



# Thermoforming Quarterly

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

FIRST QUARTER 2008 ■ VOLUME 27 ■ NUMBER 1

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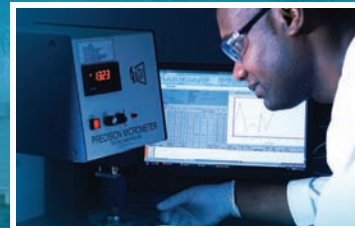
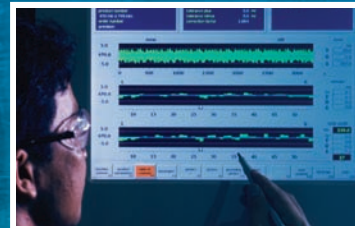
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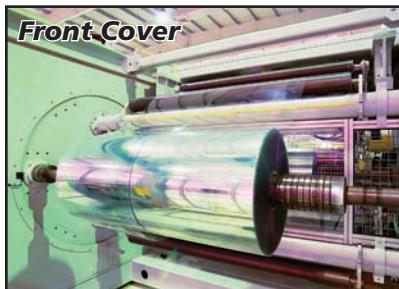
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# Thermoforming Quarterly®

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### Happy New Year!

## WELL, WHAT DO YOU THINK?

For the New Year, we have a great new look for our **Thermoforming Quarterly!** After months of hard work, we've updated the appearance and content of this professional journal. Although the previous version served us so very, very well – with in-depth content and technical articles – it's time to step up to Version 2.0. But, let there be no doubt that previous Managing Editor Gwen Mathis and Technical Editor Jim Throne were responsible for setting the dynamic direction and high level of professionalism displayed in this journal. Never satisfied with the average, they continually worked at pushing the envelope on thermoforming information.

Now, our new Managing Editor Conor Carlin and Technical Editor Barry Shepherd have been challenged to create Version 2.0 of the **Thermoforming Quarterly.** For as Will Rogers said, "Even if you are on the right track, you will get run over if you just sit there."

I know both Conor and Barry are more than up to the challenge. Both have a passion to make the **Quarterly** a meaningful "read" for our members, a publication you begin immersing yourself in as soon as the postman delivers it. With the new look and new layout come new material and content categories. For our scientists, there's a new generation of advanced technical articles. For our academic family, there's a focus on university issues.

For our managers, we're taking a closer look at the Business of Thermoforming. For our amateur photographers, we're even having photo contests.

Finally, to ensure we provide the information you need to keep fully informed on new thermoforming developments and trends, we encourage you to suggest story ideas and technical tips.

## THERMOFORMING PAVILION AT NPE?

At our February Board meeting, a hot item on the agenda is discussion about whether our Division should host a new thermoforming pavilion at the 2009 National Plastics Exposition in Chicago, June 22-26, 2009. No decision has been made on this issue yet. If you have an opinion, please contact one of our board members.

It has been suggested the pavilion be named "NPE Thermoforming World." With the thousands and thousands of attendees at NPE from all over the world – who have thermoforming on their minds – we have the opportunity to help focus and direct them to our members' booths, as well as provide generalized information about the thermoforming industry. It would be our Division's responsibility to organize the entire pavilion including several table tops, kiosks and booths. We expect this exposure will improve membership in our Division and attendance at our yearly conference.

Participation in the 2009 NPE Expo would NOT replace our Division's Fall conferences.

## 2008 FALL CONFERENCE IN MINNEAPOLIS

Speaking of Fall conferences, our next Conference is set for September 20-23,

2008 in the Minneapolis Convention Center. Conference Chairman is Dennis Northrop and the Technical Chairmen are Jim Armor and Phil Barhouse. They have an incredible line-up of proposed programs. The 2009 Conference is slated for Milwaukee.

## UNIVERSITY CENTERS OF EXCELLENCE

Also on our February Board agenda is a continued focus on developing university thermoforming programs and Centers of Excellence. Our goal is to have partnerships with several schools throughout the United States so members can access them for technical information, research, assistance, plus use them as a source for future employees. Current Centers of Excellence are the Pennsylvania College of Technology in Williamsport, PA and the University of Wisconsin-Platteville. We are trying to identify several additional universities. Please contact a board member if you have a suggestion.

## SCHOLARSHIP AND MATCHING GRANT APPLICATIONS DUE

Don't forget your local high school and college students who need financial assistance. Scholarships are available through our division. Plus, we have matching grants up to \$10,000 for colleges and universities to purchase equipment. More information about both these programs is available on our website ... which coincidentally is very popular, getting in excess of 2,500 hits a week.

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

## Why Not?

# Thermoforming in the News

## Cereplast boosts PLA performance with nanotechnology

By Tony Deligio

Cereplast has launched a bioresin based on NatureWorks polylactic acid (PLA) that it says can be used as a compostable high-temperature-resistant thermoforming plastic. CP-TH-6000 joins 15 grades of compostable resin, and it has a high-temperature limit of up to 155°F, up from a temperature resistance of 105°F for unmodified PLA. To increase the temperature resistance, Cereplast applied nanotechnology and a patented process technology.

In an interview with **MPW** last year, Frederic Scheer, Cereplast (Hawthorne, CA) CEO, said the company has a longstanding research agreement focused on nanotechnology with the University of Valencia in Spain. "We see nanomaterials as being a tremendous help to bridge the gap in terms of issues you have with agricultural feedstock as compared with petrochemical feedstock," Scheer said, adding that at the time, the company was experimenting with nanoclays as a functional additive.

## Toyota leads with thermoformable thermoset foam

By Matt Defosse

Japanese carmaker Toyota Motor Corp. is the first in that country to specify Basotect TG thermoformable thermoset foam for use in a Japanese-made car, according to BASF

(Ludwigshafen, Germany), the supplier of the material, which was introduced in 2006. Toyota is using the material for the engine hood covers in its Lexus LS series cars.

Basotect TG can be formed under heat and eliminates the previous step required to process this material, which required impregnation with adhesives, pressing, and then drying in order to form complex automotive parts. This foam, based on melamine, is lightweight (density of about 9 kg/m<sup>3</sup>), flame-resistant, sound absorbent, and can be employed at temperatures up to 200°C (392°F).

## Sears gives PVC the boot

By Matt Defosse

Sears Holdings Corp. (Hoffman Estates, IL), the fourth largest U.S. retailer with more than \$50 billion in annual revenues and approximately 3,800 full-line and specialty retail stores in the U.S. and Canada, including the Sears and Kmart chains, announced December 12 that it intends to reduce and phase out the use of polyvinyl chloride (PVC) in its packaging and merchandise. The company, in a statement, cited "the potential health and environmental risks tied to the manufacture, use, and disposal of PVC," as its reason for the shift.

Sears Holdings says it intends to "identify safer, more sustainable and cost-effective alternatives to PVC and incorporate them into the design and manufacturing process for private label merchandise and packaging" and set long-term goals for using bio-based plastics or those with higher recycled content and can be reused, recycled, or composted. It will encourage its vendors to reduce or eliminate their use of PVC in merchandise and packaging.

