



# Thermoforming

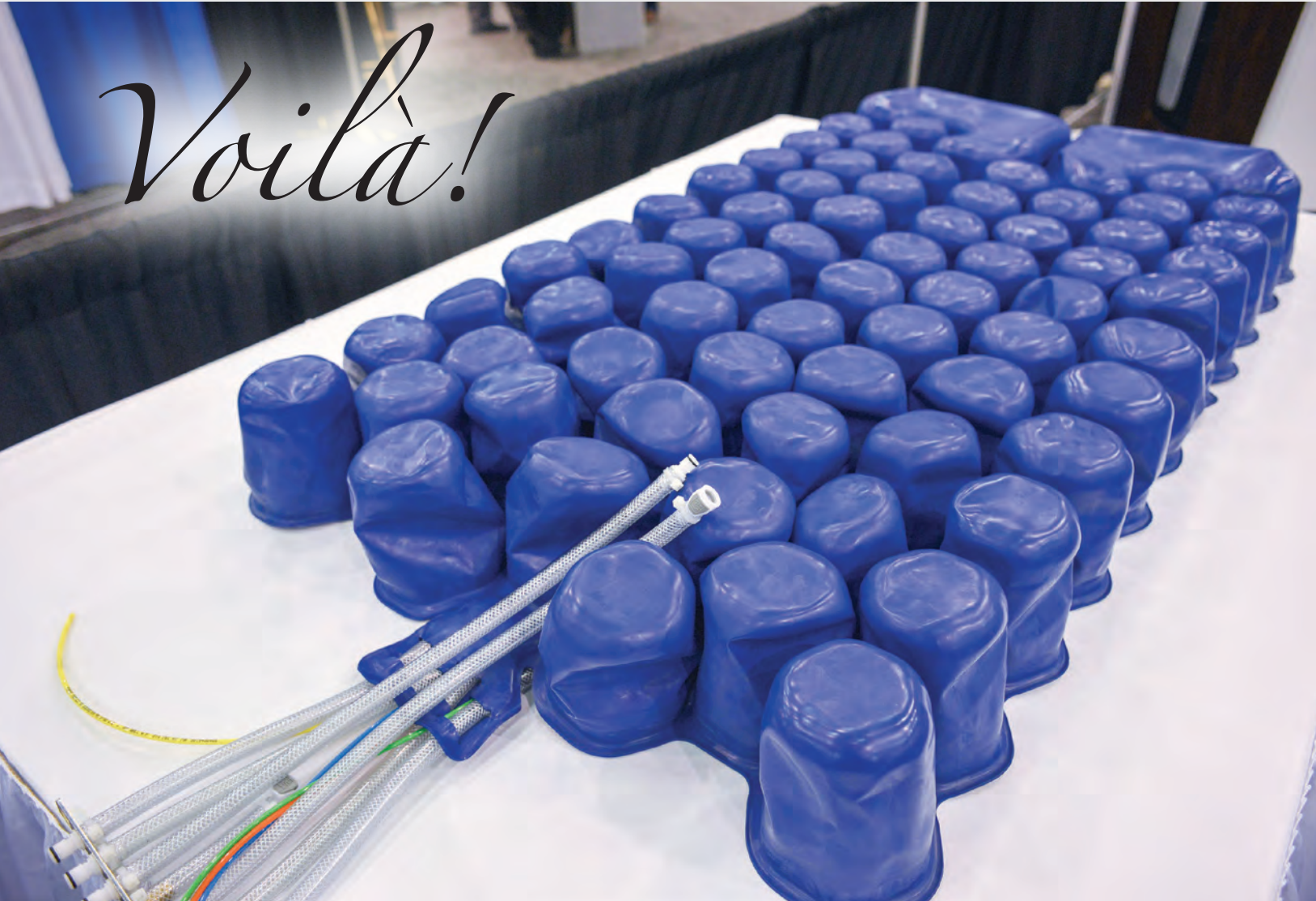
## Quarterly®

A JOURNAL OF THE THERMOFORMING DIVISION OF THE SOCIETY OF PLASTICS ENGINEERS

FOURTH QUARTER 2015 ■ VOLUME 34 ■ NUMBER 4

**Post Conference Edition**

*Voilà!*



**INSIDE . . .**

The Secrets of the Mittelstand

3D Printing in Thermoforming

2015 Thermoforming Conference and Parts Competition

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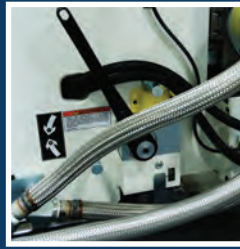
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# Thermoforming Quarterly®

A JOURNAL PUBLISHED EACH  
CALENDAR QUARTER BY THE  
THERMOFORMING DIVISION  
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2 PU Pods, Les Produits Plastitel,  
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As 2015 comes to a close, I'd like to share some recent accomplishments and offer some thoughts for the coming year. As a Division, we have made some very necessary changes to the way we do things, including crucial updates to the bureaucratic Thermoforming Division By-Laws and Operating Procedures. We have also stepped up our Communications Committee activities by including the Committee Chair, Steve Zamprelli, in the Executive Committee. This has allowed us to be more vigilant on social media and more proactive with online marketing aspects of the Division. We have added a new "History" section on our website where we can pay homage to our division pioneers and those who have contributed so much to the thermoforming industry. Thanks to the efforts of Stan Rosen, we now also have a comprehensive timeline of the development of the thermoforming industry.

We have stepped up our student activities tremendously, the results of which were evident during our successful conference in Atlanta where so many students attended and received scholarship grants. Thanks to our successes, Penn College of Technology will soon be taking delivery of their new continuous roll-fed thermoformer in time for their next annual thin gage workshop. The SPE Thermoforming Division has also allocated the necessary funds to preserve over 25 years' worth of excellent technical articles published in our flagship magazine by digitally archiving select papers and making them available online for download through the main SPE website.

As many of you know, I have worked for several years with the staff and faculty at Penn College in Williamsport, PA. The Thermoforming Center of Excellence continues to produce high-quality graduates with practical skills in thermoforming and extrusion. Surveys suggest that hiring managers continue to cite the lack of skilled workers as an area of concern. I encourage business owners and company presidents to get involved with your local schools to address important matters. Discuss curricula, design courses and most importantly, engage with students. Our industry can have a powerful impact beyond providing quality parts for industry. I recently applauded Joe Peters with the Outstanding Achievement Award as he is a wonderful example of an individual who has dedicated his time to attract young people to pursue amazing careers that are challenging, rewarding and essential in today's evolving economy.



The US market continues to show resilience, allowing more projects to be funded and more innovation to thrive. Beyond our shores, our colleagues in Europe are also making strides as our editor reports from Fakuma, Germany. In this issue, we also feature a unique article (see "The Secrets of the Mittelstand" on pp. 8-9) about what makes Germany a perennial powerhouse in manufacturing and industry (hint: it starts with their approach to education).

In this issue, we cover how a partnership between an Italian OEM (Cannon), their customer and IKEA resulted in a truly inspiring story where the lives of refugees are improved through simple and elegant solutions (see pp. 36-37).). Where else can we have an impact beyond our immediate businesses? How else can we demonstrate the broader societal benefits of plastic thermoforming? It's not such an idealistic question: depending on which source you read, roughly 1/3 of all food produced is lost or wasted before it gets to market. It is now well-documented that plastic packaging plays a critical role in reducing food waste around the world. Maybe if more people knew this fact, they would not be so quick to blame plastics for the environmental issues we are experiencing today. It is up to us to stand up to this nonsense and join proactive individuals and companies such as Shepherd Thermoforming & Packaging (see article <http://www.shepherdthermoforming.com/blog/?p=648>) and Chandler Slavin of Dordan Manufacturing (see Chandler's Blog at <http://www.dordan.com/blog/author/chandler-slavin>) to educate the consumers that the recycling of plastics is the only solution to the pollution. |

A handwritten signature in black ink, appearing to read "Mark Strachan". The signature is stylized and cursive.

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## New Members

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Luis Conceicao  
Zotefoams  
London, UK

Eric Hamberger  
All About Packaging, Inc.  
Appleton, WI

Nicole McCall  
Intech Services  
Newark, DE

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Impact Plastics  
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Sportech Inc.  
Elk Rive, MN

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Ramseur, NC

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Bloomsburg, PA

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Welex/Graham Engineering  
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Delta Products Group  
Aurora, IL

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Dart  
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Blair Companies  
Altoona, PA

Adam Hug  
Specialty Manufacturing  
San Diego, CA

Ben Huston  
First Quality  
Macon, GA

Matthew Jackson  
The Tapco Group  
Wixom, MI

Dan Jannette  
JSP  
Holly, MI

Steve Kali  
Denso Manufacturing  
Maryville, TN

Richard Kirby  
Norcold Inc.  
Sidney, OH

Will Klecan  
Aladdin Temp-Rite  
Hendersonville, TN

Bryan Legere  
Viper Mfg.  
(Algenol Biofuels Inc.)  
Lehigh Acres, FL

Brian Loftus  
WS Hampshire  
Hampshire, IL

Joe Martinez  
Profile Plastics  
Lake Bluff, IL

Jonathan Meyer  
Meyer Plastics  
Indianapolis, IN

Tom Miller  
PMC Premier Material  
Findlay, OH

Eugene Mitchell  
Denso Manufacturing  
Tennessee, Inc.  
Maryville, TN

Darrin Olsen  
EGR Inc.  
Ontario, CA

Austin Ploeger  
Select Plastics  
Ft. Worth, TX

Tim Pope  
GE  
Decatur, AL

Jason Rose  
Display Pack  
Grand Rapids, MI

David Sawyer  
First Quality Packaging  
Macon, GA

David Schiff  
The Dow Chemical Co.  
Freeport, TX

Dan Sproles  
Medallion Plastics Inc.  
Elkhart, IN

Samantha Stacy  
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Tim Wert  
Medallion Plastics Inc.  
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Steve Wiseman  
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Matt Wivinus  
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Schake Industries Inc.  
Seneca, PA

Federico Ollarsaba  
Nelipak Healthcare Packaging  
Tempe, AZ

Richard Kruyer  
The Tapco Group  
Metamora, MI

## New Thermoforming Packaging Venture Set for Saudi Arabia

PRW via *Plastics News*

Fresh food packaging supplier Linpac Group Ltd. has announced a new cooperation agreement with Zultec Group, a multinational retail and industrial supplies leader based in Jeddah, Saudi Arabia.

The companies will establish thermoforming operations in Jeddah to supply Linpac-branded rigid and flexible packaging materials, dedicated to serving food processors and retailers in fresh meat and poultry in Saudi Arabia and neighboring countries.

