptable surface quality and dimensional stability. Additional scale-up testing seems a worthwhile next step.

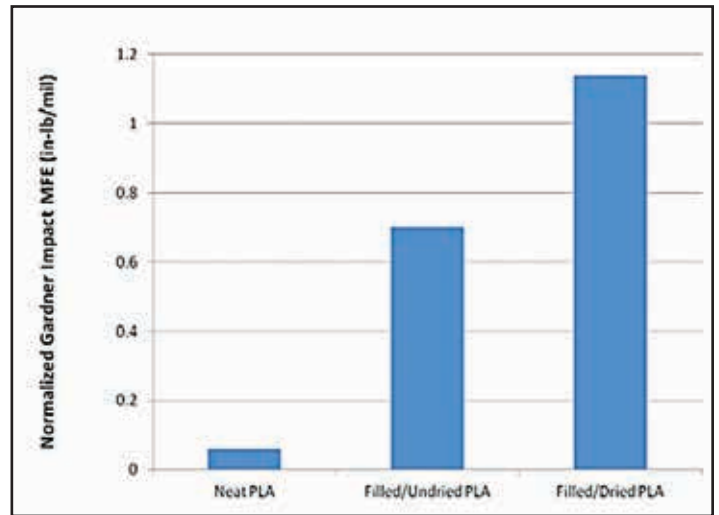


Figure 4: Comparative impact properties for neat and filled PLA

### Test #3- Undried PLA pellet and regrind direct to sheet:

PLA pellets (50%) and edge-trim (50%) were metered into the extruder at a total rate of 180 kgs/hr and processed at 250 screws rpm. The temperature zones for the barrels were between 180 and 190 deg. C. The motor load was approximately 70%. The melt temperature was 180 deg. C. Moisture analyzer testing indicated the PLA pellets had 1600-2000 PPM moisture content, and the regrind materials between 2800 and 4200 PPM.

The following is a summary of the equipment: 2 loss-in-weight (LIW) metering feeders; ZSE-50 MAXX (51.2 mm dia. screws), 1.66/1 OD/ID ratio, 40 to 1 L/D with a screw/barrel design to optimize venting efficiencies; gear pump (92.6 cc/rev) front-end attachment; slide plate screen changer (4½ inch diameter breaker plate) with 150 mesh screens; 30 inch wide flexible lip sheet die; 3-roll stack with 40 inch wide and 12 inch diameter rolls with pull roll station and torque winder.

Analysis of the sheet samples indicated a molecular weight

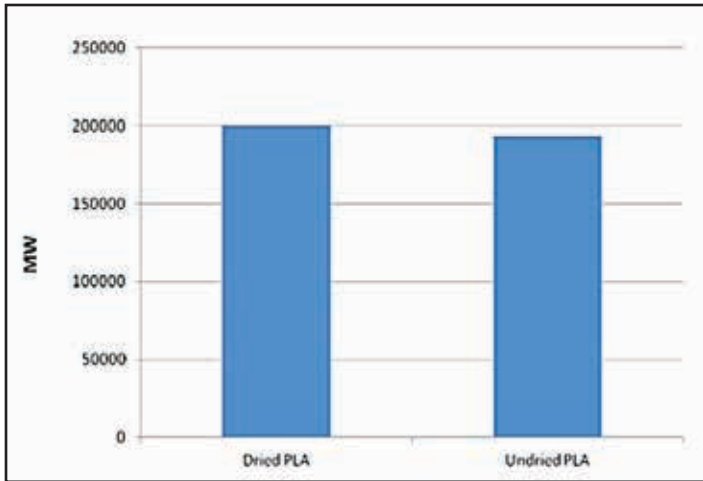


Figure 5: Comparative molecular weight data for dried and undried PLA

loss of between 5 and 8%, deemed successful for this application. The sheet sample was dimensionally stable with an acceptable appearance.

Scale-up: PLA processes are typically heat transfer (and torque) limited, and throughputs do not scale volumetrically. Based upon the results denoted, de-rating screws rpm and assuming heat transfer limitations, scale-up programs indicate attainable rates of approximately 2000 kgs/hr for a TSE with a 1.66 OD/ID ratio and 140 mm diameter screws.

### Summary

The use of PLA, and other bioplastics, continues to increase for a wide variety of products and applications. Interest has never been more intense, as evidenced by the high attendance at NatureWorks™ “Innovation Takes Root” Conferences, and the plethora of bioplastics industry events offered today. As research, understanding

and commercialization occurs, it seems inevitable that bioplastics will be embraced as an alternative to petroleum based plastics. TSE advancements have and are being developed to improve the process-ability of heat and shear sensitive bioplastics. In many cases, the TSE system only needs to be “tweaked” for success.

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## Introducing RM77 "REVOLVER" Thermoformer

**Polytype OMV, Verona, Italy**

The RM77 is a brand new concept: a fully automatic, in-mould trimming thermoforming machine designed to produce heavy or light plastic cup and tubs, but with a special "twist."

### **RM stands for Revolving Mold**

The machine's tools are made of three semi-molds, a female and two males, placed on the same vertical axis. The female half operates at full cycle speed (start position to end position and back), while the two male halves complete their cycle every two cycles of the female half. The formed material remains in the cavity for an additional cycle, which improves part quality, while having two cavity sets allows for the increase in production speed. Featuring a single delivery point, OMV integrated a simple stacking and part-handling system into the new machine.



RM77 features both a large forming area and very high cycle speeds. It is designed to reach world-record 174,000 cups per hour when producing  $\text{Ø}71$  mm PP drinking cups. This is the first machine to break the barrier of 50 cycles per minute with PP cups, a major step forward in thermoforming technology.

The machine can process a wide range of materials, such as PS, PP, PLA, PET and multilayer sheet. It is mainly intended for the production of a various range tapered cups and tubs, round and square, but it is excellent for thermoforming of high-precision PP deep objects at very high output.

The forming area of RM77 is  $770 \times 480$  mm, its cutting force is 57 tons. It can fit 57 cavities on a  $\text{Ø}70.6$  mm PP drinking cup, with an effective speed up to 57 strokes/min.

The mould movement is driven through a torque motor. All the other movements (index, cutting, stacking) are



controlled through a set of servomotors driven by an axis control system and a PLC. The system is designed for top performances in terms of speed, precision, safety. The machine is equipped with a quick mould changing system, fast air/water connections and a quick mould exit from the forming/cutting station (less than 6 hours for a complete mould change-over, from stop to restart).