## Vinyl Institute reacts to PVC pushback

By Tony Deligio

In response to increasing pressure, including the decision by Sears Holdings Corp. (Hoffman Estates, IL) to reduce and ultimately phase out the use of polyvinyl chloride (PVC) in packaging and products, the Vinyl Institute (VI; Arlington, VA) announced on December 13 that it would launch what it calls "an aggressive information campaign for retailers and packagers aimed at providing facts about PVC's safety and benefits." Sears, which includes the Kmart chain, is the fourth largest U.S. retailer.

In a statement, Tim Burns, VI President, said the PVC industry needs to do a better job of pointing out the materials safety and energy benefits, including the fact that more than 50% of the end resin is derived from salt, compared to the oil and gas used to create other plastics. "The superior safety, performance, practicality, and convenience of products made with PVC have been proven time after time and in study after study," Burns said in a release. "That is why they are so popular with consumers across the country and throughout the world." VI's new information campaign will be aimed at the packaging and retail sectors and will start in January. PVC has traditionally faced resistance from many environmental groups from manufacturing through end-of-life due to concerns over chlorine and toxins that can be released if it's burned. More recently, however, greater concern has grown out of concern over certain additives used in PVC, including phthalates and heavy metals. |

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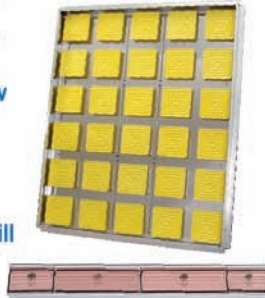
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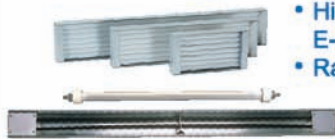
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# The Next Generation of APET: Implications for Thermoformers

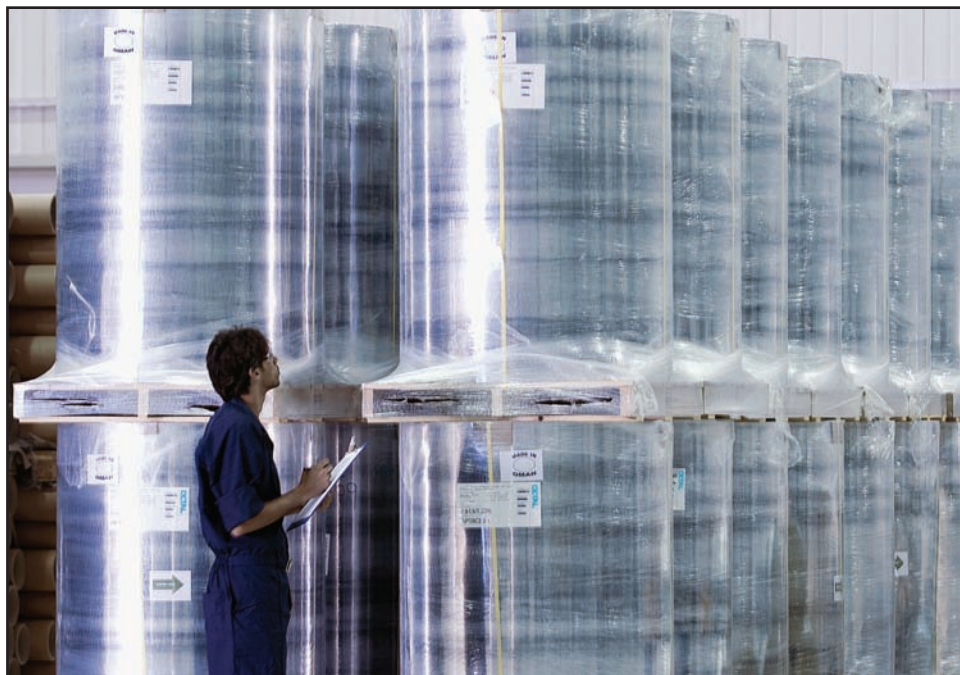
By Dr. William Karszes  
Director of Operations & Chief Scientist, Octal

If one follows the market data on volume growth, APET clear rigid trays and containers is a segment of the packaging business enjoying a much-welcomed prosperity. However, it is not clear that all players are benefiting to the degree you might expect. It is also not clear that the industry is leveraging its position as the provider of a preferred packaging substrate to full advantage, missing the opportunity to grow demand for APET packaging to its potential.

APET is a versatile packaging polymer that combines the benefits of many other polymers. It is clear, like OPS, but without the brittleness. It is tough like PVC, and somewhat stiffer, but without the chlorine content and the need for plasticizers. It thermoforms more easily than PP but is stiffer and clearer and more resistant to staining by tomato-based foods. And, it is fully recyclable in the well-established PET bottle recycling infrastructure. About the only thing APET is not suitable for is sustained use above 150° F.

These features have earned APET double digit growth rates and broad acceptance in virtually all food packaging and many consumer products packaging applications. But APET will not ascend to its rightful place as the leading clear rigid packing polymer until maximum efficiencies are extracted throughout the value chain – from the resin to the final tray.

It was almost inevitable that someone would see and seize the opportunity to make a significant



investment in an integrated complex for both large scale resin and sheet production. These two processes benefit from being co-located and result in a dense product that is efficiently produced and transported. The next wave of savings must take place at the converting level, in the realms of package design, resin content reduction and processing efficiency.

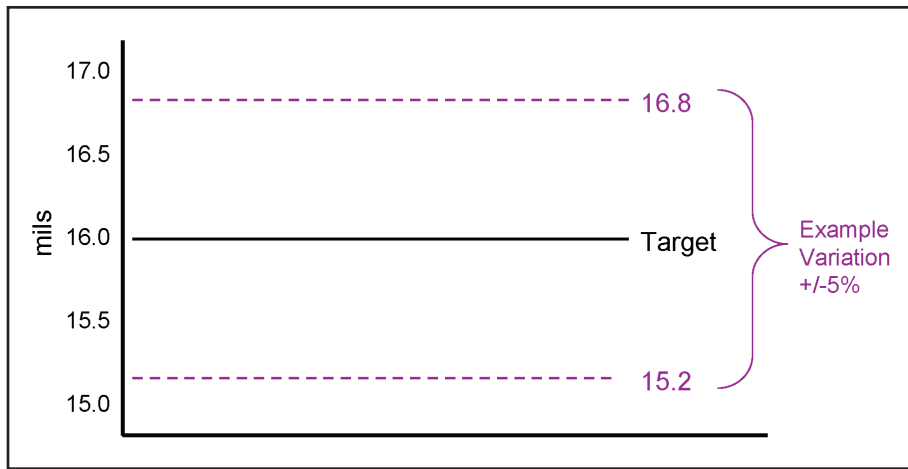
But thermoformers have been down-gauging and fine-tuning their processes for years; they know where the money is. Why should anyone think there is more to be wrung from this process? One thing we know is that variation equals cost. And the further up the manufacturing process the variation is introduced, the greater the cost of the final product, as all intermediate processes must be designed to accommodate this variation.

So for thermoforming, raw material uniformity is the best way to deliver the opportunity to the thermoformer for taking a very aggressive approach

to package design and down-gauging. Simply put, this means an APET sheet with no appreciable gauge variation.