Linpac chairman and chief executive Daniel Dayan, said: “We are delighted to formalize our relationship with the Zultec Group.

“Zultec has a long history of serving the Middle East food industry and has a deep local knowledge, which when complemented by the Linpac packaging portfolio and intellectual property, creates a powerful opportunity for both companies.

“We aim to continue to invest and develop the relationship by establishing further extrusion and thermoforming capabilities in the region as the business grows.”

Zultec group president and chief executive Zulqiurnain Ali Khan said: “We hope to add value to the Saudi economy through this cooperation by bringing world-class standard packaging solutions to the food industry, while creating employment and providing training to Saudis.”

## Amut Boosts Service Operations in Vietnam, Indonesia

By Steve Toloken, *Plastics News*

September 16, 2015 — Italian machinery maker Amut Group said Sept. 16 it has set up technical service operations in Vietnam and Indonesia to meet increased demand for its equipment in Southeast Asia.

The Novara, Italy-based firm did not provide details on the operations in its statement but said it has recently finalized several contracts in the countries, including two projects in Indonesia using its AMP 850 GP thermoforming machine as part of an inline system, with an extruder and related equipment, to make water cups with an output of 96,000 pieces per hour.

The company also said that since the Chinaplas show in May, it has wrapped up two contracts for thermoforming machinery in Vietnam, for manufacturing polypropylene cups and PP and PET lids, with its AMP 630 and VPK-C84 models.

## High Five for Verstraete in IMDA Awards

By Steven Pacitti, *Plastics in Packaging*

November 03 2015 — *A double-sided IML label supplied by Verstraete IML has helped German salad producer HOMANN win ‘Best Label Design’ at the In-Mold Decorating Association (IMDA) awards in Chicago, USA.*

The German brand used the label design for its ‘Find the Golden Gherkin’ project on containers injection moulded by Spies Kunststoffe.

It was one of five awards involving labels produced by Verstraete IML. Scooping ‘Best Part Design’ was Eggyply, Eggs Posure’s hybrid packaging and toy product. Dishwasher-proof, the packaging is resistant to frequent exposure to high temperatures, moisture and dishwashing detergents.

A five-sided label helped ConAgra win ‘Best Thermoformed Package’ award for the brand owner’s directly printed packaging. Tech II provided the thermoforming expertise.

The last two awards were won in the ‘Best Product Family’ category. Plano Molding won the gold award with its series of functional and user-friendly bait buckets for Frabill. Every bucket in the series is decorated with an IML label by Verstraete IML.

The silver award in this category went to IPL. The premium ice cream packaging was decorated with transparent IML labels produced by Verstraete. As a result, this premium ice cream packaging has a no-label look. Moreover, this IML packaging can withstand temperatures of up to -5 deg C. |

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### THE SECRETS OF THE MITTELSTAND

By Sven Engelmann, Dipl –Ing.

*(Editor's Note: The genesis of this article was a conversation at the European Thermoforming Conference in Prague (April 2014) between the editor of TQ and long-standing contributor/industry author Sven Engelmann. We were discussing the importance of workforce development to the thermoforming industry and whether or not US and European firms face the same challenges in training and retaining workers. While "Made in Germany" is a well-known phrase that connotes engineering excellence (the recent VW scandal notwithstanding), less is known about the societal construct that serves as the foundation for this phenomenon – The Mittelstand.*

*We are pleased to publish this unique piece in our pages and we encourage readers to send us their comments.*

#### Introduction

Before we begin, it is important to translate *Der Mittelstand* as best we can for non-German speakers. There is no exact equivalent in English, but 'small and medium-size enterprises' is a close approximation, at least in terms of a literal translation. Like much in translation, however, we must go deeper to understand the richer cultural and social meaning.

The *Mittelstand* is not one single company. It is more of a general term for all enterprises of a certain size in German-speaking countries (Germany, Austria, Switzerland). These are generally companies with less than 1000 employees. The companies of the *Mittelstand* and their employees are also the biggest tax payers in Germany. The *Mittelstand* is the backbone of the German economy and one of the major contributing factors to the wealth of the German people.

#### The Role of the German Education System

There are many reasons for the strength of the *Mittelstand*. Certainly, one primary reason is the education system in Germany. This system is designed to educate the broad majority of people while offering different paths for students based on aptitudes and interests. Of course, there are different strata of schools like other countries, including top-tier universities in Germany, but for the *Mittelstand* it is important that everyone has received a solid educational foundation.

Skilled workers have received a three-year apprenticeship which is a dual education. It is conducted in cooperation between the schools and the companies that hire the apprentices upon completion of coursework. The schools will educate students in general subjects at the outset of the program. They will also offer specialized courses related to the profession that the apprentice has chosen. The companies play an integral role in the practical part of the coursework. Training is possible in more than 350 professions.



The apprenticeship system dates back to medieval times and has survived through industrialization into the modern era. Moreover, professions designed and dedicated to industrial needs are deep-rooted in the apprenticeship system. Even today, new professions are still created and slotted into the apprenticeship system, e. g. mechatronics (a mixture between mechanics and electronics) or IT-specialist courses. This system accounts for hair dressers as well as for bricklayers. But let's focus on industry.

#### Industry-Education Symbiosis

Industrial companies of the *Mittelstand* usually range in size from 20 to 1000 employees. Many of these companies have their own apprenticeship center. For English-speaking visitors to a *Mittelstand* company, the apprenticeship center is often explained as the training center. Of course, one receives training in an apprenticeship, but having graduated from an apprenticeship is far more than simply receiving training. After the three-year program one is considered a "Facharbeiter", a skilled worker, (usually at the age of 18 or 19) although here again the translation into English doesn't really explain the fundamental importance of this path. Human resources managers, for example, will take note of the subjects studied during a student's time as a *Facharbeiter* because those skills are fundamentally important to their career. These skilled workers are the backbone of each company. Good skilled workers earn enough money to support their family and they make a good living. After some years of job experience, skilled workers have the possibility to return to school to become a "Meister". There is also the possibility to become a technician through a two-year, non-academic program at the end of which the student must pass an exam.



If the skilled worker did not have a high school degree (“Abitur”) before starting the apprenticeship at a company, there are ways to earn it through a separate path. From there, the student can choose an academic path, such as a degree from a University of Applied Sciences. In this way, a skilled worker becomes an academic and can benefit from his practical experience and his newly-acquired academic skills.

Alternatively, a student who pursues an academic path can also find employment while taking courses. This is considered a dual-academic education. In this case the student is employed by a company where their “practical” semesters are carried out in the office or factory and “theoretical” semesters take place at the university. In these cases, the apprentice and students can get a small salary from the company.

Of course, as in many other countries, there is always the possibility to enroll at a university straight from high school, graduate and then start to work. Like other European countries (and unlike the US), the German education system is basically free.

### Management Philosophy

Certainly, one of the secrets of the success of the *Mittelstand* is education. Another major key is the management ethos and the way they do business. Like any other business, a *Mittelstand* company has to grow revenues and remain profitable. That said, *Mittelstand* companies have a longer time horizon than simply the next quarter. Most of the companies develop a five-year plan. Within development periods, most of the participants do not rotate positions (from engineering to procurement or operations, say) like some multinational management programs. Employees typically stay in their path. Of course, they get encouraged, supported and promoted within those tracks. Long-term success and stability is what a *Mittelstand* company wants. If there is a big fluctuation in management, the company will likely go down very fast. Usually there are only small fluctuations across these companies.

### Cost Structure & Ownership

Without a doubt, Germany is a country with high labor costs. So how does one explain the strength of its economy? One answer can certainly be found in the influence of the *Mittelstand*. Though the German economy did experience pain during the recent financial crisis, it has been acknowledged that the *Mittelstand* influence prevented a deeper disaster. German capitalism is

sometimes referred to as “stakeholder capitalism” as opposed to the US-centric “shareholder capitalism.” In stakeholder capitalism, workers can take half the seats on a company’s board where they have a say in the direction of the company. In the US, shareholder capitalism, workers do not participate on the board and management strives to reward shareholders through stock price appreciation, dividends and buy-backs. In times of crisis the *Mittelstand*, the employers, employees, unions and society as a whole tend to stick together and try to manage. Layoffs are less likely and less sweeping. When multiple parties realize that each must sacrifice, it is easier to find common ground.

That said, it is not necessarily true that everything is rosy in this world. Like in any other enterprise throughout the world, there is competition, there is failure, and of course there can be bad management. Many *Mittelstand* companies are family-owned. Whereas in former times the succession plan was always conducted by the children, today the transfer can happen with the help of someone from outside the family, though given the social impact as we have seen, the companies still retain the fundamental *Mittelstand* character.

The large, globally-known German companies such as the car manufacturers are very much dependent on the *Mittelstand*. Most of them are very important suppliers. They are knowledgeable, creative and they have deep experience in their field of expertise. This expertise and generational transfer of knowledge are major factors that prevent the *Mittelstand* from becoming outdated.

### Final Thoughts

So, can we truly reveal the secrets of the *Mittelstand*? First, we must rely on common sense – “gesunder Menschenverstand” - learned over many generations. It is certainly true that the long-term vision of a company recognizes that there is more business than quarterly results. *Mittelstand* companies never aim for short-term success. Their major pillars are practical education for all supported by a society that is fully aware that, without the *Mittelstand*, economic growth is very much threatened. Equally important is a highly-dedicated management team that leaves no one in doubt that while the firm has to make profit, it thinks in generations, not fiscal quarters. It seems that the *Mittelstand* will continue to generate wealth for a many more years to come.

*Promotional poster by Genossenschaftliche FinanzGruppe Volksbanken Raiffeisenbanken, a German network of cooperative banks. (Google images) |*



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## THERMOFORMING SCHOLARSHIP WINNERS - Where Are They Now?

### **Katie Pitts - 2008 Thermoforming Division Memorial Scholarship**

“Since winning the scholarship, I completed my Master’s degree in Mechanical Engineering at the University of Wisconsin-Madison, writing my thesis in thermoforming mechanics and polymer melt flow. I then completed a PhD in Chemical Engineering at the University of Ottawa in Canada, writing my thesis in using particle image velocimetry to measure blood flow at the microscale. My PhD thesis work involved custom fabrication of soft polymer microfluidic devices in a clean room environment. After completing my studies, I am now employed in the biomedical device industry at a company that makes microfluidic polymer devices to measure blood chemistry. “

### **Brian Rupnow – 2011 Segen/Griep Scholarship**

“I graduated from the University of Wisconsin Stout (Menomonie, WI) Double majoring in Manufacturing Engineering (ABET Accredited) and Plastics Engineering.