The table below gives RM77's productivity for the most popular PP cup standards.

PP - $\phi$ (mm)	No. of cavities	Speed (Strokes/min)	Productivity (cups/hr)
<b>70.6 drinking cup</b>	51	57	174,000
<b>73.0 yoghurt cup</b>	45	33	89,000
<b>95.0 Mc Donald cup</b>	30	24	43,000

### About OMV

OMV Machinery, founded in 1963, is today part of the Swiss group Wifag-Polytype. Located in Verona, Italy, it designs and manufactures thermoforming machines, moulds, extrusion lines and different types of automations.

OMV offers flexible solutions, high quality standards, and high technical concepts. Its cutting edge developments resulted in dozens of international patents. Among these, OMV stands out today for:

- T-IML: Thermoformed In Mould Labelling systems
- Shuttle forming machines
- Joint development of the new PEF bioplastic, in cooperation with Avantium/YXY (NED).

With the addition of OMV to its know-how and competence portfolio, Polytype can offer today complete solutions for thin-wall plastic processing from the raw material to the formed and printed container. |

## From the Editor

If you are an educator, student or advisor in a college or university with a plastics program, we want to hear from you! The SPE Thermoforming Division has a long and rich tradition of working with academic partners. From scholarships and grants to workforce development programs, the division seeks to promote a stronger bond between industry and academia.

**Thermoforming Quarterly** is proud to publish news and stories related to the science and business of thermoforming:

- New materials development
- New applications
- Innovative technologies
- Industry partnerships
- New or expanding laboratory facilities
- Endowments

We are also interested in hearing from our members and colleagues around the world. If your school or institution has an international partner, please invite them to submit relevant content. We publish press releases, student essays, photos and technical papers. If you would like to arrange an interview, please contact Conor Carlin, Editor, at [cpcarlin@gmail.com](mailto:cpcarlin@gmail.com) or 617-771-3321.

## Rim Rolling in Thermoforming

### **Dexter Mould Technology, Doetinchem, The Netherlands**

Rim rolling of thermoformed cups is usually performed in a secondary operation with equipment that is physically located behind the forming and cutting of the cups. To eliminate this secondary stage, dexter Mould Technology has developed a new thermoforming principle to perform the rim rolling action inside the forming mold during the forming cycle. This allows processors to produce rim-rolled cups inside the forming/cutting station of a tilt-mold machine. Each product that is ejected from the cavity is finished and can be stacked and packed. The invention is patented and named as RRIM® - 'Rim-Rolling-In-Mold'. Due to the nature of the RRIM process, almost any shape (square, oval, triangular) can be produced in addition to standard round products.

Dexter MT has developed RRIM to offer the thermoforming industry a solution to handle cups with different sheet thicknesses to get one calibrated outer dimension, leading to universal lid fitting and more flexibility in production. In addition to some pneumatic control signals, the mold contains all necessary movements for internal rim rolling and therefore will work on any tilt-bed thermoforming machine. Because the secondary stage can be eliminated, this new approach offers great advantages in downstream packaging processes, as well as a reduction in floor space.

Dexter MT continues to develop RRIM with several molds in production. The development of a 2nd generation is on its way and will be presented at K2016 in Düsseldorf, Germany. The current focus is on widening the operational window for rim rolling and allowing for faster movements in the molds, leading to virtually no reduction in cycle time. The 1st generation RRIM lead to approximately 3-5% cycle speed reduction compared to the forming process without RRIM. For comparison, secondary stage rim rolling can reduce output by 5-10%.

RRIM works for all common thermoforming materials such as PP, PET, PLA and PS and does not deform the cup itself. Because the rim rolling is done during the forming cycle, the forming and rim rolling processes are separate and they do not affect one another. The shape of the rim itself can be varied depending on the desired end result.

For the North American market, dexter MT has created a strategic relationship with Angle Tool Works of Burr Ridge, Chicago.

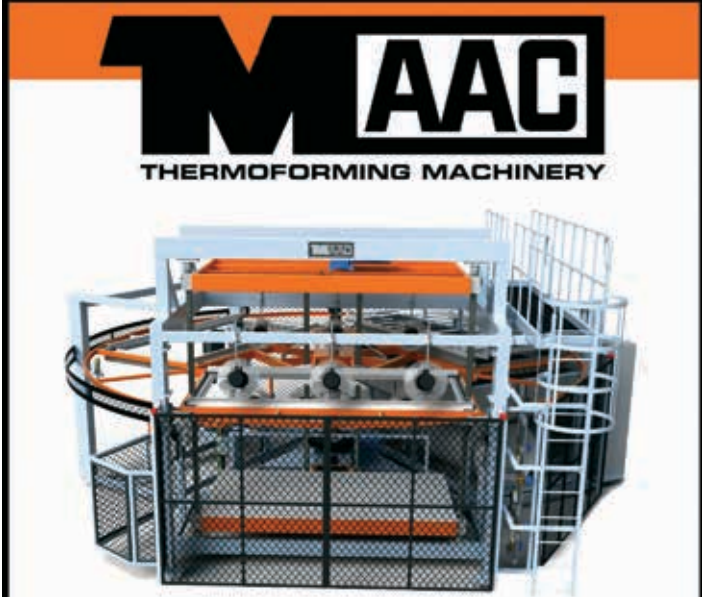
*Dexter MT will exhibit RRIM technology at K2016, Hall 3, F69 from October 19-26. For more information, contact Pieter-Jan Willemse at +31 314 37 26 70 or [pj.willemse@dextermt.nl](mailto:pj.willemse@dextermt.nl) |*



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## 2016 SPE Thermoformer of the Year

**Ian Strachan, ToolVu**

Ian Strachan entered the thermoforming industry when he became General Manager of the Elvinco Group of Companies in 1971, where he was involved with the development of new technologies in thermoforming, injection molding, blow molding and extrusion. Prior to his appointment, he worked in specialty high-tech metal production and with the South African Mint to upgrade and implement its production management and control systems.

From 1974 to 1988, Strachan served as Managing Director for Nampak Mono Containers, a thermoforming and steam chest molding company. Nampak was the largest diversified packaging group in the world at the time. Strachan went on to manage several subsidiary companies that specialized in thermoforming and extrusion, where he developed several new packaging processes that are still being sold in those markets to this day. With the support of an old friend, Frank Nissel, Mono Containers developed multi-layer "hi-tech" barrier packaging in the first applications outside of the US. Strachan was also the first to introduce CPET packaging outside of the US, with the

blessing of a previous Thermoformer of the Year, George Lueken, who invented the process.