Gauge variation drives many decisions in material selection, process set up and tool design, all of which help to define realized efficiencies. A sheet with less than one percent gauge variation opens up possibilities to the package engineer that a sheet with three to five percent variation cannot deliver.

To simplify the situation, benefits can be put into two different buckets: yield improvement (mostly driven by down-gauging) and process efficiency improvement. Ultimately, nearly all efforts to reduce cost can be categorized this way. Down-gauging has been on the minds of packaging designers since the first accountant set foot in a thermoforming operation. But there are limits to it based on many variables, foremost being the need to design to the thinnest area of a sheet, knowing (or assuming) that the thinnest area is



a specified percent below the average gauge.

So designers build in an allowance for this. If the thinnest area is five percent less than the average gauge, then the average gauge specified must be five percent above the thinnest gauge that will result in a package that performs as specified.

Conversely, if the thinnest area is one percent thinner than the average gauge, the specified gauge must be only one percent above the thinnest gauge that will result in a good package. In this example, this is a savings of four percent. It means that most of the packages made from the +/- five percent sheet had to be overbuilt to ensure that no packages were made below the minimum required gauge. In the case of the high precision +/- one percent sheet all the packages were built closer to the minimum requirements, saving material and cost, and providing for a highly uniform product throughout the run.

Efficient package design must recognize and accommodate sheet

variation. To design a package assuming a highly uniform sheet means designing so packages perform reliably using the minimum gauge required for the specified end use. Proper use of rigidity features and locking mechanisms are the keys to taking advantage of a sheet that is now thinner on average compared to a more variable sheet.

But taking highly uniform sheet into account during design has significant advantages. Closures and other features perform more consistently and reliably. They are not hard to open and close on some trays and too easy on other trays. Snap fit lids deliver more reliable seals. Tear tabs and perforations release with a highly predictable force, which is pleasing to the consumer.

As an example, with a container full of fresh cut fruit with liquid, pulling off the lid should be easy and predictable. If it is too difficult, the instability of the package when the lid seal breaks free can cause the consumer to spill the contents. On the other hand, if it is too loose, the container will leak and in extreme cases, the lid

will not re-close. A uniform sheet helps the designer and the toolmaker engineer a solution that ensures the optimum balance of performance and ease of use.

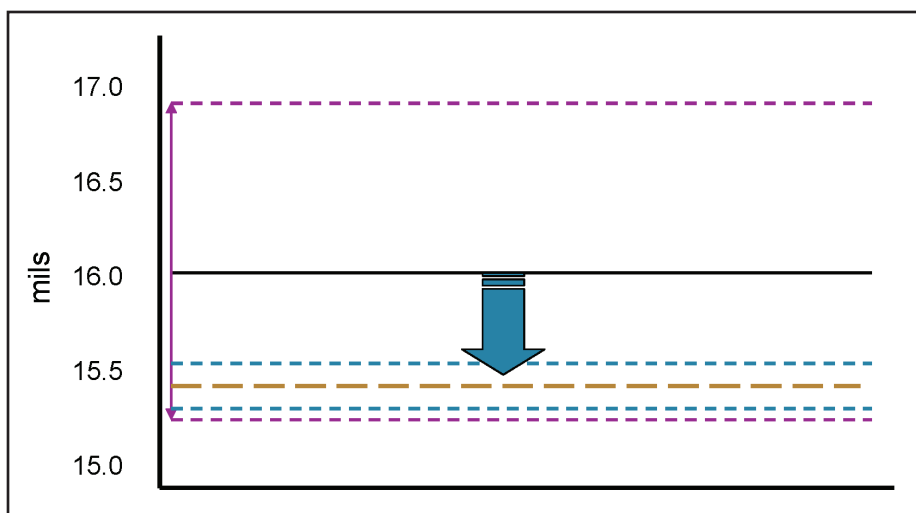
So with down-gauging comes the dual benefit of cost savings through yield improvement and better end-use performance through improved consistency and predictability.

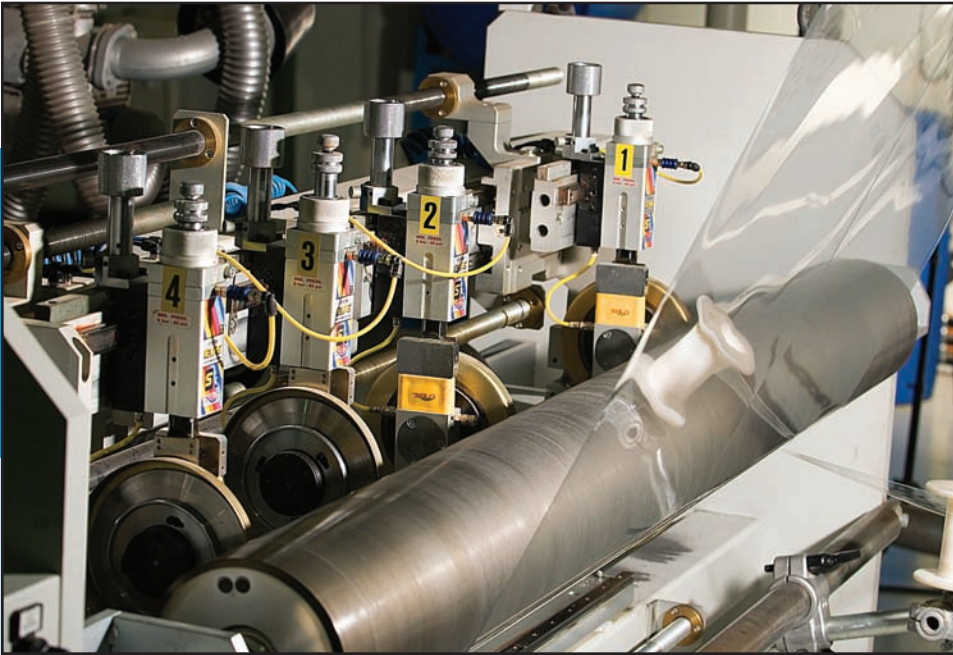
Process efficiencies are some of the most difficult metrics to correlate to sheet quality, but they are there! Operators love uniform sheet because they can set up the machine and get to stable process settings quickly. Furthermore, with high-precision sheet, once the machine is lined out for the first roll, it can be left at its initial settings roll after roll, reducing losses and lost production time.

But there is another important process savings that is often not realized but should be pursued aggressively: throughput. A thermoformer's total capacity is determined by the linear feet of sheet processed per hour. The most often cited bottleneck in a machine's output is the rate at which the sheet is cooled, which determines the dwell time in the die before the next cycle begins.

If a sheet is down-gauged, there is less mass to heat and cool, but generally the thermoformer is run at the same settings for thin sheet as for the thicker sheet due to a lack of confidence in how the next roll will form. This is an opportunity lost. With high precision sheet, thermoformers can confidently be aggressive about reducing cycle time to take full advantage of gauge reduction. Just one extra cycle per minute on a machine running at 20 cycles means a five percent throughput increase. If one assumes 90 percent machine availability, this amounts to over nine full days of incremental production in a year, and all at no cost to the operation.