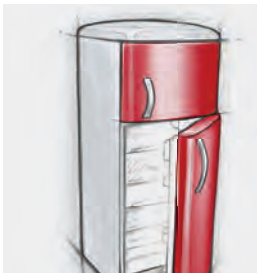
At Sonex (aircraft) I had a great opportunity to prove my skills and ability where I was an asset in the completion of the Sub-Sonex 2. I worked at Cleveland Tubing Inc. as a Manufacturing Engineer. We design and extrude corrugated plastic tubing products such as Flex-Drain.

I also work for Rupnow Brothers Racing as the Team Manager. I deal directly with sponsors and the riders to ensure the team has the best possible success. In the future I would like to obtain an internship or co-op with a race team to work in research and development of new technologies.

For the summer of 2011, I Interned at Plexus (Neenah, WI) as a Manufacturing Engineer Intern working with other manufacturing engineers to incorporate development of manufacturing processes, to solve problems / improve technical processing, to work on Continuous Improvement projects and to represent manufacturing in new process planning and development, design and procurement of specialty tooling.” |



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## Welcome to the Creative Boom

### *Why Technical Employers Need Creative Employees for the Future of their Business*

By E.J. Daigle, Dean of Robotics and Manufacturing Technology, Dunwoody College of Technology, Minneapolis, MN

There's a classic scene from early in the movie *The Graduate* where Dustin Hoffman's neighbor says to the job-hunting youngster, "I just want to say one word to you. Just one word... plastics." If that conversation were happening today, that one word would undoubtedly be "change".

Industrial fields across the country – thermoforming among them – are undergoing a rate of change unprecedented in recent industrial history. The reasons are clear: widespread automation, pervasive robotics in manufacturing and engineering, the advent of increasingly sophisticated processes and advanced materials. All these factors are reshaping the shop floor and completely altering the skill set of every employee that works on it.

So what should employers do? How can we all evolve our workforces to keep pace with change and take advantage of the market opportunities that change creates? It all comes down to one word: creativity.

#### **The Need for a New Kind of Employee**

The fastest way to evolve our workforces is to hire qualified and well-trained employees, but already the deck is stacked when it comes to finding qualified candidates. A recent *Wall Street Journal* article points to the decline in technical industry apprenticeships from 500,000 a decade ago to just 280,000 today. Added to that, polls by Manpower Group and The Manufacturing Institute cite widespread employer difficulties filling jobs, the latter stating 75% of manufacturers surveyed were experiencing trouble filling open technical positions.

With a diminished apprenticeship base and technology driving the demand for highly skilled workers, employers need to turn to technical colleges and seek a new breed of candidate: one that brings a more rounded skill set and industry-ready experiences to their first day on the job.

#### **Educational Balance**

It used to be enough for employers to critique a resume, conduct an interview or two and seek the right references. But today there is a real need for balance in a candidate's background. Employees ideally should bring a hands-on familiarity with the tools, machinery and processes of their chosen profession from summer work experience and immersive internships, but they also must have basic analytical thinking skills, a design

sensibility, a grounding in computer programming and a holistic view of the production, engineering and manufacturing process that informs how they perform their particular role.

#### **Creativity: The New Differentiator**

It might seem like an instant misnomer. Why should technical employers seek creative skills in their hires today? Consider the prevalence of software programming, CAD technologies, injection molding and widespread new standards such as 3D printing in all kinds of manufacturing processes. It is easy to see how a candidate who brings both technical skill and design sensibilities would be a beneficial hire.

At Dunwoody, our curriculum fosters a creative approach to technical subject matter and class challenges. Students work with CAD/CAM software, 3D printing technology and in our in-house manufacturing lab, an environment that gives students critical experience in translating concepts into fully matured and manufactured prototype products.

A number of colleges, including our own, are also challenging students to compete in competitions at a new level. Our *Autonomous Snow Plow Competition*, for instance, challenges participants to conceive, design and engineer a robotic snowplow that autonomously navigates city sidewalks, driveways and parking lots in the worst weather conditions.



## Foot in the Door

Employees work in the real world and the pace of change requires all workers to make an immediate contribution in their chosen field. Given the degree of technical specificity, proprietary processes and materials in everything from plastics manufacturing to automotive engineering, employers should seek candidates from colleges that have a strong track record of working closely with industry. The best technical colleges work hand in hand with employers in everything from plastics and other forms of manufacturing to engineering, automotive, HVAC and more in order to ensure students gain experience with the technologies, equipment and processes they will encounter in their future jobs. At Dunwoody many of our projects and curricula are designed in concert with employers and ask students to gain both a familiarity with the current technical demands of their future workplaces and a creative sensibility when it comes to understanding and solving real-world problems.

## Instructors and Educators

Lastly, as an employer trying to fill your next open position, you should ask a candidate about who taught their classes? Try to seek out and interview graduates who come from a college where classes have been taught by faculty members that are both experienced educators as well as industry professionals. There's no substitute for the benefit students receive from being immersed in real world examples, case studies and even anecdotes of daily working life and challenges in chosen fields. It is the experiences and perspectives that come from instructors who have worked and succeeded in the trenches of ever-changing industry fields that will really help guide and prepare the most successful technical workers of tomorrow.

*About the author: E.J. Daigle is Dean of Robotics and Manufacturing Technology at Dunwoody College of Technology in Minneapolis. He can be contacted at [edaigle@dunwoody.edu](mailto:edaigle@dunwoody.edu).*



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## 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!

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# Thermoforming Technical Problems I Wish I Could Solve

## Forming Low-Density Foam – Visiting a Revisit

By Jim Throne, Dunedin, FL

### Prologue

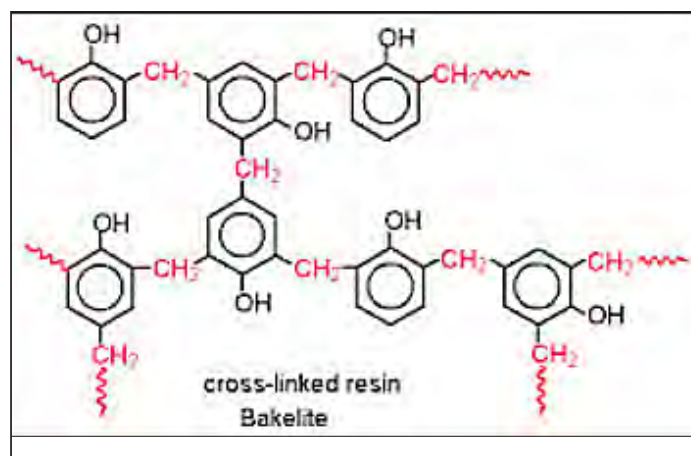
If you've been paying attention, you know that I've been on a kick regarding forming low-density foams. I began by discussing forming low-density polystyrene foam (*ad nauseam*, some say). My last vignette on this subject dealt with polyolefin foam. Let me repeat: forming polyolefin foam can often border on rocket science. The core reason for this, I preached, dealt with the very sharp transition from the relatively solid cellular structure to a collapsing, catastrophic melting.

### So why are 'we' back?

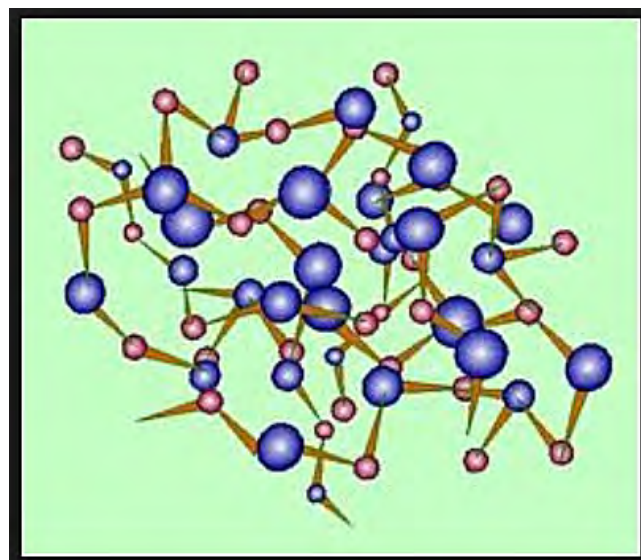
Because there are ways of stabilizing polyolefins that will allow foam formability. So, I thought I'd have one last go at the subject.

The operative word here is crosslinking. Yeah, I know. We always make a distinction between thermoplastics (like a plate of spaghetti) and thermosets (like a plate of scrambled eggs). But sometimes there's a crossover or a mid-point between these two distinct polymeric characteristics. And that's what we will explore here.

First, consider the extremes. The classic example of a thermoset is Bakelite, aka phenol-formaldehyde, an early 20<sup>th</sup> century invention:



The little wiggles indicate connections between the horizontal chains. These connections crosslink the chains into three-dimensional structures. Here's a 3D representation:



'Crosslink density' is a term used to describe the crosslinking nature. In essence, it is a measure of the number of carbons on the polymer chain between crosslinks. The higher the crosslink density, the fewer the number of carbons. Ergo, Bakelite has a very high crosslink density, meaning there are bridges every few backbone carbons. Those in the trade would say that Bakelite is 100% crosslinked.

### So where are we going with all this?

We're going to crosslink polyethylene (and other polyolefins as well). Why? Because we have a burning desire to produce thermoformable low-density HDPE foam (and other difficult or impossible-to-thermoform olefins.) But, and this is a big but, we only want a small amount of crosslinking. Too much and the plastic may not be extrudable and even if it is, it may not be foamable.

There are three proven ways to crosslink polyolefins: chemically with peroxides, chemically with silanes, and electrically with electron beam irradiation (EBI). For HDPE, we would use a peroxide such as dicumyl peroxide or DiCup. The crosslinking agent is often added to the hopper of the single-screw extruder system and to a down-stream port in a twin-screw extruder system. We are talking about fractions of percents of these agents.

There is a balance in dosage level (between an insufficient amount to minimize cell collapse during heating and an excess) that prevents achieving foaming levels during extrusion. Trial-and-error and often mostly error. However, once the system is functioning, the foam sheet can be heated and matched-mold formed quite well. Crosslink densities for HDPE are very low, typically in the range of 30-50 backbone carbons, and the foam is considered to be around 60% crosslinked. The phrase 'light crosslinking' is often used in the literature.