Strachan also developed thermoformed in mold labeling (T-IML) and several other products for Unilever in the mid-1980s, which later won the Unilever International Award for most innovative packaging technology in thermoforming.

From 1988 to 1992, Strachan served as CEO and Deputy Chairman of the Sun Packaging Group, one of the largest packaging firms in South Africa. An international company with operations in Japan and the US, these companies led the way in the development of biopolymers and processes that are still used in these industries.

Strachan later formed MGA Southern Africa Pty. Ltd. and MGA Inc., an international consulting firm specializing in technology and process improvement in the packaging and thermoforming industries. More recently, he acquired ToolVu, LLC, which offers a game-changing process management system that monitors what is happening in a thermoforming mold in real-time. |



# SPE Thermoforming Division Approves Three Emeritus Directors

The Society of Plastics Engineers (SPE) Thermoforming Division has named three new Emeritus Directors of the Board.

Emeritus membership of the Thermoforming Division Board of Directors is a lifetime appointment conferred on individuals who have actively served on the Board in the past and supported the thermoforming industry. The new honorees, who bring the total number of Emeritus Directors to eight, are:



■ **Lola Carere.** A member of SPE since 1987, Ms. Carere has served on the Thermoforming Division Board of Directors since 1994 and had over twenty-five years of experience in the cut sheet custom thermoforming industry before retiring in 2013. She

has served SPE as Secretary, Treasurer, Program Chair, President-Elect and President of the Southern Section. In 1988, she was assistant to the ANTEC General Chair. On the Thermoforming Division Board of Directors Ms. Carere has served as Membership Chair, Sponsor Chair for the 1994 and 1995 SPE Thermoforming Conferences, Chair of the 1997 Conference, Chair-elect, Chair, and Prior Chair of the Board of Directors. She also served as Co-Chair of the 2012 SPE Thermoforming Conference held in Grand Rapids, MI. In 2005, she was awarded SPE's Lifetime Achievement Award.



■ **Richard (Rich) Freeman.** A member of the SPE Thermoforming Division Board of Directors since 1991, Mr. Freeman has worked in the thermoforming industry for over 40 years, the last 36 at Freetech Plastics (Fremont, CA), where he is CEO. In 2013 SPE named him Thermoformer

of the Year. He contributed to the development of the SPE Thermoforming Conference as a technical program organizer and presenter in the U.S. and Europe, originated

the Division website, and created the Division's Machinery Grant program, which has placed equipment in over 25 schools. The machines have been used to produce thousands of student designed parts, many of which have gone on to win national awards. Mr. Freeman started and continues to sponsor the Industrial Designers Society of America (IDSA) Student Thermoformed Parts Competition. An IDSA member since 1999, he organized three SPE Thermoforming Division exhibits at IDSA conferences.



■ **Roger Kipp.** A member of the Board of Directors of the SPE Thermoforming Division since 1992, Mr. Kipp was vice president of McClarin Plastics for 18 years prior to his retirement in 2013, and he is now an industry consultant. He has served

the Division as conference chairman, conference treasurer, division treasurer and division chairman. He has also been a member of the SPE Finance Committee and Foundation Board. SPE honored Mr. Kipp with the 2002 Outstanding Achievement Award, a Lifetime Achievement Award in 2003, the Honored Service Member Award in 2008, and the Thermoformer of the Year Award in 2010.

"These new Emeritus Directors have long served on the SPE Thermoforming Division Board and made significant contributions to the Division's success," said Bret Joslyn, Division Chair. "Ms. Carere was one of the Division's first female board members and played leadership roles in our conferences. Mr. Freeman had extensive involvement in the development of the division's machinery grant program and continues to work closely with many student organizations. Mr. Kipp served as the division's councilor for many years and remains active in SPE as the Chair of the SPE Foundation."

A list of Emeritus Directors may be found on the SPE Thermoforming Division website at [thermoformingdivision.com/awards-recognitions/emeritus-director/](http://thermoformingdivision.com/awards-recognitions/emeritus-director/). |

## Thermoformers Win Big at the Plastics for Life Global Parts Competition at ANTEC 2016

During the ANTEC® 2016 Conference this past May, the Society of Plastics Engineers (SPE) honored plastic products that meet the ultimate test of value by in some way making our lives better.

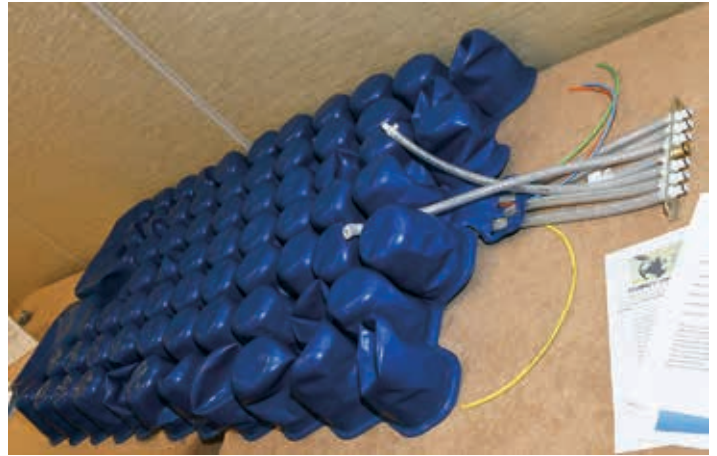
The annual ANTEC is SPE's largest event and the world's leading plastics technical conference. A panel of judges selected the winners of the 3rd annual Plastics for Life™ Global Parts Competition from among a wide range of parts that had already won in competitions at previous SPE events during the past year. In addition, a People's Choice award was presented to the part that received the greatest number of votes from ANTEC attendees.

The award categories and winners are:

**Grand Prize: Plastitel Inc.** – vacuum thermoformed TPU pods serving as the support surface of the IsoLibrium patient bed from Stryker Corp. The pods are the main support surface of the IsoLibrium bed, facilitating patient mobility and ensuring regular movement. This aids in the function of vital organs, reduce bed sores, and improve circulation. Two major challenges were ensuring a minimum thickness on every individual pod and accurately measuring them.

**Sustaining Life: Delphi Automotive PLC** – an overmolded polyamide heated tip fuel injector for Honda Motor Company. An electrical heater within the injector is energized by the vehicle controller, rapidly heating the ethanol fuel and thereby dramatically improving vaporization and reducing emissions. By making possible reduced fueling during engine warm-up, these injectors also offer reduced emissions on ethanol and gasoline applications. Total hydrocarbon and carbon monoxide emissions were reduced by 40% - 70%.