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Additionally, consistent packages and trays result in stacks coming off the thermoformer that are very predictable in their height. Predictable stack heights mean that trays sold by count in corrugated boxes will stack to the same height every time. This means that the corrugated box can be designed for the expected stack height and not larger to accommodate a variable stack height. Equally important is that the trays can be made to bear some load, which makes it possible for the corrugated to be lighter duty and thus less costly.

Taken together, the advantages of a highly precise sheet can bring substantial cost from the entire value chain, while allowing well-run participants to maintain and even expand their margins. This is the real value creation that makes APET a superior economic choice as well as the best material choice for more and more applications, which we are now starting to see in the market. It is how aggressive thermoformers are positioning themselves to win in a hyper-competitive packaging segment. |

*About the Author: Dr. William Karszes is a highly qualified chemical engineer with extensive experience in the chemistry and manufacturing of polyester resins and extruded films. He brings a track record in operations and start-ups, specializing in extrusion in all formats from film & fiber, to extrusion coating. In addition to 30 years of experience in plastic processing and a vast background in physical testing and use of data to characterize product and processes, Dr. Karszes has several patents.*

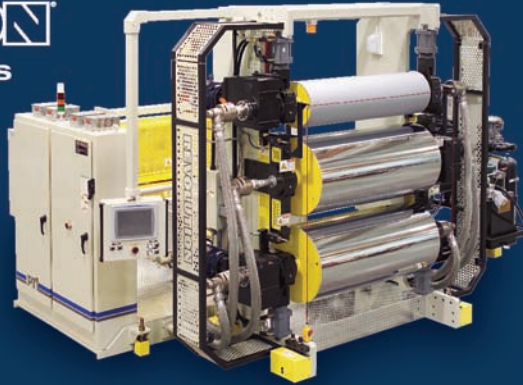
*Dr. Karszes is a graduate of the Rensselaer Polytechnic Institute with a Ph. D in plastic engineering and a Bachelors Degree in chemical engineering. He is a member of the American Chemical Society, the American Society of Chemical Engineers, TAPPI and the Society of Plastic Engineers. He has also served as the president of the TAPPI's Extrusion Coating Division and sits on the National Board of Directors of the Extrusion Division of the Society of Plastic Engineers.*

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# The Seven Year Itch: Exchange Old For New

Ensure production quality, keep pace with technology and competition

Donald A. Kruschke, Executive Vice President,  
Stopol, Inc.

**T**hermoforming needs to take a cue from the auto industry.

The typical U.S. consumer purchases or leases a new car every three to five years – regardless of whether the vehicle needs to be replaced or not.

A significant portion of the general public has been conditioned to replace their cars or trucks every few years for a variety of reasons:

- Just wanting the latest and greatest bells and whistles
- Bored with their current car
- Elevation in social status
- Life change such as children dictates the need for a larger car
- Better performance

Of the reasons listed above, only the last two can be considered practical. Yet, people seem to have no problem investing their hard-earned cash in a product that loses 15% of its value once it leaves the lot.

Now consider the thermoforming industry and how processors hold onto machines for up to 15 years – despite a mountain of evidence pointing to the impracticality of this action.

Capital equipment purchases are substantial investments and you have to make sure that you maximize your investment dollars. When you hold onto equipment too long, you are doing a great disservice to yourself, your company and your customers because you are not:

- Getting Full Residual Value
- Maintaining Production Quality
- Keeping Up with Technology
- Leveraging the Tax Code to Your Advantage

The following details exactly why thermoformers need to borrow from the auto industry's playbook and begin exchanging their old equipment for new equipment every seven years.

## GETTING FULL RESIDUAL VALUE

If after owning your car for seven years, someone were to offer you 30% of its original price tag, you would probably pull a muscle leaping at the chance to make that deal. But you know that you will never get an offer like that – at least not for your car.

However, the opportunity to make that deal with your thermoforming machinery is a daily reality.

After seven years, your thermoforming machine should retain at least 30% of its original value. The thermoformer you bought brand new for \$700,000 will still be worth \$250,000 after year seven. However, that 30% figure will decrease incrementally with each passing year and if you hold onto a piece of equipment too long, it's only worth will be as scrap material.

“The world is getting smaller, and the world is demanding more quality,” said Brian Crawford, Lyle Industries' Vice President of Sales. “There is no dumping ground for old equipment. The people in Mexico, India and China aren't just going to take any machine.”

The residual value of your machine can vary, depending on a number of factors. “After seven years, your residual value can range from 20% to 50%, depending on the condition of the machine,” according to Bill Kent of Brown Machine L.L.C. “You walk into some plants, and the machine is 8 years old but looks like it's only a couple years old. In others, you wonder what century it was built in.”

When purchasing new equipment, it's also important to consider features that will make this new machine more attractive in the future – and thus hold a higher residual value, according to Roger Moore, TSL Vice President of Sales.

“You have to consider the original specs on the equipment,” he said. “Sometimes the additional value or cost up front for certain features is little compared to the residual value down the road. Quartz top-heat and bottom-heat tunnels are preferred to calrod or tubular heaters because of the materials being used such as polypropylene.”

Moore added that certain features for thermoformers, such as servo drives, are vital to a machine retaining its residual value.

“There's always a buyer for everything,” he said. “But trying to sell a non-servo machine in today's environment is very difficult.”

## MAINTAINING PRODUCTION QUALITY

Just like cars and their drivers, thermoforming machines and their usage patterns can be broken down into three general categories:

1. Heavy Use: 7 years old, 5-7 days per week, 2-3 shifts per day.

*This is the equivalent of a car driven by a sales rep or someone that puts between 20,000 - 40,000 miles on their car each year.*

2. Moderate Use: 10 years old, 5-7 days per week, 1 shift per day.  
*This is the average driver that commutes to and from work for a total of about 32 miles daily.*
3. Light Use: 10 years old and older, 1 shift per week.  
*This is the clichéd little old lady who only drives her car to church on Sundays.*

With most thermoformers falling in the Heavy Use and Moderate Use categories, you can see that the lion's share of equipment in the industry experiences a substantial amount of wear and tear. As a result, you can count on your machine to suffer considerable losses in both performance and production.

"After seven years, you are definitely going to lose speed and precision," Lyle's Crawford said. "As parts loosen up, the running tolerances will be a bit wider. You can retool but if you don't maintain the press, you'll lose quality around the edges."

In addition to a loss in quality, you are also going to experience a significant loss in the machine's output.

"You are going to see a loss in productivity of at least 10%," Crawford added. "Users of equipment can easily verify this. And many would say that 10% is a somewhat conservative estimate."

Brian Urban, Sencorp, Inc. President and CEO, is one of those people.

"After the seventh year, the machine will be performing with less than 75% efficiency. And that's without technical upgrades," Urban said. He added that a 12-year-old machine that has been rebuilt to specifications will still suffer a 25% loss in throughput.

In addition, your costs to maintain and upkeep your presses after the seventh year will increase dramatically, Crawford said.

Another factor is tooling and whether or not it is properly integrated with the machine, said Brown's Kent. In some instances when using certain materials, you have tooling that does not match the press in terms of speed, so the processor must slow down the entire run.

"And when you ask them, 'Why don't you just buy some new tooling for your press?,' they tell you they can't because it's cost prohibitive," Kent said. "The people doing the bigger production runs can justify paying for the new tooling but the short-run processors can't."