### What about PP?

Polypropylene can be crosslinked in each of the three ways mentioned above. If peroxides are used, a higher-temperature and more expensive peroxide other than DiCup is required. Silanes are also used in combinations with other activators and adducts. Again, dosage moderation is required. A most unusual technology has warranted major attention: electron beam irradiation. PP is extruded below the kick-off temperature of the chemical foaming agent additive. The sheet is EB irradiated, crosslinking the polymer but not activating the foaming agent. The crosslinked sheet is heated to decompose the foaming agent, thus producing a very stable low-density PP foam that is quite thermoformable. Automotive guys love this stuff – trunk liners, carpet underlayment, behind head liners, under rear deck shelves and so on.

### So what is there to solve?

All commercial foams and indeed all commercial products are produced, marketed, sold, and used on cost/performance bases. It should be apparent from the earlier vignette on uncrosslinked polyolefin foams that these foams are fraught with technical processing problems. Light crosslinking mitigates some of these issues but adds a crosslink agent cost burden. And there is an additional cost factor: great difficulty in (or in some cases impossibility of) reprocessing crosslinked foam trim.

In short, as the cost of producing the foam, whether thermoformed or not, increases, the potential size of the market decreases. I've been told that this ratio is linear on log-log paper.

So the quest is to reduce the cost of olefin foams to increase their marketability particularly against traditional PS foams.

Keep in touch. |

## Need help with your technical school or college expenses?

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.

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### Working Samples: Using 3D Printers & 1-Up Formers

By Chris Pohlman, Brian Allers, Alex Augustin, Genpak Corporation, Middletown, NY

**3D** printing allows designers, engineers, and entrepreneurs to create objects never before imagined in today's thermoforming industry, with a turnaround rate that is faster and cheaper than ever. This article will focus on the investigation that led us to evaluate 3D printing technology and to make professional quality thermoformed parts using a 3D printed mold for food packaging.

#### Recognizing the Problem

Clients and competitors are using a combination of 3D printers and one-up forming machines to get high-quality, working thermoformed samples within 3-5 business days. A client said that our turnaround time was not adequate in today's industry. After some research, we realized many of our competitors were utilizing a Formech 508FS one-up thermoformer.

#### Mold Attempt #1

Using the Dimensions SST 1200 ES 3D printer, we printed a mold using ABSplus thermoplastic at a .010" layer thickness resolution. The female mold also utilized a plug assist that would be done by hand to help distribute even sheet thickness. The material used was 15mil APET. The mold utilized vacuum tracks and channels.



Figure 1: Dimensions SST 1200ES



Figure 2: Negative cavity

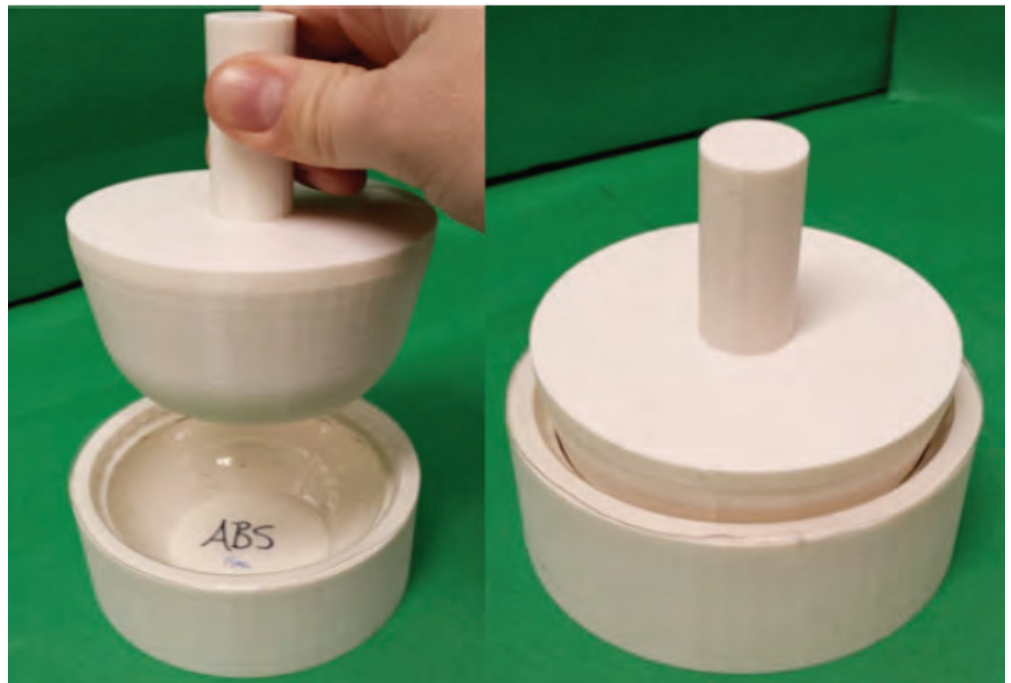


Figure 3: manual plug assist

#### Mold Attempt #1: Results

Our results were pleasing overall. We were able to provide a nice snap-fit seal with the cup. The detail in our flutes was prominent. The prototype was not ideal initially because the de-nesting lugs were not formed properly. You can see the grid-like pitting that was formed into the plastic and therefore changed the texture of the material.





Figure 4: thermoformed product sample; detail

## Mold Attempt #2

After reflecting on the quality of the first thermoformed sample, we needed to explore other 3D printers with higher resolution and various build materials. We reached out to CIMQuest who is contracted to service our Dimensions SST1200ES to see what options are available. We asked them to print our molds using the Objet Eden 260V. The finish options were non-gloss and gloss.

To better understand the differences between the Dimensions 1200ES and Eden 260V we visited CIMQuest and printed some small sample parts ourselves. The print was quick and the removal of the support material was finished in less than 10 minutes because it uses a secondary water pressure station to blast it off.



Figure 5: Positive mold with non-gloss finish; sample non-gloss sample

## Mold Attempt #2 Results

The male mold with non-gloss finish had a hollowed core with material thickness of 0.25" to withstand heat and pressure when vacuum is applied. The non-gloss was 10x better than the ABS sample and the gloss finish is of product quality. To have a 3D printer that doesn't require sanding, bead blasting, epoxy or any additional steps after having the support material removed is a monumental benefit.

## Reflections & Summary

**Best 3D Printer:** Eden 260V

**Best Mold Type:** Negative

- May require a manual plug assist.
- Once a sample is formed it is easiest to remove from mold.
- Consider where plastic needs to be thickest; first point of contact on the mold is where material will be thickest.

## Tips and Tricks for ABS Molds via Fused Deposition Modeling

### Surface Finish

- Use acetone to melt the plastic together, but...
- Submerge the product in acetone in 5 second intervals after drying completely.
- Try vaporizing if you have the time.
  - May turn mold gray or white but bead blasting or sanding will remove it.
  - Shave it using a razor blade on flat surfaces. This removes grooves and allows maximum transparency in thermoformed part.

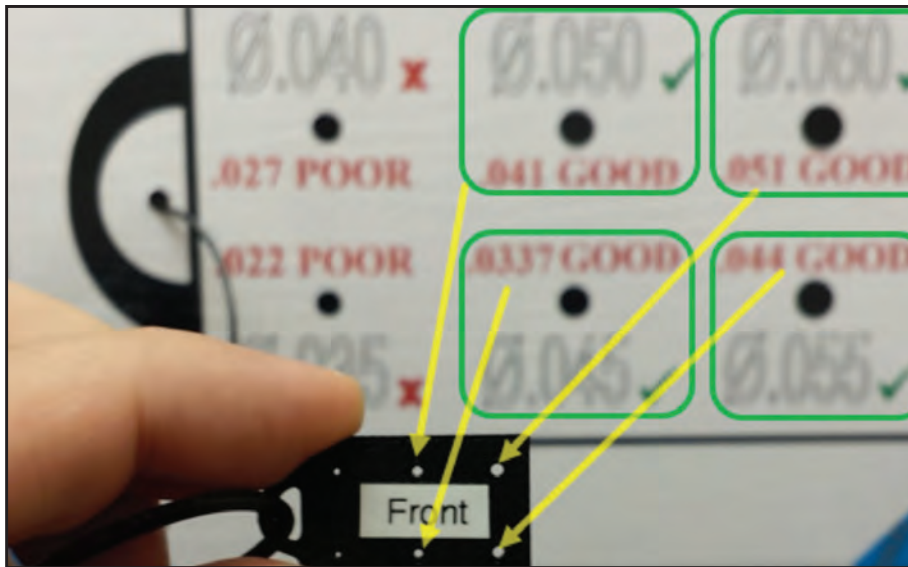
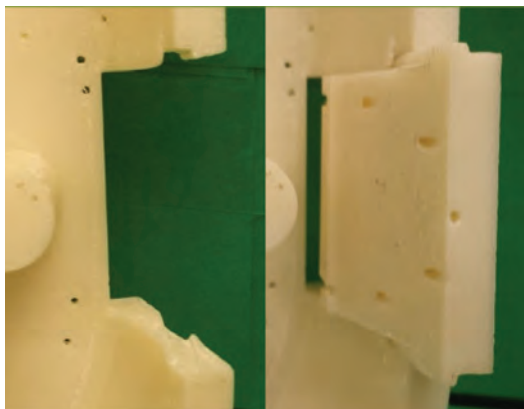


Figure 7: map of designed vs. actual vacuum hole sizes

## Tips and Tricks for ABS Molds

### Vacuum Hole Size

- The accuracy and tolerance of the ABS vacuum lines varies on the location, determined by what surface it is on.
- If the vacuum hole is placed on a flat surface, the CAD hole size should be .045" but it will be printed at .0337" in real life.
- If vacuum hole is put on a curved surface, like a seal, the CAD hole size should be .055" but it comes out to be .044" in real life.
- The quality of the vacuum lines is not completely concentric until the CAD dimension is .045.



## Tips and Tricks for Forming

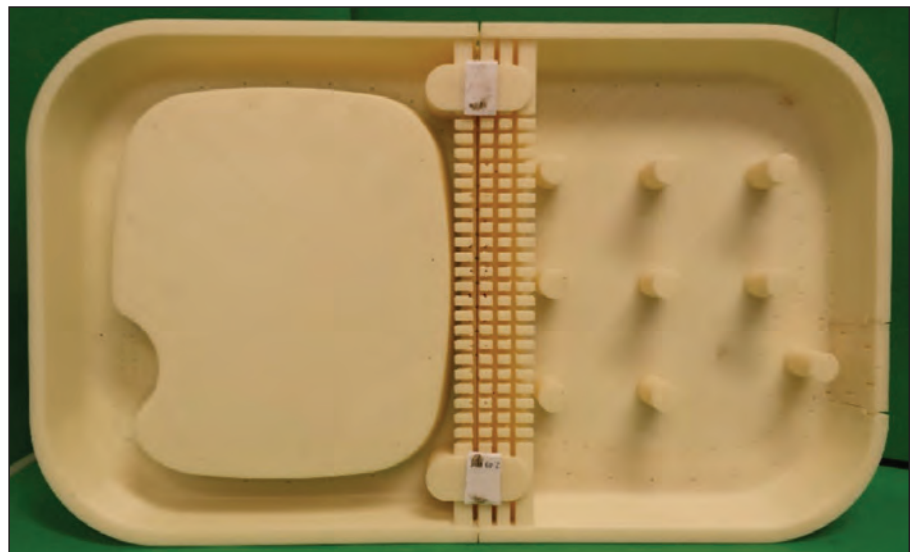
### Pre-Heat

- Always pre-heat to get quartz heaters warmed up.
- Be sure not to have the mold inside the heating station and ensure that it is free of any liquid or debris that might damage the vacuum pump.
- The mold might warp, therefore we suggest ABS mold wall thickness be between .25" and .375" and allow time for the mold to cool off in between shots.