**Protecting Life: Promogroup** – plastic/metal hybrid floor rocker reinforcement for the 2015 Fiat Chrysler Jeep Renegade. This honeycomb reinforcement was designed for high-energy, high-speed side impact crashes. The use of this solution reduces the component weight by 45% versus the steel solution, or 1 kg/vehicle, with the added benefit of a 10% cost reduction. This new technology



*Grand Prize: patient bed thermoformed by Les Produits Pastitel.*

sets a precedent for similar applications across the body structure, including 30-40% mass reduction from each reinforcement, performance comparable to high strength steel, and ease of assembly.

**Quality of Life: Sonoco Plastics** – 39 ml blow molded VariBlend dual dispensing bottle. The VariBlend dispenser sits atop a two-compartment bottle. A new design locks securely to ensure the package will travel without leaking and the product will maintain its integrity. Consumers can select different formula strengths by turning the dial on the dispenser, satisfying their demand for product personalization and freshness. Six positions exist, or brand owners can set fixed ratios. Keeping products separate until time of use keeps them fresher for longer. Designed for products that come in multiple strengths, require ingredient segregation, offer shade/ color selection, or need mixing and blending. Submitted by toolmaker FGH Systems.

**Improving Life: Productive Plastics Inc.** – nine pressure formed parts for covers for an MRI medical scanning device. Utilizing cast and machined molds to ensure no shrink tolerance and CNC linear tolerances for molded in dimensions. All parts utilized pushers to pre-stretch materials. Use of Sekisui's Kydex T sheet made it possible maintain the required wall thickness and consistency over multiple runs. The parts include undercuts and are formed in mating parts to better line up for fit. The assembly allows for the parts to fit a separate metal frame that is assembled at the staging location. This custom hardware reduced the amount of tools required to install and service, and reduced the total time required for installation and service.

**People's Choice: SureCan Inc.** – blow molded gasoline can. The 2.2 and 5.0 gallon can makes it possible to direct how and where fuel is dispensed, with a rotating nozzle, thumb trigger, and hand support grips at the bottom. The thumb safety trigger securely seals the vent on top of the can. The thumb button assembly is made up of two main parts, the thumb button itself and the safety trigger. The vent does not open or release any air unless the safety trigger is pulled straight back and then depressed with the main thumb button. On average the SureCan releases fuel at a rate of about 2 gallons per minute. |



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*Improving Life Award: pressure formed parts for MRI cover by Productive Plastics.*

## 2016 SPE Thermoforming Quarterly Author Membership Program

The SPE Thermoforming Division invites prospective authors to contribute articles to its award-winning publication, *SPE Thermoforming Quarterly*. As part of our mission to facilitate the advancement of thermoforming, we seek to widen our audience and increase our knowledge base.

**The Division is offering a one-time, complimentary SPE professional membership to prospective authors who are not currently members of the Society of Plastics Engineers and who have not previously written for *Thermoforming Quarterly*.**

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The magazine offers several major categories of articles:

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## The Recycling of Thermoforms: An Important Challenge for the PET Value Chain

*This is an interim report from the Petcore Europe Thermoforms Working Group. The work is ongoing and new findings and information will be reported on again. For any queries on the matter, please contact Eva Schneider, Petcore Europe Communications Officer, [eva.schneider@petcore-europe.org](mailto:eva.schneider@petcore-europe.org).*

The demand for PET and other polymers in fresh food rigid packaging is growing fast. Mono-layer trays for e.g. packing fresh fruits and vegetables, and multi-layer sealed trays with lids as seen for fresh meat or food preparations are providing the best packaging assets for the packing, distribution, shelf displays, consumer handling and food conservation at home. But what happens to these thermoformed packaging when they have been used and tossed into the bin?

### **PET thermoforms in the context of the European Commission Circular Economy**

"Recycling of PET thermoforms is the final stage for closing the loop of PET recycling, we have to find solutions for increasing the recycling rates, especially in the context of the new Circular Economy Package and its ambitious plastics recycling targets proposals<sup>1</sup>" - this statement comes from Wim Hoenderdaal, co-chairman of the Petcore Europe PET Thermoforms Working Group, during his presentation at the Petcore Europe Conference 2016. This annual event, which took place in February this year, brought together 160 leaders and experts from the complete PET value chain to discuss the current most important topics for the industry, including the question on how the industry can improve recycling of PET thermoforms.

PET Thermoforms provide many assets which make a difference. Petcore Europe is keen to demonstrate that recycling is one. Did you know that PET Thermoforms are already made of 50% recycled PET? And that PET can be recycled again?

### **Petcore Europe Thermoforms Working Group actively working on solutions**

In order to find solutions, Petcore Europe - the European association representing the PET value chain - formed the PET Thermoforms Working Group in June 2015, comprising more than 30 companies and organisations including

key players from industry and waste management. The goal is to maintain and increase the market share of PET thermoforms in the European market by improving the image of PET thermoforms as the best-in-class packaging material in this field through providing sustainable and reliable end of life solutions for PET thermoforms.

More and more PET thermoformed packaging are placed on the market in Europe. Currently, the estimated demand for PET thermoforms is approximately 800.000 tons of PET resin per annum, out of which over 400.000 tons come from post-consumer recycled PET (r-PET). On average, a PET thermoform contains over 50% of r-PET. Based on their growing market share, the PET industry sees the need for an increase in the collection and recycling of these PET thermoforms.

### **Collection and sorting of post-consumer thermoforms need to significantly improve**

The discussion starts with the heterogeneous collection situation in the EU. There is no uniform collection of trays in Europe, some countries collect all kind of plastics while others only collect PET bottles. Important steps are therefore required to improve the sorting of the incoming post-consumer packaging, for example to sort PET multilayer from monolayer trays - as PRE (Plastics Recyclers Europe) recommends - and to separate PET trays from PET bottles. The final quality of the recycled material is critical and determines in which applications it can be used: in food contact packaging, in agriculture or other markets such as strapping, polyester fibres or injection moulding applications.

### **Concrete trials are underway in several European countries**

Ongoing trials in France and Belgium are investigating what quality and percentage of PET thermoforms can be included in the PET bales without affecting the quality of the r-PET.