TSL addressed this tooling issue and is very pleased with the results.

"In our particular case, it's been about five years since TSL introduced Low Flex technology in our machines," Moore said. "Low Flex allowed us to run larger tools or molds and to hold higher form air pressures, resulting in a higher yield and a higher quality product from our machines."

## KEEPING UP WITH TECHNOLOGY

Seven years ago there was no satellite radio in cars – or anywhere else for that matter.

But nowadays, satellite radio is nearly a standard option in most cars.

GPS navigation. Blue tooth-compatible electronic systems. Pre-crash safety systems. Adaptive cruise control. These are all relatively new bells and whistles that the automakers have given us in recent years.

And thermoforming machinery is no different.

There are innovations every year to thermoforming equipment and these enhancements tend to add up over the lifetime of a machine. What may have been a new "bell or whistle" when you purchased the machine is a standard in year four.

—"After seven years, you're obviously going to see better control schemes, heating enhancements, advances in materials, and new designs to make the thermoforming process more precise," Lyle's Crawford said.

Some parts – such as drives, motors, computer-programmed controllers, ovens and pneumatic cylinders – seem to improve on an annual basis, Crawford said. And the materials being used are in a state of perpetual improvement.

"There will always be a demand placed on the materials used and their ability to form and cool quickly," he said. "Plastics materials are constantly evolving."

Just look one aspect of the thermoforming equation – heating.

Just a decade ago, gas catalytic heaters were highly prevalent, but known for their considerable up-front cost, lack of control, substantial replacement cost, short life, poor uniformity and low temperature. These negatives were enough to mandate a change in technology. And when infrared technology surfaced, these "issues" were not only remedied, but the overall performance of the new technology was significantly stronger as well. Infrared heating boasts an efficiency of 80%, while gas catalytic heaters run at a rate of about 30%.

And there is no ceiling to technological advances to thermoforming equipment. They will always occur because competition drives OEMs to seek new ways to improve and further differentiate themselves from one another. Whether it's an improvement in the thermoforming process or a machine's reliability, repeatability and precision, technological progress is inevitable.

Plus, processors often compete with each other to respond to customer needs and meet their demands.

"Ultimately, end-user demands will drive change," Crawford said. "Customers are going to request better and more precise parts from plastics processors and they, in turn, will demand greater quality and performance from their machines. This will obviously come back to the OEMs."

Kent agreed that processors need to be wary of keeping pace with technology to meet customer and market demands. "Technology is advancing so rapidly that about every year something new comes out," he said. "About 20 years ago, it was very difficult to get polypropylene through a thermoformer. Today, people do it and think nothing of it."

Bob Colletti of Conlet Plastics, Inc. recently added a MAAC Three-Station Rotary Comet to his New Millford, CT, facility and said the linear transducer, quartz elements and two-speed platens in the machine have really made a difference at the company.

"It's easily the fastest machine in our shop," Colletti said. "When you upgrade your technology, the impact

goes beyond improved efficiencies and production capacity. New equipment adds value to your entire operation because the added capabilities it brings can attract customers.”

“Plus, a new machine like the Comet gives you a great deal of flexibility in terms of how you use the rest of the equipment in your plant,” he added. “Its speed alone frees up other machinery for other jobs.”

Time is of the essence. Especially when it comes to the time it takes to actually get your new equipment.

Macedonia, Ohio-based Joslyn Manufacturing Co. recently added two Royce Routers to their facility.

“The turnaround was pretty quick compared to others,” said Bret Joslyn. “For us, downtime is a killer. With new machinery, we want to plug it in and have it start running immediately.”

Before adding the Royce Routers, Joslyn had four older machines that were down 30% of the time.

“The improvement in technology warrants the purchase,” Joslyn said. “The speed and holding tolerance of the Royce is exceptional. By adding these two machines, we probably improved our cycle times by over 30%.”

## CONCLUSION

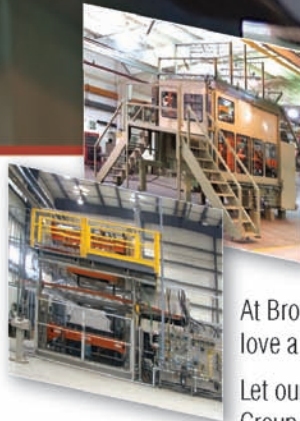
The future hinges on our ability to re-condition the industry and how they perceive their equipment.

It makes economic sense to trade in your 7-year-old machine and still receive 30% of its residual value rather than trying to “dump” the equipment five years later and receive nothing in return.

It makes business sense to continually upgrade your technology to bolster your performance and further meet the demands and needs of your customers.

And it’s common sense to market your company and its production capabilities as proactive, progressive and forward-thinking – qualities that create value for your customers and for you. |

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# Third-Motion Servo Plug Assist

Bill Kent, Brown Machine

The form press on most thermoforming machines features upper and lower moving platens. In addition, many machines now feature a third motion – a plug-assist drive. Initially, plug-assist tooling was always mounted in a fixed position on the platen opposite the mold. However, there are significant advantages to mounting plug assists independent of the other two platens. Machine builders call this third-motion servo plug assist, servo-driven plug assist, servo plug drive or independent servo plug assist.

Regardless of the name, all suppliers of large-platen thermoforming equipment in North America now offer independent, third-motion, servo-driven plug assists for processing deep-draw products.

North American large bed thermoformers normally have a mold with female inserts mounted on the top platen with the plug assist on the lower platen. With the advent of servo-operated platens, equipment suppliers are more easily able to incorporate a third motion to achieve independent plug action.

Generally speaking, European equipment has always had an independent plug assist. Even in trim-in-mold machines where one platen is fixed and the opposite moves, you are likely to find a plug assist. The plug assists in older equipment were driven via pneumatic or hydraulic cylinders. In this type of press, the plug assist was attached to rods that passed through the fixed tool half and connected to a spider plate. The drive mechanism was attached to the spider plate. Today both form/trim/stack and trim-in-mold machines incorporate servomotors for the platen and plug movements.

Processors of deep-drawn containers need to incorporate

independent third motion plug assist on any new equipment purchases to remain competitive in the cost-driven world markets of today. What does independent third motion plug assist do for the processors?

## BENEFITS

- A) Third-motion allows tooling to be designed to eliminate flexing. Elimination of flexing allows tooling to clamp tighter and prevent any slipping of material through the clamp rings. Material slippage can be more pronounced in large platen formers due to larger, heavier tools.
- B) Third motion allows for faster cycling because plug assists can be moved back to a home position before the tools are opened, decreasing time required for platen travel.
- C) It is easier to down-gauge sheet thickness requirements producing product with more uniform material distribution resulting in less weight with comparable strength.
- D) Third-motion tooling allows different forming techniques. 1) The forming air pressure can be started before the plug assists is fully extended. 2) A vacuum pulse (Brown Machine - Patent Pending) can be applied on the plug side to keep material away from the mold cavity lip during plus assisting. 3) It is very easy to incorporate coining in the lip area on the mold inserts. This gives uniform consistent return lips on the finished products. This is of particular importance for those products that require lip rolling.