## Tips and Tricks for Mold Design

### Keep Heat & Pressure in Mind

- If your mold is too big to be printed, split it into multiple parts using dowel pins and holes with a press fit relationship. This allows you to sand them down later if too tight as well as epoxy them together.
- Interchangeable parts can be a valuable feature design within a mold for testing specific functions on your mold and product. |



For reinforcement the standoff where the dowel rods met was designed like a heatsink

Standoffs were made  $\text{Ø}.375''$  to  $\text{Ø}.5''$  to prevent buckling

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### Understanding Bioplastics and Sustainability

By Ryan Hunt, CTO, ALGIX, LLC

The emergence of bio-based materials in the plastics industry has created a wide variety of new technologies and resin platforms that can be used to replace conventional plastics. Understanding the technical jargon and the technology landscape of what bioplastics truly are - and what they do - can be confusing and can limit adoption in the commercial marketplace.

The most common question is, “What are bioplastics?” The answer is not simple. By definition, bioplastics are plastics derived from renewable biomass resources, such as vegetable fats and oils, corn starch, agricultural byproducts, or microorganisms (bacteria or algae). Bioplastics may be biodegradable, meaning that microorganisms can consume the material and convert it into CO<sub>2</sub> and water, usually through a composting process. Examples of these are PLA, PHA, PBS and starch blends. On the other hand, some bioplastics may be durable, meaning that they cannot be consumed by microorganisms but offer the ability to be recycled through conventional means. Examples include Bio-PE, Bio-PET, Bio-PTT and Bio-PA. Fossil-based plastics that are biodegradable and are not generated from renewable biomass resources may be considered “bioplastics.” These materials, such as PBAT and PCL, can offer a biodegradable end of life option, even though they are produced from oil.

How does one select the type of material is best for them? Like any other material, it must provide the desired functionality and performance to meet end-use requirements. In cases where two polymers meet desired performance metrics, one may be bio-based and the other non-renewable.

A life cycle assessment (LCA) can be employed to compare the total environmental impact of a product through all stages of its life cycle. An LCA uses established databases, scientific literature, and first-hand data to compile all inputs and outputs required to create a product. The final results are quantitative metrics showing the amount of carbon dioxide equivalence (CO<sub>2</sub>e) released, energy and water consumed, as well as human health and ecosystem impacts. These metrics are directly comparable to competitive products to inform users which product has the least impact on the environment. LCA has become the go-to tool for large companies and brand owners

to understand environmental and economic shortcomings and to focus efforts on a sustainable and competitive process improvement (see “Carbon and Environmental Footprint of PLA Products” in vol. 27, no. 4, 2008, pp.32-34 for more information on LCA and carbon footprint measurements).

Once a brand owner or converter understands bioplastics and the end of life options for these materials, the next step is to understand the available conversion techniques and applications. While an in-depth analysis of each polymer and its capabilities is beyond the scope of this summary, bioplastics have a history of use in injection molding, sheet extrusion, thermoforming, blown films, blow molding, fiber extrusion and profile extrusion. Many bioplastics can offer performance advantages, such as biodegradability in composting or marine environments, improved gas exchange, low toxicity, and natural aesthetics, among others.

Over the past few years, public awareness of pollution, including both terrestrial and ocean disposal issues, has increased. Consumer awareness is driving brand owners to consider alternative materials that offer a more sustainable life cycle as illustrated by LCA analysis. There is explosive growth in the bioplastic space where durable bioplastics, such as Bio-PET and Bio-PE, are being used for bottles and packaging. Similarly, steady growth in biodegradable bioplastics is dominated by PLA and polyesters. Bioplastics represent a fast-growing segment of our industry that is constantly innovating and developing eco-friendly alternatives to many conventional plastics. |

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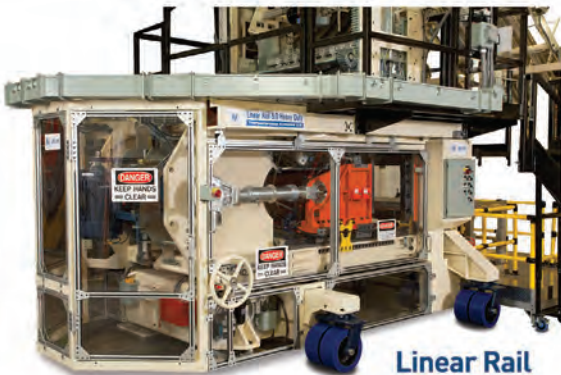
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# KYDEX® 4545 makes KYDEX® Thermoplastics the first complete aviation interiors product line in the thermoplastic extrusion industry

This year, SEKISUI Polymer Innovations, LLC, manufacturer of KYDEX® and ALLEN® thermoplastic sheet products, became the first and only manufacturer in the thermoplastic extrusion industry to offer a complete aviation interiors product line. With the addition of KYDEX® 4545, aviation interior project teams can choose from a portfolio of fully-compliant materials from one supplier - from flight deck to economy class.

### Exceeding regulations while providing design flexibility

KYDEX® 4545 is an ultra-low heat release, proprietary, high performance thermoplastic sheet specifically formulated to exceed the heat release and smoke density requirements in FAR 25.853. KYDEX® 4545's excellent formability and fabrication characteristics and tight tolerance control are perfect for complex 3D shapes and sharp detail. It is available in a wide range of colors and velour matte texture, with low MOQs and quick turnarounds.

The product name 4545 corresponds to two measurements of heat release in a regulation established by the US Federal Aviation Administration. The regulation FAR 25.853d is comprised of two separate tests: OSU Rate of Heat Release, which specifies that materials cannot exceed rates of 65/65 and Specific Optical Density of Smoke Generated by Solid Materials. The OSU rate of heat release attempts to limit the possibility that materials with large outer surface areas will flashover, become rapidly involved in a fire, or readily contribute to an existing fire in a crash situation. The smoke density test determines the smoke generation of a burning material to help improve passenger egress capability after a fire.

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in a crash situation. The smoke density test determines the smoke generation of a burning material to help improve passenger egress capability after a fire.

The product's ultra-low heat release, wide processing window, and ease of thermoforming make it ideal for composite components that include bonded build-up applications. This allows project teams the flexibility to use a number

### WHAT DOES BONDED BUILD UP MEAN?

This aviation interiors term refers to components created out of multiple materials. For example, a section divider might have a honeycomb core with a thermoplastic exterior. A seat can use several different materials including thermoplastic, foam, leather or fabric, and an in-flight entertainment system.

### A history of supplying the aviation interiors industry

Since the first product was invented in 1965, KYDEX® Thermoplastics have been used in aircraft interiors in applications like seat backs, tray tables, bulkheads, and partitions. They are lighter than the phenolic products traditionally used in aviation interiors. And, unlike parts made with phenolic materials, KYDEX® thermoplastics can be recycled back into the industrial production stream. (See inset for the full aviation interiors portfolio product guide.

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## About SEKISUI SPI

SEKISUI SPI manufactures KYDEX® and ALLEN® thermoplastic sheet, which is thermoformed by SPI customers into 3D components used in leading edge markets including aviation and mass transit interiors, medical devices, heavy equipment and agriculture, and electronic equipment housings. In 2014, KYDEX, LLC in Bloomsburg, PA and Allen Extruders, LLC in Holland MI were combined to form SEKISUI SPI.

KYDEX® Thermoplastics are used over alternative materials because of their product attributes (fire retardancy, environmentally sensitive, chemical resistant and highly durable), wide processing window, and refined aesthetic. ALLEN® thermoplastics are engineered to demanding specifications for applications like heavy truck and construction equipment components. The high-gloss smooth materials are considered 'best in class' and are used for applications as diverse as recreation vehicles to electric car charging stations. SEKISUI SPI is part of SEKISUI Chemical Company, an \$11 billion global leader in plastics and chemicals. Visit [www.sekisui-spi.com](http://www.sekisui-spi.com) for more information. |



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Look to past articles for guidance.
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### Report from FAKUMA, Friedrichshafen, Germany

By Conor Carlin, Editor

**How** many times have you been to a tradeshow and complained about the badges? Perhaps you were an exhibitor and you had difficulty reading names and companies from a distance. More likely, the badges were flipped around so you couldn't see anything. Or you've been a visitor to a booth and your host struggled to scan or read your badge. At Fakuma, there were no such problems because there were no badges at all! What a novel idea, and certainly done by design. From this, I could only infer that people had to introduce themselves directly and offer cards in an attempt to conduct business. With only a smattering of German, I didn't do too badly when asking exhibitors for their thoughts on the industry. Of course, this could have been due to the fact that their English was decidedly better than my German.



Fakuma is billed as containing “the entire world of plastics technology.” The exhibition’s name is derived from the German for “**F**ach” (subject) + “**A**ustellung” (exhibition) + “**K**unststoff” (plastics) + “**M**aschinen” (machinery). (Now you know.) From the perspective of thermoformers, however, it has usually been viewed as a regional show mainly focused on injection

molding, tool making and ancillary technologies. And although the show organizers gamely organized a small “thermoforming center”, Fakuma remains a show for other primary plastics processes. Some of the largest booths belonged to Sumitomo, Engel, Arburg, Milacron, Wittman and Sepro, the last two being major robotics companies.

“Industry 4.0” was the official show theme. Defined as “integrated production”, Industry 4.0 is essentially the next stage in the evolution of production efficiency where robotics and software are more easily integrated and production systems become more digitally interconnected and interdependent. Automation and light-weighting were two obvious themes throughout the halls. A quick read of the show daily indicated that a few of the larger OEMs expect to post increased sales in 2015 while other companies are pursuing capacity expansion, including several who are targeting the US. Several companies discussed their plans for increased hiring and training, typically through their proven apprenticeship programs (*see article on pp. 8-9 for in-depth discussion of the German model*). Much of the technology and parts was geared toward the automotive supply chain which, in this part of the world, is deep and extensive.