Valorplast and Plarebel are organising such pilot scale tests in the collection and are working closely with the sorting centres to ensure the quality and composition of the bales. Sorting technologies are now allowing to take out "multilayer trays" from the "mixed PET bottle and tray

stream". Thus, a stream of "PET mono-material" including bottles and thermoforms is already achieved. Further tests have to demonstrate if severe recycling conditions, high friction and high temperatures in combination with a high percentage of trays (>10%) can lead to loss of yield. When PET trays become brittle, the percentage of fines can go up.

A limited stream of bottles is currently supplied to some recyclers in France with a few percentages of PET trays in their bales. It will still take some more time to aggregate all the data and come to a conclusion on the quantity and quality of PET trays that can be included in PET bottle bales.

It is important to note that both studies are carried out with post-consumer material only, some previous work was done on post industrial waste (thermoform scrap), which is considered to be not fully representative.

Besides developing a route for the recycling of mono-material trays in combination with PET bottles, another option is to develop a route for the recycling of all PET thermoforms, mono and multi-material as well as coloured thermoforms. This might make it possible to combine these thermoforms with difficult to recycle bottles such as heavily coloured, opaque and multilayer bottles.

WRAP in the UK has launched a new project with eight companies. The objective is to recycle the complete stream of thermoforms, mono- and multi-material, into new applications. The trial will include washing, pelletizing and solid stating, and the outcome material will be available for testing in new applications.

The Petcore Europe Thermoforms Working Group has also initiated its own project, in which different partners of the supply chain work together on recycling trials. The particular aim is to determine the quality of r-PET that comes from a recycling stream mainly composed of multilayer PET thermoforms.

### Design for recycling is key

The Petcore Europe Thermoforms Working Group is furthermore emphasizing the importance of design for recycling. For instance, PET trays in general have big labels and the label type is not designed for easy removal. One reason and need for using high washing temperatures and high friction is to ensure the complete removal of labels and glues. Several label producers, also members of the Working Group, are currently working on label solutions. It

will be important to inform the whole supply chain to use the right label size and type.

Also the use of absorption pads and the necessity to glue these to the trays is an area for further study. Alternative tray designs have demonstrated that gluing or even using these pads can be avoided. These projects and applications will be further evaluated by the Working Group.

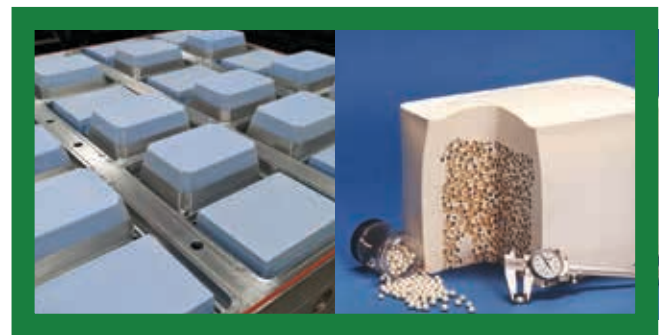
### About Petcore Europe

Petcore Europe is the trade association based in Brussels representing the complete PET value chain in Europe. Our mission is to ensure that the PET industry and its associations are aligned to deliver increased value and sustainable growth of the PET value chain, to ensure that PET is positioned and recognised as an environmentally sustainable packaging material, to represent the interests of the European PET industry to the European institutions and other key stakeholders, to validate and support innovative packaging solutions from a recycling perspective, and to work with all interested parties to ensure the sustainable growth of PET post-consumer collection and recycling.

### References

1. 55% plastic packaging "preparing for re-use and recycling" target for 2025. |

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## In-House Recycling of Polypropylene Films with an Oxygen Scavenger Layer and Their Oxygen Absorption Capacity after Extrusion

### Influence of extrusion temperature and multiple extrusions

by Sven Sangerlaub, Daniel Schlemmer & Norbert Rodler, Fraunhofer Institute for Process Engineering and Packaging IVV

Packaging material producers are constantly faced with ever increasing demands for cost reduction and higher sustainability. To reach these goals they are supported by the service offer and expertise of the Fraunhofer Institute for Process Engineering and Packaging IVV as a "external research department" of companies. This article deals with a study which was conducted for an industrial consortium. Fraunhofer IVV did extrusion trials and made films for the consortium as a service on its pilot lines. The films were tested (DSC, MFF, color values, oxygen absorption) and suitable methods were developed and provided to them. Oxygen scavenger additives, which are blended with polymers, are a commonly established product on the market. The oxygen scavengers protect packaged foods from the reaction with oxygen. An important group are iron based oxygen scavengers. They are a mixture of iron powder and additives, which are dispersed in a polymer matrix. The oxygen scavenger is market available as a masterbatch that is applied as an additive for extrusion. It is often used in combination with polypropylene (PP).

The material is extruded to a separate oxygen scavenger layer within a multilayer film structure. Such films are thermoformed to trays. The production scrap is grinded and reused as blend partner for new film extrusion. Such recycling avoids waste, increases the material efficiency and reduces the environmental impact. Not much was known about how iron based oxygen scavengers influence the recyclability of polypropylene. This question was answered in this study.

### Material and method

We used isotactic polypropylene (RP325M, LyondellBasell, Rotterdam), which was blended with 20 % w/w iron based oxygen scavenger (SHELFPLUS® O2 2710, ALBIS PLASTIC GmbH, Hamburg). The blend was extruded to polymer strands on a co-rotating twin screw extruder (Collin Teach-Line ZK 25T x 24D by Dr. Collin GmbH screw diameter of 25 mm and a L/D of 12). The extruder is shown in Figure 1. The polymer strand was cooled down in water and cut to pellets. The pellets were extruded again. The process was repeated six to nine times. After the last polymer strand extrusion the pellets were extruded to films with a thickness of 70 µm on a cast film extrusion line (screw diameter 30 mm, E30Px30L/D by Dr. Collin GmbH, Ebersberg, Germany), which is shown in Figure 2. The oxygen absorption capacity of the film was analysed.