## MACHINE DESIGN

Today there are two basic third-motion designs used in large platen thermoforming machines for the North American market:

- A) The pressure box is designed as a rectangular box. The plug assists

mount to a plate inside the box. To get strength in the clamp plate, posts are mounted in the areas between plug assists. Four to six rods are mounted on the back side of the plug plate and extend through the base of the pressure box for connection to the third-motion plug drive.

- B) The pressure box is designed as a solid box with bored holes for the plug assists. The plug assists are each mounted to a rod that extends through the base of the pressure box. All plug rods connect to a spider plate. The third-motion drive connects to the spider plate.



*Fig. 1. Bottom platen with plug assist servo motor in the foreground.*

Method A does not have as much strength as method B. In addition, the compressed air consumption used in method A is considerably greater than that used in method B. Processors should also look at the method of attaching the third-motion drive. To mount the pressure box easily in the thermoformer, both the pressure box and plug drive should have automatic connection to the platens.

Processors should review the method of attaching the plug assist. The difference in changing out plug assists in a large, multi-cavity tool can vary significantly depending on the method used when changing plug assist.

Equipment suppliers each have their own design for third-motion axes. Processors should evaluate the actuation method, guidance and stabilization, duty factors and maintenance accessibility to minimize downtime and reduce operating costs. |

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# Demolding

Adolf Illig, "Thermoforming, A Practical Guide"

Technical Editor's Note: As our tools get more sophisticated and designs more demanding, we must look more closely at the finer points of thermoforming processing technology. Thermoformers in North America do not use the term "demolding" very often. However, it best describes the part of the forming process that involves getting the part off the mold without distortion. Adolf Illig's chapter on this subject provides a great deal of information. Some editing has been done to replace terms and phrases not normally used in North America.

The following factors essentially effect the demolding process:

- Temperature of the plastic and mold
- Taper or draft
- Undercuts
- Positive or negative forming
- Pressure balancing/de-molding air
- Demolding speed
- Demolding aids in the tool
- Surface structure in the tool
- Friction between the tool and the part

## DEMOLDING TEMPERATURE

A part can only be demolded when its thickest area has cooled sufficiently enough to be removed from the tool in a stable condition. The part will deform if it is too warm on demolding. On the other hand, if it is too cold during demolding, the cycle time will be longer than necessary.

Positive (male) tools are another disadvantage, with the part becoming increasingly more difficult to demold as the cooling period is increased because the part shrinks onto the tool. Demolding at a higher temperature means that due to the higher heat expansion, the part has not shrunk onto the tool completely and thus is easier to demold. With positive tools prolonged cooling of the part causes it to contract onto the tool. With negative (female) tools,

prolonged cooling will aid the release of the part.

In extreme cases, if cooling is too severe on a positive tool, a part formed in standard polystyrene or acrylic glass (PMMA) will develop cracks during or even before demolding. Other plastics, such as PC, although they won't tear if cooled too severely, will shrink onto the tool in such a way as to make demolding impossible. In this instance the part will have to be cut or forced off the tool.

## TOOL DESIGN FOR EASY DEMOLDING

Fig. 1(a) shows an example of draft angles that are too acute. In this case the demolding air (air blow-off) has to flow through the tool during the whole stroke of the platen opening. With more obtuse draft angles as in Fig 1 (b) demolding air is only required to the point where the part separates from the mold completely at which time atmospheric pressure forces air through the gaps between mold and part. In practice use the following guidelines:

- Mold draft angles that are too acute require very accurate timing of demolding air flow and press speed. The faster the speed the more difficult it is to match the air flow. With a very acute draft the press opening speed must be slow.
- Where slight or no side wall draft angles are required it is preferable to use a negative (female) mold to facilitate demolding.

- On some negative formed single impression containers, 0 degree side walls are possible when demolding is performed very slowly. This is only practical in special cases for low quantity runs of articles less than 1 liter in volume.
- With positive form tools side wall draft should never be less than 0.5 degrees. However it is possible to have one side wall at 0 degrees if the opposite side wall has a substantial draft to compensate.

In general draft angles of 3 to 5 degrees are desirable.

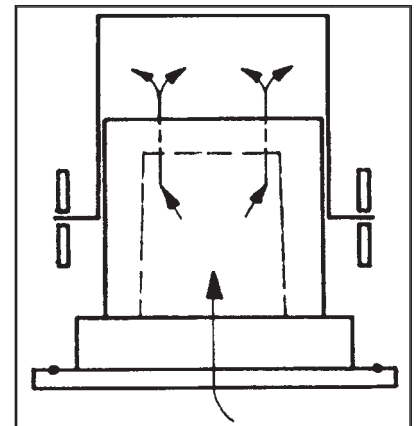


Figure 1 (a). Side wall draft < 0.5 degrees.

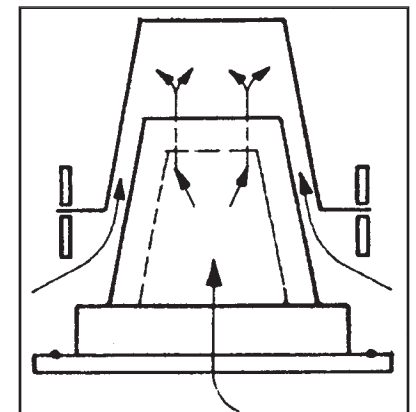


Figure 1 (b). Side wall draft > 0.5 degrees.

## PRESSURE COMPENSATION AND DEMOLDING AIR

During the cooling part of the cycle the plastic remains pressed against the tool by the coining of forming pressure

(vacuum or compressed air). Before the part is separated from the tool with demolding air (air blow-off) the vacuum and pressure are shut off and vacuum lines are vented to balance with atmospheric pressure. This relieves the formed part simultaneously creating a reproducible starting condition for the demolding air control system.

Pure pressure tools do not operate with demolding air. Parts are demolded mechanically by ejectors or other mechanical demolding aids, subsequently allowing the air to flow freely between the tool and the part.

## DEMOLDING SPEED

Demolding during fast cycle times is more difficult to control than slower cycle times.

Too little or too much demolding air can deform the part. The tool should be designed with as much venting as possible in locations that will promote demolding as well as provide good vacuum.

## DEMOLDING AIDS

The large venting system shown in Fig. 2 incorporates a weight-relieved valve which facilitates demolding. This type of valve is being used in diameters ranging from about 40mm to 80mm. These are used primarily for opaque parts where the parting line would not be objectionable on the finished part. Slotted nozzles ranging from 4mm to 12mm in diameter are also employed for venting air. These are commercially available as inserts.

Plug assists can aid in demolding as shown in Fig 3. In this example the main aim is to prevent deformation of the part. Although plug assisting is not necessary for achieving good wall thickness

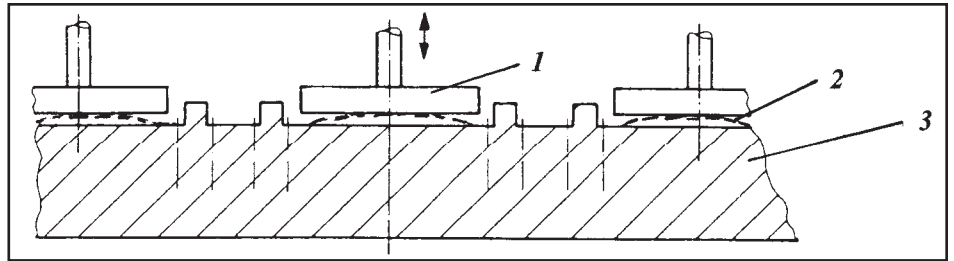


Figure 3. Plug assist as aid for demolding flat parts: 1. Plug. 2. Part. 3. Mold.

distribution during forming of flat parts they can be employed as demolding aids to prevent deformation.