That said, those brave thermoforming souls who exhibited could certainly claim to provide solutions with both machinery suppliers and heavy-gauge processors displaying their wares.

Geiss, Illig and Frimo displayed single station forming machines. Cannon and Kiefel had informational booths with examples of heavy-gauge parts on display. CMS, an Italian OEM, displayed a 5-axis trimming machine. Mould & Matic, a toolmaker that is part of the Haidlmair Group in Austria, was one of the only companies focused on thin-gauge packaging industry.

The thermoforming island was populated by smaller companies - custom formers - that offered expertise in ABS and PMMA forming for point of purchase, transport trays, dunnage, automotive interiors, laminated panels, structural parts as well as some exterior components with UV-protection. A few displayed impressive parts illustrating the abilities of the thermoformed process to deliver high-quality solutions for demanding applications. Though small, these companies were exporting their parts to Brazil, Argentina and other non-European markets.

Fakuma was fully booked since February and though it is held twice every three years (no show in 2016 which is a K year), the organizers stated that they don't want to “significantly exceed” the magnitude of this year's event. For those North American companies who haven't ventured to Friedrichshafen before, you have a bit of time to decide before the next event in 2017. |

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# 2015 Thermoforming Parts Competition: Packaging, Consumer, Medical Products all Take Home Awards

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By Bill Bregar, *Plastics News*

ATLANTA — Two companies — Allied Plastics Inc. and Les Produits Plastitel Inc. — tied for the People's Choice Award, and each won another category award in the parts competition at the Society of Plastics Engineers Thermoforming Conference in Atlanta.

The People's Choice Award is voted on by conference attendees.

Wilbert Plastic Services Inc. of Belmont, N.C. won a gold in the category of heavy-gauge innovation, as well as the Judges' Award for its medical part.

The SPE Thermoforming Division handed out 20 awards to companies and students Sept. 1 during a dinner at the conference.

Matt O'Hagan, chairman of the parts competition, said a total of 30 part entries and eight student parts vied for the awards. He said the contest generated a strong crop of products.

"The quality of the parts, value-add and innovation, it was all there," said O'Hagan, who is sales manager, non-automotive and distribution for LyondellBasell's Equistar business. He is based in Lansing, Mich.

Both student winners were from the University of Wisconsin. Kevin Langer won \$1,000 for his turtle shower caddie. David Charlier picked up \$500 for his product, called a Whirl, with six thermoformed compartments in a round holder.

The division received the student parts from Richard Freeman of Freetech Plastics Inc. in Fremont, Calif.

Here is a recap of the parts competition winners:

### **Roll-fed consumer, gold**

Think4D Inc. of Antona, Manitoba, won the gold award for the packaging for Gillette's Venus Swirl women's razor. A key is the technology to print and form the silver Flexiball on the package. The Flexiball acts like a rotating hinge for the razor.

The package, hinged like a clamshell, is easy to open. Think4D prints and forms the blister packaging, which can be heat-sealed in an automated production line. The multidimensional lids are packed hot right off the thermoforming line onto thermoformed

packing trays, and the residual heat maintains the desired arc required, which reduces scrap and increases line speed, according to the company.

The Venus Swirl package is made of PET, recycled PET and paperboard.

### **Roll-fed consumer, silver**

Another Gillette razor package — this one the men's Fusion — netted the silver award for Placon Corp. of Madison, Wis. The package features an easy-open design, through a 360-degree perforation around the periphery of the PET blister pack, which is then heat-sealed to a paperboard insert. A pull-tab, marked with an arrow at the top of the blister, shows the consumer where to pull down and easily separate the plastic blister from the paperboard.

Placon controlled the perforation tearing — not too easy, not too difficult — by adjusting stop blocks and changing the height in the tool.

The trimming to create the perforation presented a challenge. The thermoformer used matched metal tooling and innovative trimming techniques to make the perforated outer trim with the multi-level final trim manufactured in only two trim presses.

Blister walls were canted in at a specific draft angle, and the package designed so it can be integrated into Gillette's high-speed automated packaging.

### **Roll-fed food, gold**

Plastic Ingenuity Inc. of Cross Plains, Wis., brought home the gold for a two-component tray that holds healthy snack products from Sargento, preventing the unwanted mixing of the items — cheese in one portion and fruit and nuts in the other. The outer sleeve gives eye-catching graphics, nutritional information, radial-shaped sides and product visibility from multiple angles.

One critical element: the reverse draft stacking, allowing for easy separation of the trays with high-speed, automated de-nesting equipment, while remaining transparent to the consumer, unlike typical random, alternating stacking lugs used on thermoformed trays, according to the company.

### **Roll-fed innovation, gold**

OMG srl of Givoletto, Italy, near Turin, won the gold for a paintable thermoformed panel that resembles a brick/stone wall. The panel is made of PVC sheet, produced in a thin-gauge thermoforming machine from roll-stock. Forming, cutting, bending and punching are done in a 30-second cycle.

The part is made with a production tool with a temperature controlled aluminum mold, OMG said.

### **Roll-fed recycled, gold**

Innovative Plastech Inc. of Batavia, Ill., won the top honor in recycled content for its reusable dunnage tray that holds 40 two-liter soda bottles for shipping, distribution and displaying in warehouse-type retail stores, without the need for extra shelving, other than a pallet.

Each tray is molded from recycled PET sheet.

Bottles are loaded, then topped with an empty tray, which locates on the bottle caps below. This nesting saves vertical space. Two of the trays fit next to each other on a standard-size pallet. Once the stacks of trays and bottles get up to five layers high, the pallet is wrapped for shipping.

Since the trays nest over the bottles, bottles cannot slip out of the stack when shipping, as can happen with sheets of cardboard, according to the company.

One difficulty in forming is the thickness of the material (0.70-inch). The chain rails on the thermoforming line need to be heated in order to pierce the material. Also, the external roller drive is critical to getting the material fed into the thermoformer. The trays are made on a single-cavity aluminum mold, attached to a water-cooled block for good temperature control.

### **Roll-fed recycled, silver**

Plastic Ingenuity won silver for its clamshell package for Flonase over-the-counter nasal allergy relief spray.

The curved-flow clamshell has a continuously varying, non-planar seal that differentiates the brand in stores. The coined hinge technology provides a high level of repeatability during robotic closing in high-speed automation. A durable snap closure is important to keep the packs closed during the 180-degree, aggressive robotic transfer of the packs into the sealing station.

The designers made a narrower-than-typical bottom flange and gave additional features, so the pack could stand on a shelf and work well with retail pusher trays. As a result, the narrow flange increased the complexity of the heat-sealing process. A patent-pending sealing technology was developed to seal the pack, with its continuously varying, non-planar flange.

The package contains about 40 percent post-industrial recycled material.

### **Heavy-gauge vacuum forming, gold**

Plastitel grabbed the gold in this category — and a People's Choice Award — for a system of thermoplastic polyurethane pods used as the main support surface on a Stryker IsoLibrium medical bed. The pods are divided into four sections, individually controlled to maintain the correct pressure needed for the patient.

The pods help the mobility of the patient, improving the functioning of vital organs, helping to reduce bed sores and improving circulation.

### **Heavy-gauge vacuum forming, silver**

Medallion Plastics Inc. of Elkhart, Ind., picked up the silver for an aftermarket hood for a Ford F-150 pickup truck, the one made with an aluminum body.

The hood's design features an outer and inner hood assembled together, to replace the F-150's original hood for an aftermarket truck assembly plant. The two-piece hood uses a black smooth polycarbonate/ABS for high impact strength combined with high heat deflection.

Medallion uses a ceramic tool that is non-water cooled, allowing an innovative design to allow for negative drafts.

According to the company, the PC/ABS hood replaced a much heavier aftermarket glass-fiber reinforced hood that weighed about 20 percent more. It also cuts the time in half for processing, preparation and painting.

### **Heavy-gauge pressure forming, gold**

Specialty Manufacturing Inc. of San Diego, won the gold for an assembly for a medical device used in an operating room.

SMI forms the parts from Kydex-T sheet. The design uses snap-fit features to attach the canister chamber, which eliminated the need for mechanical fasteners and cut assembly time. Formed-in features also allowed for easy, consistent part alignment.

Formed-in threads also addressed a customer requirement to reduce secondary operations and reduce the total number of parts. The tooling is temperature-controlled production tooling that is machined from block aluminum.

### **Heavy-gauge pressure forming, silver**

Productive Plastics Inc. of Mount Laurel, N.J., won for its three-part cover for an automated diagnostic system that checks patient test results and flags them for doctor evaluation.

Productive uses Baystate Casting and Borke Mold for tooling, using a textured mold. All parts use pushers to pre-stretch the materials.

Kydex-T sheet allows for the required wall thicknesses and consistency over multiple runs and hundreds of parts.

The kiosk design had the parts fitting to a metal skeleton with very tight tolerances for the attachment. The full assembly is seven different parts.

All of the three pressure formed parts use undercuts to make formed-in seams. Because of the depth of the location of the undercut, the tooling loose pieces had to be temperature controlled to reduce the effect of warpage during processing.

### **Twin-sheet, gold**

Profile Plastics Inc. of Lake Bluff, Ill., won the gold for an air duct that cools critical elements of a medical diagnostic machine.

The material is Kydex-T. The tooling of machined aluminum female twin-sheet production tooling with temperature control.

The two-cavity mold forms left-hand and right-hand parts.

The customer chose a twin-sheet design over other processes for a combination of low-cost tooling, dimensional stability and design flexibility.

### **Twin-sheet, silver**

Associated Thermoforming Inc. of Berthoud, Colo., won silver for intake and exhaust ducts for the healthcare industry, from Kydex-T sheet.

ATI officials note the parts have very challenging draw ratios and required minimum wall thicknesses, adding to the difficulty in forming the part. The company uses a two-up aluminum billet, temperature controlled tool.

### **Heavy-gauge TPO, gold**

Allied Plastics won gold in this category — and also grabbed a People's Choice Award — for a two-piece enclosure housing for the engine and fuel tank for a mobile light tower.

The material is a high-flexural-modulus thermoplastic olefin, in varying combinations of colors. The parts are made on water-cooled, cast-aluminum molds, which were cast-oversized, then CNC-machined to CAD data supplied by the customer.

The depth of draw versus multiple potential undercut features meant that part orientation on the tool was very critical, Allied officials said.

The plastic enclosure replaced a metal housing. The TPO housing offered weight savings, and eliminated the need for painting. It's also corrosion proof.