Figure 1: Co-rotating twin screw extruder at Fraunhofer IVV

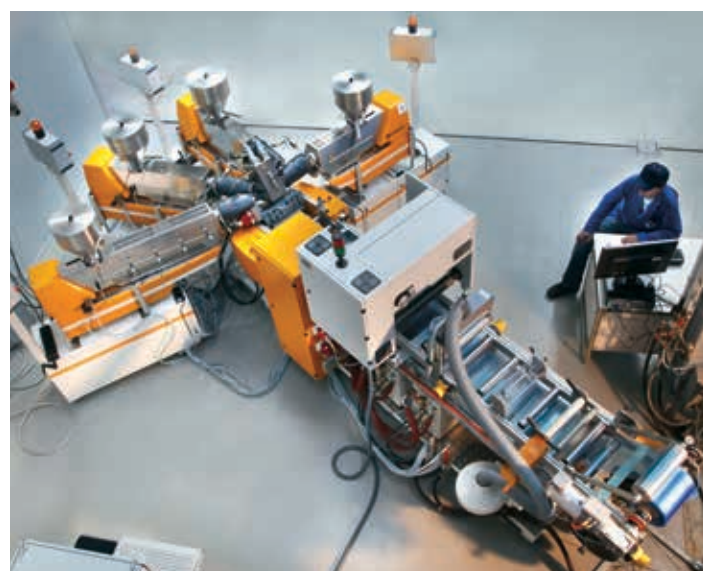
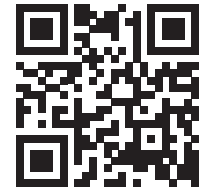


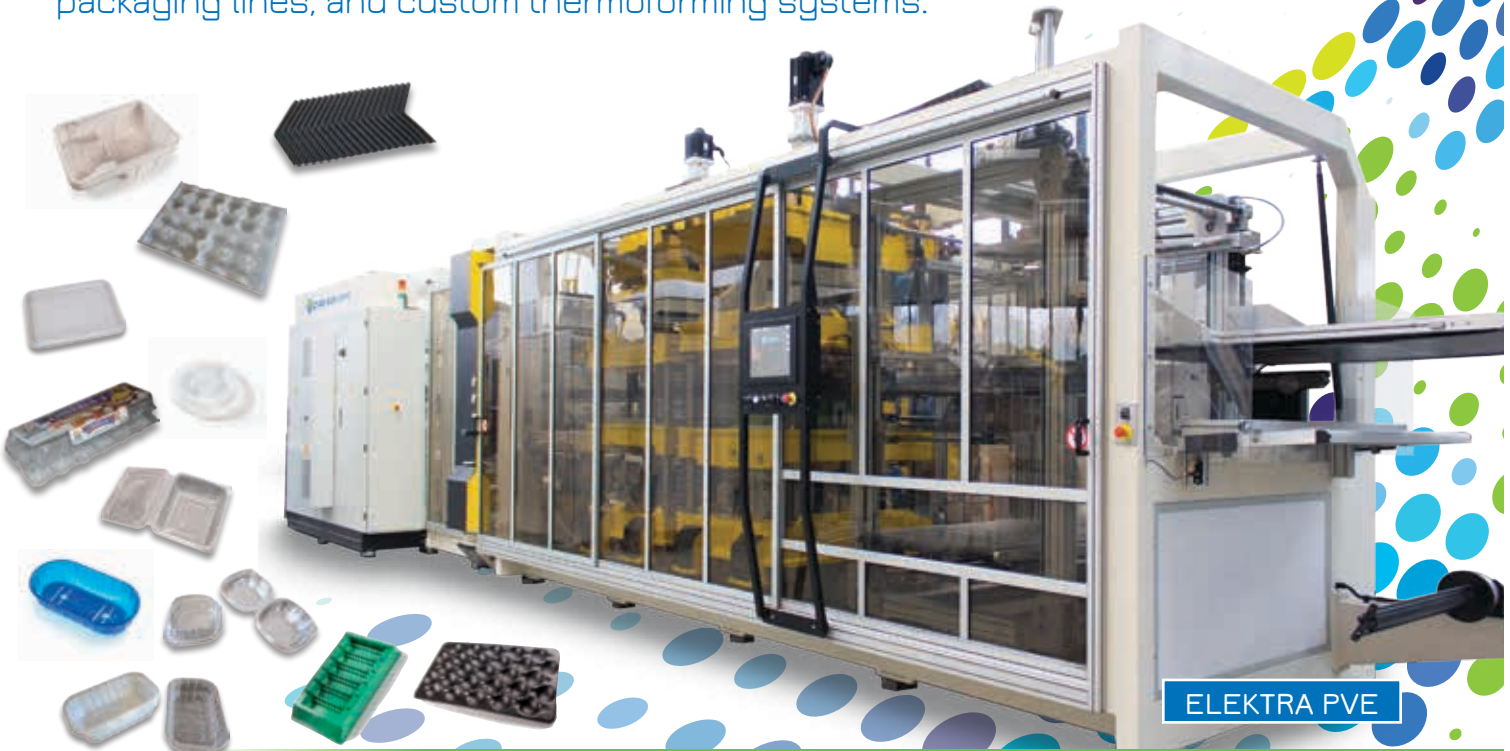
Figure 2: Cast film extrusion line at Fraunhofer IVV



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Two different temperature profiles for the strand extrusion and the film extrusion were used (Table 1). The samples were extruded to strands up to nine times. The last extrusions was the film extrusion.

temperature zone - co-rotating twin screw extruder	temperature / °C	
	extrusion	extrusion
	temperature profile T1	temperature profile T2
0	40-60	40-60
1	160	210
2	220	300
3	230	270
4	230	300
5	200	270

temperature zone - cast film extrusion line	film extrusion
0	40-60
1	180
2	235
3	240-250
4	240-250
5	250-265

Table 1: Temperature profiles

From the polymer pellets the melt flow rate was determined according to the standard ISO 113. The testing weight was 2.16 kg, the testing temperature was 230 °C. The oxygen absorption capacity of the films was measured with measuring cells and a method developed by Fraunhofer IVV. The head space volume of the used cells was 226 cm<sup>3</sup>. The relative humidity was adjusted to 100% by putting a petri dish with water into the cells. Figure 3 shows a measuring cell with sample.



Figure 3: Measuring cell for the analysis of oxygen scavengers

The melt pressure in the twin screw extruder reduced with a higher number of extrusions (Figure 4). A higher processing temperature (temperature profile T2) had a stronger effect. The melt pressure dropped more at a higher temperature impact. Such effect is already known for PP. It is explained by shortening of polymer chains which reduces the viscosity. At the temperature profile T2 this effect was so strong that it was not possible to do the planned ten extrusions due to breaks of the polymer strands, i.e. the processability was reduced. Interestingly, the oxygen scavenger had no detrimental effect on the melt pressure. This result was backed by the melt flow rate analysis (Figure 5). The oxygen scavenger had no influence on the melt flow rate, also. As expected the melt flow rate was increased by a higher number of extrusions and a higher extrusion temperature (temperature profile T2).