Too much demolding air can deform the part as well as too little. This is where a plug that is the inverse shape of mold can help. After cooling, the plug moves to within 1 or 2 mm of the part. It is then possible to blow the part against the plug with a lot of demolding air without deforming it, breaking the contact between the part and the mold.

**Note:** When plug assists are utilized for the purpose of demolding described above as well as for good material distribution on side walls, it will be necessary to contour the plug the same but slightly smaller than the mold. This may prevent getting the maximum benefits from the plug during forming. Also, the length of the plug stroke for forming would not be as long as the stroke for demolding, making it necessary

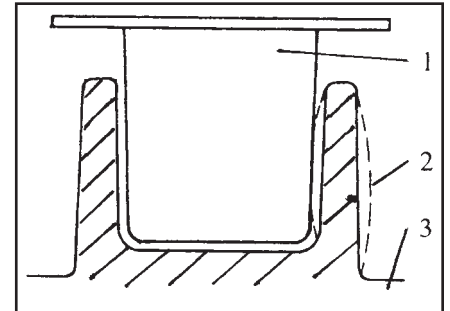


Figure 4. Plug assist as aid for 0 draft containers. 1. Plug. 2. Part. 3. Mold.

to have an independent plug action with a programmable control. See Fig. 4.

Process sequence:

- Form with plug assist
- Retract plug (if necessary for cooling)
- Move plug into tool again
- Demolding air presses the part against the plug
- Form tool moves away
- Plug moves away
- Remove part

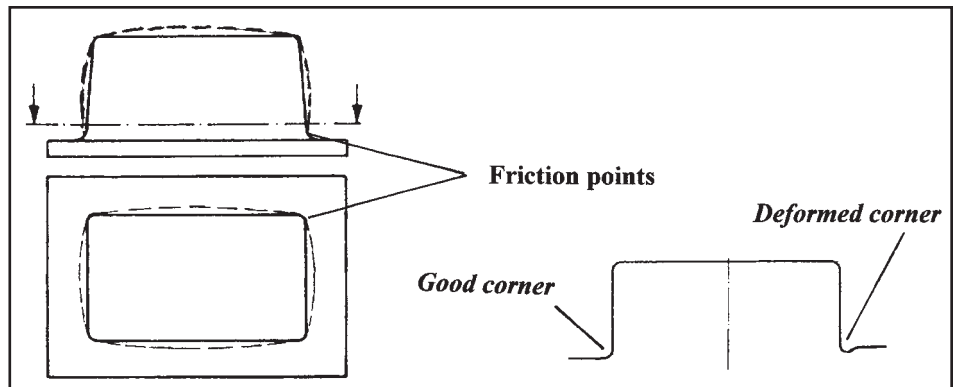


Figure 5 a. With demolding air on.

Figure 5 b. With deformed corner.

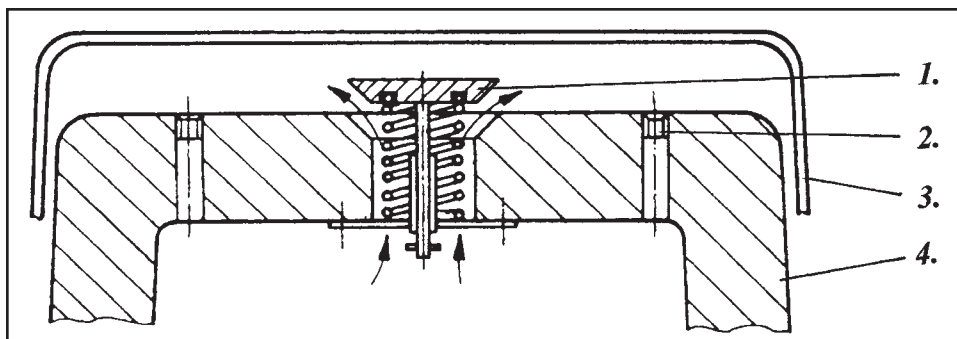


Figure 2. Rapid venting inserts: 1. Weight relieved valve. 2. Slotted inserts. 3. Part. 4. Mold

**Note:** Roughing the surface of molds can help the demolding air to flow faster between the part and the mold. However surfaces may require polishing in specific areas to prevent friction (see below).

## FRICION BETWEEN PART AND TOOL

Friction between the part and the tool can lead to scratch marks on the part (Fig. 5a) and in the worst cases, deformation (Fig. 5b).

Here are some practical guidelines:

- Rough surfaces on the mold to benefit overall venting may require polishing out in areas where friction is a problem on demolding.
- Release agents can be used on sample or test tools, such as soft soap for wooden tools or Teflon or silicone spray for aluminum tools.
- Production molds that are not demolding can be coated by electroplating with a porous chrome or a nickel layer containing sintered-in PTFE.

## DEMOLDING UNDERCUTS

Some undercuts will demold *without* tool breakaway sections if the material type allows. Fig. 6 shows an undercut which can be demolded from a solid mold. This is common practice on stackable cups and trays. If the undercut is too large (Fig. 7) white stress marks (“stress-whitening”) or deformation will occur on some plastics. This stress appears as a change in color of pigmented plastics or a milky hue in transparent plastics. This is caused by the severe bending of the plastic at temperatures below the glass-transition point.

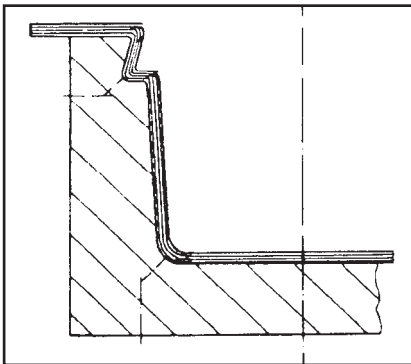


Figure 6.

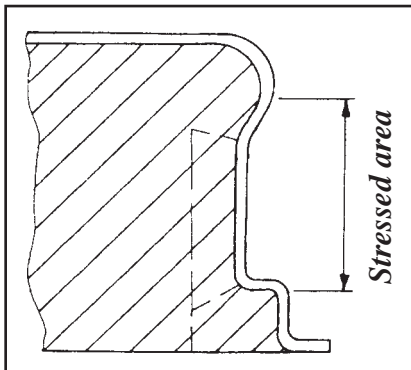


Figure 7.

Severe undercuts can be demolded by using mechanical breakaways or hinged sections. Fig. 8 shows a tilting tool which is made possible by the part geometry and rigidity. During the platen’s downward motion the tool hinges up which frees the undercut. Some issues with this type of breakaway are poor cooling of the hinged section and the need to buffer the dropping tool section if it is heavy.