### **Heavy-gauge TPO, silver**

Brentwood Industries Inc. of Reading, Pa., snagged the silver for a center console for the interior of a refuse truck, formed on Primex TPO sheet. The assembly replaces a sheet metal interior panels on the previous model of the truck.

The pressure-formed part gives a highly aesthetic, structurally rigid assembly. The material is custom colored gray and black, and formed on an acid-etched mold surface to give a medium-gloss appearance. The machined-millet mold has four hydraulically controlled core pulls, to create the recess for the metal gauge panels.

### **Heavy-gauge value added, gold**

Productive Plastics won gold for a cover for a medical diagnostic scanning machine. Parts are pressure formed using a cast and machined mold. All parts utilized pushers to pre-stretch materials, to achieve the customer's requirement for distribution of materials.

The company used Kydex-T sheet.

The 10 parts use undercuts and are formed in mating edges, for better line-to-line fit. The assembly allows for the parts to fit a separate metal frame that comes together at a staging location.

Productive Plastics paints the covers using a high-gloss PPG paint.

### **Heavy-gauge value added, silver**

Kintz Plastics Inc. of Howes Cave, N.Y., picked up silver for a pressure-formed top cover enclosure for a portable medical laser unit used to remove tattoos.

The cover measures about 20 inches wide by 34 inches long, and is formed on a female, machined aluminum, temperature-controlled mold that is more than 11 inches deep. The material is Kydex-T sheet, extruded to size.

To accommodate the fact the three of the top cover's sidewalls had zero draft, horizontal ribbing for venting, undercuts and several molded-in sidewall recesses, three of the four molded sidewalls retract pneumatically, to allow the forming of the features and removal of the part after forming.

A syntactic foam plug-assist helps stretch the heated plastic into the deep mold.

After the part is formed, Kintz adds internal blocks for mounting features, then machines the cover on a large five-axis machining center. Then the company adds 16 threaded inserts used for mounting. Finally, the cover gets a copper conductive coating on the inside, and a two-tone paint finish on the outside surfaces.

### **Heavy-gauge innovation, gold**

Wilbert won for a medical enclosure made with temperature-controlled positive tooling for vacuum forming, and negative tooling with action for pressure forming. The part also won the Judge's Award.

The sheet materials include PVC/acrylic, polycarbonate and PC/ABS.

Undercut features on tooling hide trimmed edges on parts at transition areas. The enclosure uses hidden fasteners.

Each enclosure kit is packaged and shipped to the customer.

### **Heavy-gauge innovation, silver**

Medallion Plastics got silver for dashboard top for a motorhome, featuring automotive-style sticking. The company said that is a step up from the current ABS/vinyl wrapped style of dash tops for motorhomes in the high-end, Class A motorhome segment.

Medallion uses a ceramic tool that is non-water cooled to make the part. An innovative design allows for negative drafts.

The assembly includes a dash top outer, an inner, foam and a cut-and-sew stitched cover. |

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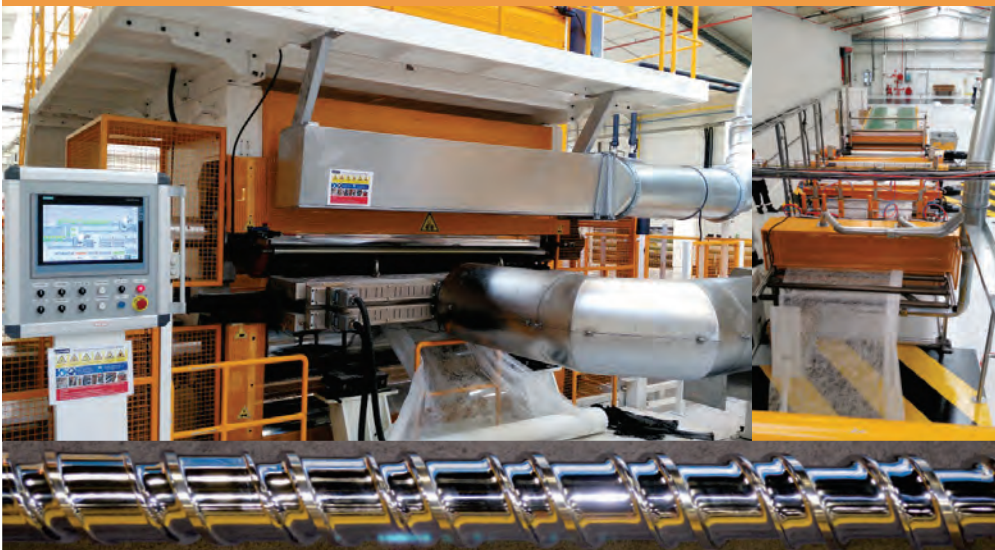
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# 2015 THERMOFORMING CONFER



## PEOPLE'S CHOICE AWARD Winner

2-piece Enclosure  
Allied Plastics



## PEOPLE'S CHOICE AWARD Winner

PU Pods  
Les Produits Plastitel



## HEAVY GAUGE INNOVATION Gold & Judges' Award

Medical Enclosures  
Wilbert Plastic Services



## HEAVY GAUGE INNOVATION Silver

Dashboard Top  
Medallion Plastics

## HEAVY GAUGE VACUUM FORMING Gold

PU Pods  
Les Produits Plastitel



## HEAVY GAUGE VACUUM FORMING Silver

F-150 Hood  
Medallion Plastics



## HEAVY GAUGE PRESSURE FORMING Gold

Medical Device Assembly  
Specialty Manufacturing



## HEAVY GAUGE PRESSURE FORMING Silver

Automatic Diagnostic System  
Cover  
Productive Plastics



# 2015 THERMOFORMING CONFER



## HEAVY GAUGE TWIN SHEET

**Gold**

Air Duct  
Profile Plastics



## HEAVY GAUGE TWIN SHEET

**Silver**

Intake / Exhaust Ducts  
Associated Thermoforming



## HEAVY GAUGE TPO

**Gold**

2-piece Enclosure  
Allied Plastics



## HEAVY GAUGE TPO

**Silver**

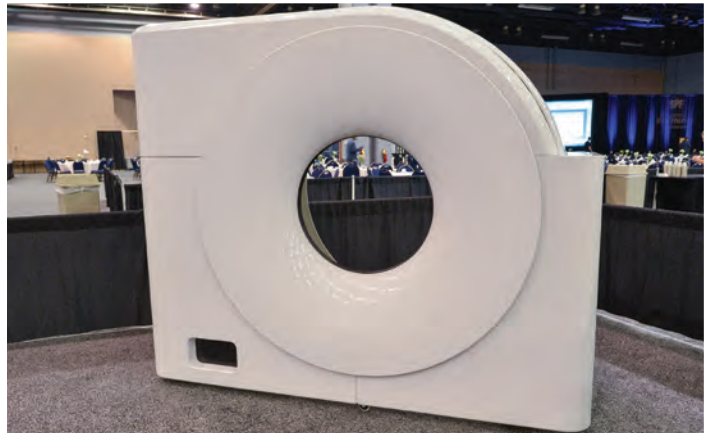
Center Truck Console  
Brentwood Industries



# ENCE AND PARTS COMPETITION

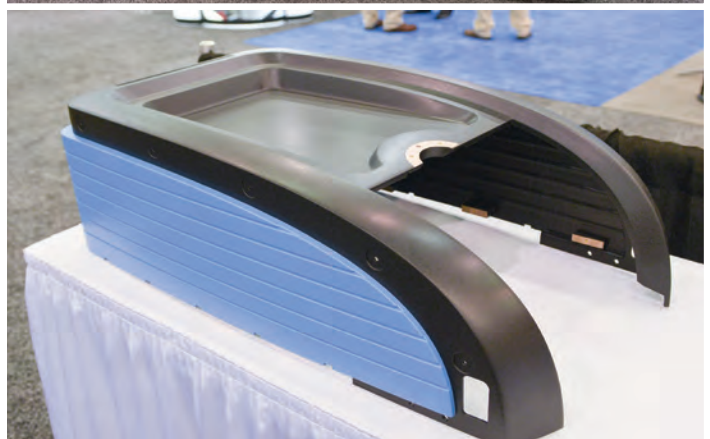
## HEAVY GAUGE VALUE-ADDED Gold

Cover for Medical Diagnostic  
Scanner  
Productive Plastics



## HEAVY GAUGE VALUE-ADDED Silver

Enclosure for Medical Laser Unit  
Kintz Plastics



All photos courtesy of Dallager Photography.

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## ROLL-FED CONSUMER Gold

Gillette Venus  
think4D



## ROLL-FED CONSUMER Silver

Gillette Fusion  
Placon



## ROLL-FED FOOD Gold

Sargento Tray  
Plastic Ingenuity



## ROLL-FED INNOVATION Gold

PVC Panel  
OMG srl

# ENCE AND PARTS COMPETITION

## ROLL-FED RECYCLING Gold

Dunnage Tray  
Innovative Plastech



## ROLL-FED RECYCLING Silver

Flonase Clamshell  
Plastic Ingenuity



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### Safeman & Cannon Partnering for the Benefit of Refugees

By Zvi Rappaport, North America Sales Director for Cannon USA

*The IKEA foundation is developing and testing a better home for refugee families, in partnership with the United Nations Refugee Agency (UNHCR) and Better Shelter. Cannon provided the Swedish thermoformer Safeman with equipment required to produce the plastic modular shelter.*



Many of the textile or plastic shelters currently used in refugee camps have a life span of as little as six months before the impact of sun, rain and wind calls for their replacement. Unfortunately, refugees can stay in camps for several years. Not only does this leave vulnerable families even more exposed to the challenges of life in a refugee camp, it also presents a huge burden to the aid agencies and governments that are trying to create a more dignified life for the millions of people who have had to flee their homes. Thanks to the IKEA Foundation's focus on funding innovative projects and developing connections between its partners, that could be set to change.

#### Collaborating for the benefit of refugees

The IKEA Foundation provides project funding and management support for refugee projects while UNHCR brings the know-how and field experience. Better Shelter, a social venture, develops the prototypes and specifications for houses that are put up in modules and can be delivered in flat packs, a well-known IKEA concept that simplifies transport.

#### A smart, portable shelter

The houses are designed to be set up, taken apart and transported easily. A tubular steel structure, similar to that used for camping tents, supports modular paneling elements for the roof and the walls. These panels, made by thermoforming rectangular sheets of expanded TPO (thermoplastic polyolefin), are characterized by an excellent resistance to UV rays and rain. The lightweight panels are fixed to one another through simple plastic buttons and, when installed, they guarantee a certain degree of thermal insulation, a complete tightness to light, wind and rain, while preserving "optically" the privacy of the family living in the shelter, a defect much criticized of the textile tents widely used as shelter until now.