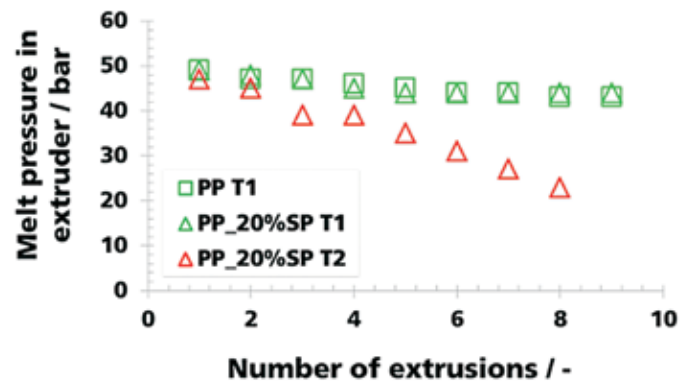


Figure 4: Melt pressure in the co-rotating twin screw extruder; SP: oxygen scavenger SHELFLPLUS® O<sub>2</sub>

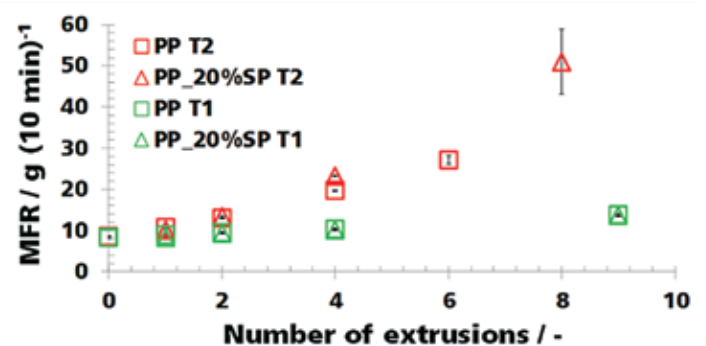


Figure 5: Melt flow rate (MFR) of compounds; SP: oxygen scavenger SHELFLPLUS® O<sub>2</sub>

The absorption capacity was also influenced by the extrusion temperature and by the number of extrusions (Table 2). As expected the absorption capacity reduced with a higher number of extrusions and a higher extrusion



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Number of extrusions	capacity / mg O <sub>2</sub> (g additive) <sup>-1</sup>	
	temperature profile T1	temperature profile T2
1 film extrusion	49±1	40±1
4 strand extrusions, afterwards 1 film extrusion	40±2	31±5
8 or 9 strand extrusions, afterwards 1 film extrusion	35±3	26±2
Data sheet: oxygen scavenger additiv for film extrusion (SHELFPPLUS® O <sub>2</sub> 2710, ALBIS PLASTIC GmbH)		44

Table 2: Absorption capacity of oxygen absorbing films

temperature. After nine extrusions and at the higher extrusion temperature profile T2 the absorption capacity was reduced to the half. The more realistic scenario of the temperature profile T1 and five extrusions caused a reduction of the absorption capacity of only 20%. Therefore it can be concluded that the iron based oxygen scavenger keeps its functionality in industrial recycling conditions.

Conclusions: Our results show that polypropylene and polypropylene with dispersed oxygen scavenger degrade by the impact of extrusion which can be seen by increased MFR. The more often the material is extruded the more intense is the degradation. However, overall the iron based oxygen scavenger has a much lower impact on degradation than the extrusion temperature and the number of extrusions.

### Acknowledgement

This study and the corresponding research project (ExtruStab AiF-No. 18343 N) of the Industry Association for Food Technology and Packaging (IVLV) was funded from the budget of the Federal Ministry for Economic Affairs and Energy (BMWi) through the Arbeitsgemeinschaft

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4. da Costa, H.M., Ramos, V.D. and Rocha, M.C.G., Rheological properties of polypropylene during multiple extrusion. Polymer Testing, 2005. 24(1): p. 86-93. |



**Did you know** the SPE Foundation offers numerous scholarships to students who have demonstrated or expressed an interest in the plastics industry?

The Spring Councilor's meeting was held in Indianapolis, IN the weekend prior to ANTEC. The meeting was conducted in three sessions: two regular council sessions and one session of the Council Committee of the Whole.

SPE is working to expand its relationship with other organizations that are involved in the plastic industry. Manufacturers Association for Plastics Processors (MAPP) and Society of the Plastics Industry (SPI) are two examples of partner associations. We will see more strategic partnerships as many professional associations are facing the same challenge of providing value and relevant information for their members.

New products were introduced to the council. "Plastic Insight" and "Industry Insights" are e-newsletters. They are available on The Chain and provide members with forums to discuss both technical and non-technical issues.

The Chain is becoming the primary means of information transfer for SPE. You can find it on the SPE website and I recommend that you check it out.

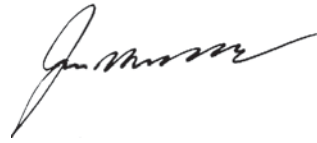
We also reviewed e-voting. The SPE Council used e-voting for the first time during this election cycle. Overall, it worked well with some 75 out of 90 councilors voting. One of the issues raised was the inability to interview candidates by council member. The Division will be looking at using it for our board elections.

Membership in the Society is hovering around 20K with an additional 6700 e-members. This is still below previous levels and is a matter of concern for the Council and Executive Committees. Our division faces the same issues.

The Governance Task Force (GTF) presented the Leadership Deployment Plan (LDP) and the 3-year Strategic Plan.

The LDP was the result of 3 years of work by the GTF. This plan reorganized the Executive Committee of the Society and the committee structure. Standing committees, ad hoc committees and task forces were addressed. For complete details, members are encouraged to visit the SPE website.

The 3-year Strategic Operating Plan addresses goals for the Society and how they should be accomplished. It is dynamic plan that addresses the direction the Society needs to take in order to attract new members and keep current members. I recommend that you take a look at it and provide feedback on The Chain to SPE.



One of the interesting parts of the SOP was the importance of conferences. The Thermoforming Division was recognized for having a focused event versus a general event and providing more value to the attendees.

ANTEC is the premier event of SPE but it is declining in attendance and content. One of the goals of the SOP is to review ANTEC and how to revitalize it to provide more value to the members and increase participation. Again, I am looking for input from you on your thoughts about ANTEC and how it can be improved.

As part of the Strategic Plan, the Society has moved away from budget planning on a one-year basis to a 3-year basis. This allows more flexibility to react to changing conditions and allows better planning window for the Society.

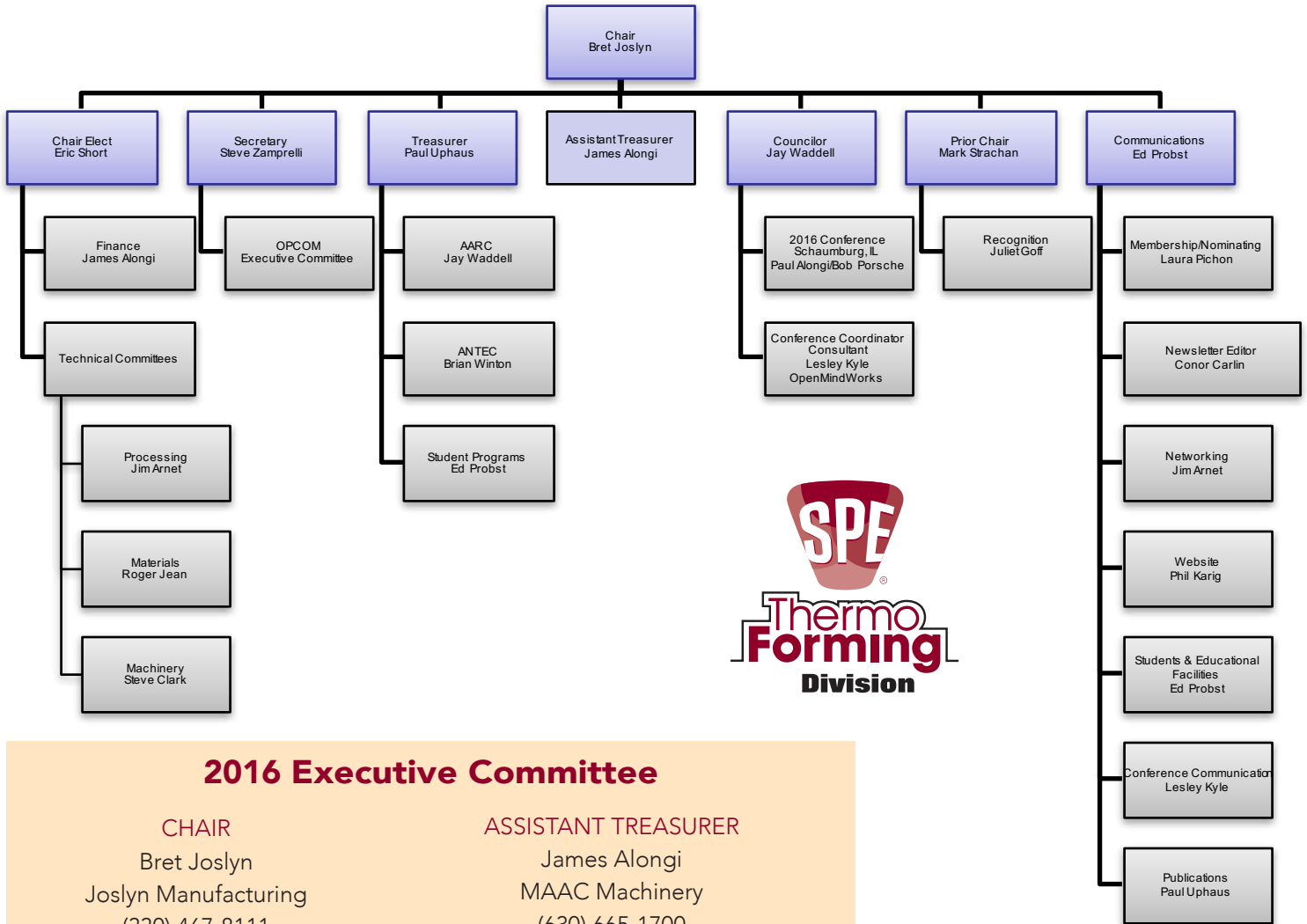
Revenues vs Expenses always remains an interesting topic. Things are improving, however, and with some of the new initiatives being put into place, SPE fiscal health is looking better. SPE is predicting a \$56K deficit for this year which is considerably less than before. Better controls and procedures have been put in place and the major infrastructure improvements are almost complete. Again, I recommend going to the SPE website where you can review the financial reports for yourself.

One of the best items of the Council meeting is the Councilor Committee of the Whole. This is where councilors can bring up concerns and comments on just about anything within SPE. It is an open forum for the councilors to speak their minds. So, if you have items you would like to be addressed to SPE as a whole, let me know and I will present to the Council during the CCOW meeting.

SPE continues to face challenges and so does our Division. Times continue to change and we must adapt. I look forward to hearing from you. |

Jay M. Waddell

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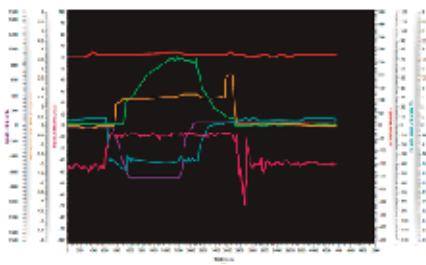
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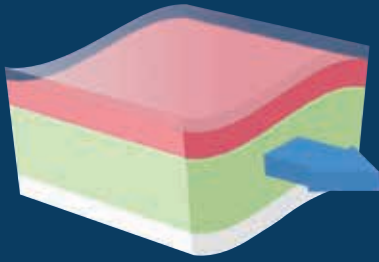
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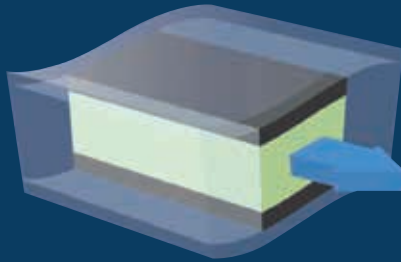
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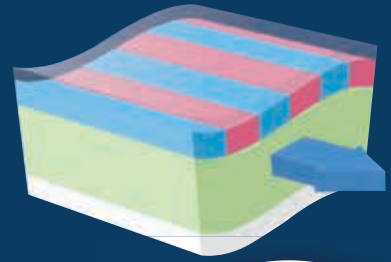
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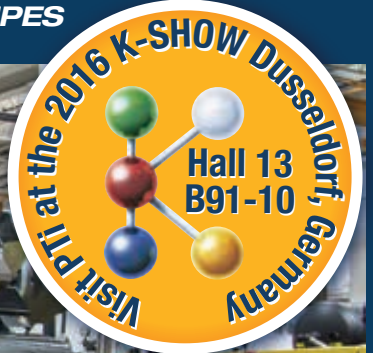
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