*Four hours are needed to mount a complete shelter.*

Each house is fitted with a flexible type of solar power unit, which is sufficient to power one lamp that comes with the house, and a USB port. The USB option may look odd, but it shows the high conceptual level behind the project. The refugees, approximately 3.5 million, live in UN-provided tents. They not only demand comfort, security and dignity, but they also need a way to communicate with the rest of the world. Their mobile phones, tablets and computers plug into the same four-pin ports that we all use.

The prototypes of the shelter have been tested in refugee camps in Ethiopia and Iraq. The families who live in the shelters have had a direct say in how the product is developed, contributing their vivid experience to this collaborative process.

Began in 2008, the project required a number of refinements prior to the definition of the ideal shelter. When the decision was made to use thermoformed plastic walls and roof, NORTEC-Cannon AS (the Cannon agency in Northern Europe) was consulted by the Swedish company Safeman for the supply of a proper industrial solution that could provide a large number of parts in a fast and realistic manner. Safeman manufactures



*The prototyping of parts was done in Cannon Ergos, producing more than 1,000 thermoformed wall and roof panels in expanded TPO (thermoplastic polyolefin).*

everything from custom parts to high-volume units to assembled products for the industrial sector. The company designs and manufactures products using materials such as plastic, textile, foil, leather and metal. They were involved from the beginning in the development of this innovative shelter.



*The assembly plan for the new shelter, utilising typical IKEA packing concept.*

Cannon Ergos was also involved and responded by designing a complete production solution, while offering their laboratory facilities to supply the desired prototypes for the field tests. The suggested thermoforming solution aimed to produce a totally trim-less panel: no peripheral scrap is generated in this project, thereby reducing waste and contributing to the overall project economics.

### **A dedicated, environmentally-friendly solution**

The plant, supplied by Cannon Ergos in the first quarter of 2015, includes:

- Two forming presses to shape five different types of panels served by four handling robots
- Three presses to punch the holes for the connecting buttons
- Five thermoforming molds
- The heating stations for the plastic sheets
- The complete engineering of the plant
- Two prototyping molds and all the relevant production of prototypes

When fully operative, this plant will be able to produce panels for about 30,000 shelters/year.



*A partial view of the thermoforming plant, during construction in Cannon Ergos.*

“This is a clear example of how we use design and the design process to create benefits based on the user’s needs,” explains Anders Rexare Thulin, Chief Executive of Better Shelter. “We create added value for every euro with houses that are cheap and durable.”

*We thank IKEA Foundation ([www.ikeafoundation.org](http://www.ikeafoundation.org)) for parts of the article and for the shelters pictures. |*

## Why Join?



It has never been more important to be a member of your professional society than now, in the current climate of change and volatility in the plastics industry. Now, more than ever, the information you access and the personal networks you create can and will directly impact your future and your career.

**Active membership in SPE – keeps you current, keeps you informed, and keeps you connected.**

The question really isn't "why join?"  
but ...

## Why Not?

# COUNCIL SUMMARY



November 6, 2015 — As the new official “greybeard” of the Thermoforming Division, I am grateful for the privilege of being the spokesperson for the Division in Society matters.

The role is interesting because the Councilor is the advocate for the Thermoforming Division. I will be addressing the concerns of our division to the Council and the staff of SPE. In turn, I will be reporting the Council’s activities to the board and membership.

The meeting itself was a series of reports from the Executive Committee and staff. Financial, membership and programs were presented. Budgets remain tight but are being managed in a very fiscally conservative manner. That said, the budget is projected to have a loss of about (\$150k) this year. This can be attributed to the rollout of new programs, new software and upgrades to IT infrastructure. In addition, we had an NPE year in 2015 which meant we missed \$350k in exhibit sales from ANTEC. ANTEC Europe was also canceled and therefore added as an expense to the income statement.

SPE is evolving. The realization has sunk in that the Society has to change from its former line of thinking to become a more progressive organization. This began last year and is now beginning to bear fruit. What are we talking about?

First, the Society reviewed its entire operation from top to bottom. Russell Broome, a past President, was brought in as the managing director for North/South American Operations while Willem De Vos serves as the Chief Executive Officer. The staff was realigned and some changes were made.

SPE Headquarters picked up more responsibilities from the Divisions and Sections such as website help, new TOPCON registration programs, new information technologies and several other initiatives that add more value for the membership.

Go the SPE website and check out some the newest programs for yourself. One is *Insight*. This is a program that allows you to customize news feeds from various sources on topics of interest to you. Rather than wading through articles and feeds that you don’t interest you, you can now get current information tailored to your specific needs and it will arrive when and how you specify. This is just one many projects underway to improve services to the membership. Another innovation is *The Chain*. This is an online forum for technical and commercial discussions that allows members to post questions and seek answers to technical issues from the all 15,000+ members.

The business model is also changing. The Society realizes that it cannot exist on revenue from membership dues only and so new revenue stream opportunities are being developed. Advertising, webinars, corporate sponsorships and other initiatives are being deployed. For reference, in the 1990s, membership and ANTEC revenues contributed \$5.5M annually. Today, that number is \$2.2M.

So yes - your Society is moving to adapt to the new challenges and it has a solid plan in place. There will be more to follow in the next report.

Thank you,  
Jay Waddell  
Councilor

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# 10<sup>th</sup> EUROPEAN THERMOFORMING CONFERENCE 2016

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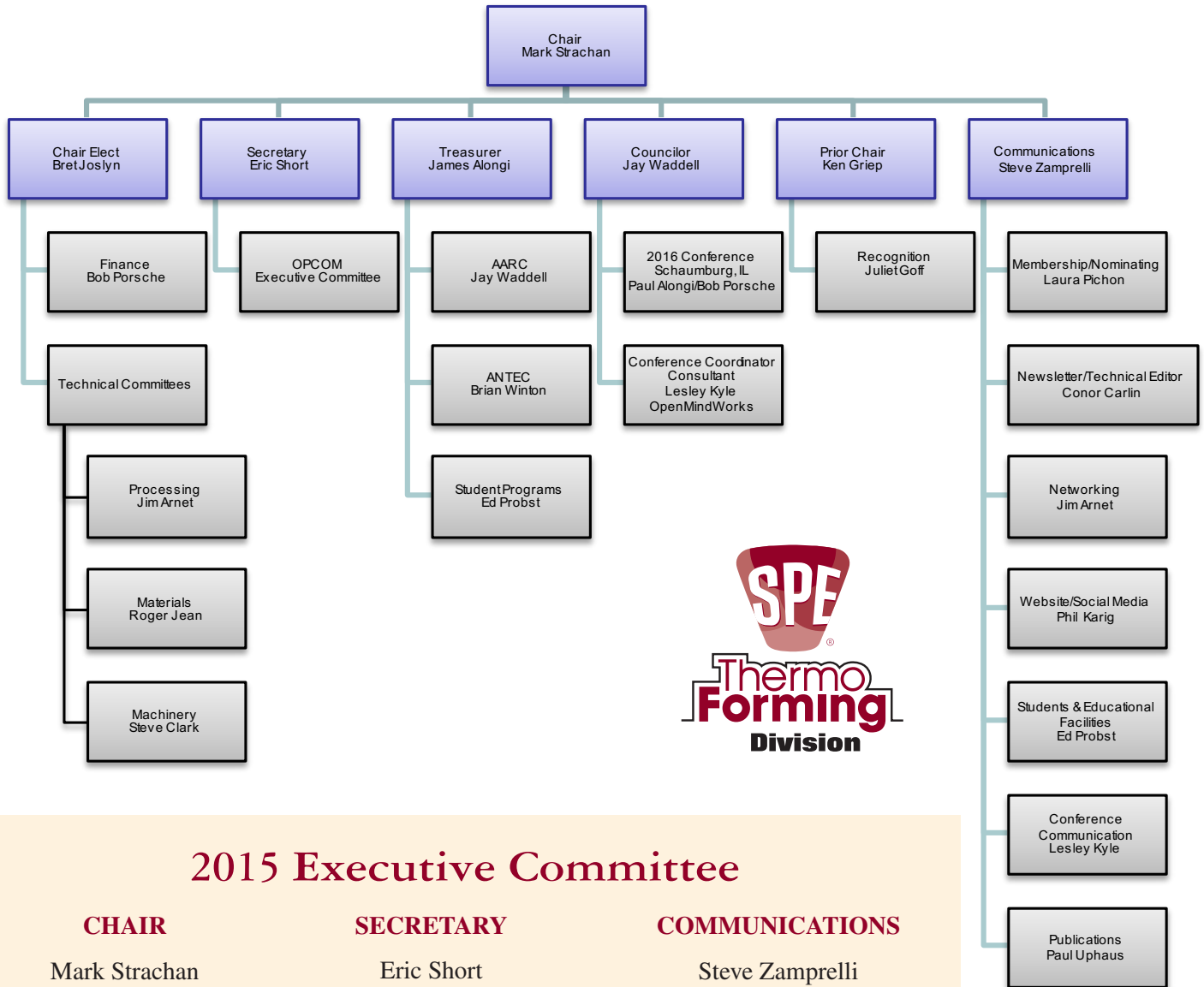
Join us in Sitges, Barcelona where we will be celebrating 20 years of the ETD supporting your industry, you will be most welcome.

## Questions?

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## APPLICATION // LIGHT TOWER ACCESS PANEL

### OPPORTUNITY

- Make it rustproof
- Reduce noise and weight
- Eliminate need for paint
- Improve serviceability

### PMC SOLUTION

- TPO thermoformed “mold-in color access panels,” replacing powder-coated metal

### ADVANTAGES

- Recyclable materials
- Weatherable with no secondary coating
- Sleek aerodynamic design



## APPLICATION // WATERCRAFT DASH/GLOVE BOX

### OPPORTUNITY

- Eliminate secondary application
- Seamless product integration
- Custom design

### PMC SOLUTION

- Vinyl clad ABS sheet product
- Indian Burl decorative laminate

### ADVANTAGES

- Soft touch “feel”
- Luxury appearance
- Custom thermoformed design
- Sustainable thermoplastic product



## APPLICATION // COMMERCIAL SALES CASE

### OPPORTUNITY

- Reduce time and material to “dial-in” the thermoforming process
- Screen printable
- Lightweight

### PMC SOLUTION

- Thermoformed Carbon Fiber Black sheet laminate

### ADVANTAGES

- Simplifies the thermoforming process to meet specifications
- Reduces cost for production (time and material)