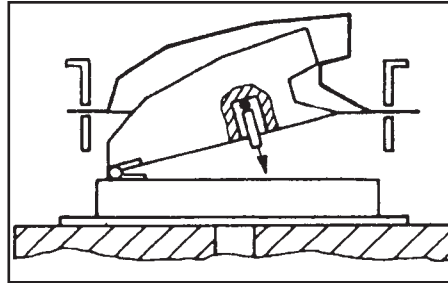


Figure 8.

Flexible materials that are formed into undercuts on a male tool can be demolded by using a “bell” that contours the mold with space around the part allowing the demolding air to force the molded part out to the bell while the mold drops away (Fig. 9).

Sheet machines which permit the operator to access the tool during the operation can be used for molds that have loose tool components that come away from the mold on demolding and can be re-inserted by hand back into the mold. This is usually only possible on heavier gauges where the cycle time is long enough to allow the operator to get into the mold (Fig. 10).

Finally, Fig. 11 shows a split tool with a sliding section that stays in the part when the mold drops. The clamp frames

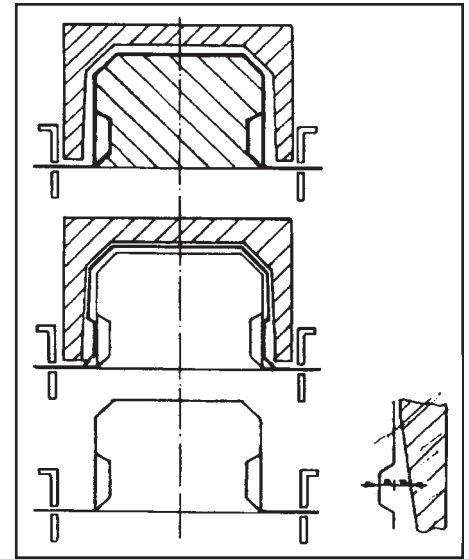


Figure 9.

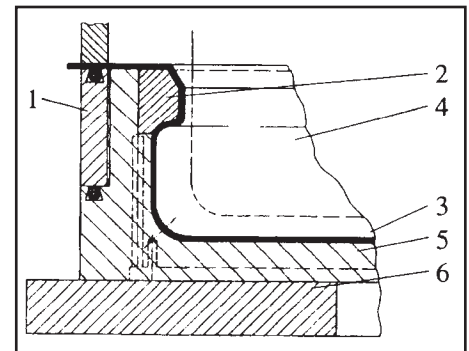


Figure 10.

remain closed until the sliding section is clear of the undercut in the part. Once clear, the sections in the mold drop back to the forming position. Sufficient part stability is necessary for this type of tool and the sliding sections must move freely on bearings to seat accurately. In some cases these sections must be activated by a pneumatic cylinder and controlled electronically.

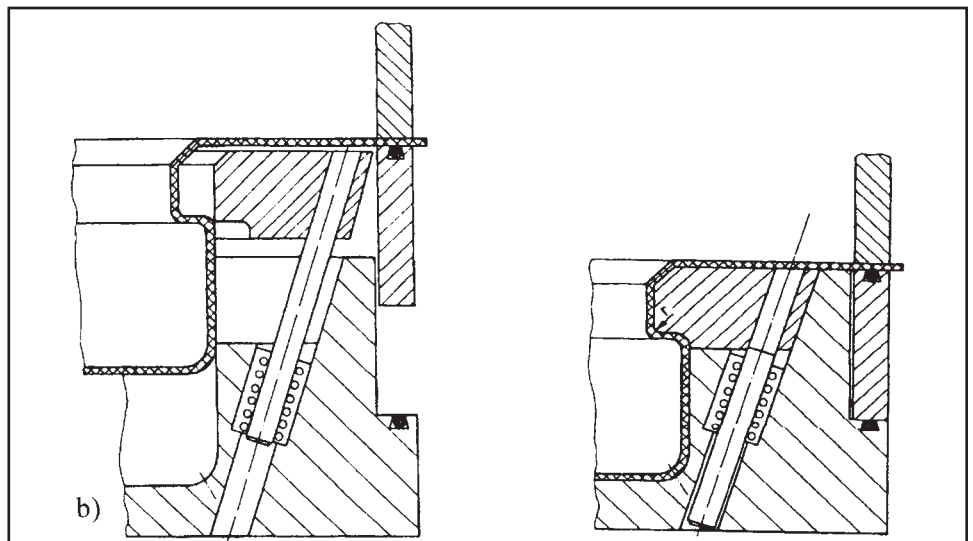


Figure 11.

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## UWP Department of Industrial Studies Receives State-of-the-art Zed SC-Series Roll-Fed Thermoformer



*(From left to right, front row) Majid Tabrizi, Director of the UWP Center for Plastics Processing Technology; Provost Carol Sue Butts; Chancellor David Markee; Tom Kuehn, President and CEO of Plastics Ingenuity; Jan Acker, President and CEO of Placon Corporation. (Left to right, back row) Walt Walker, President of SPE Thermoforming Division and VP of Operations at Prent Corporation, and Marc Zelnick, President of Zed Industries.*

PLATTEVILLE – The University of Wisconsin-Platteville Department of Industrial Studies is now one of the first universities in the nation to have a Zed SC-Series roll-fed thermoformer. The machine is housed in the Center for Plastics Processing Technology.

Approximately 40 companies from the United States and Canada contributed to the donation. A dedication ceremony, held October 1, 2007, recognized contributors and attendees had the opportunity to see the roll-fed thermoformer in action.

“I’m extremely proud to be here and part of this activity,” said UWP Chancellor David Markee.

Mark Zelnick, President of Zed Industries (Vandalia, OH), collaborated with many of the contributing companies to make the donation possible. Other major contributors included Plastic Ingenuity of Cross Plains, Prent Thermoforming of Janesville, Placon Thermoforming Products of Madison, the Milwaukee chapter of SPE and the Thermoforming Division of the Society of Plastics Engineers. According to Tabrizi, many of the companies and vendors made an in-kind donation.

The machine was custom designed for the UWP Center for Plastics Processing Technology. It features multiple emergency stops and safety equipment and was designed for an educational setting. Some components of the machine are brand-new and UWP is among the first to benefit from such technology.

Tabrizi thought it was necessary to have a roll-fed thermoformer to

complement the MAAC and Lyle cut-sheet thermoformers the plastics lab currently has. According to Tabrizi, having experience and knowledge of both types of machine gives students an edge when they enter the workforce.

“The roll-fed thermoformer will give us a much broader knowledge of how to run different pieces of equipment. It will also give more recognition to the program and make it easier for students to find a job,” said Mike Swets, a student in plastics processing technology and Vice President of the UWP Society of Plastics Engineers.

Many of the representatives from the companies who donated agree that the new machine will greatly benefit students. They believe that by contributing to the donation of the roll-fed thermoformer, they are making an investment where the return is a skilled and knowledgeable workforce.

“Platteville students are in every part of our organization and they are a great help. We wouldn’t be where we are today if not for their talent,” said Tom Kuehn, President and CEO of Plastics Ingenuity of Cross Plains.

“The partnership with the plastics industry has proven to be a successful model. We are proud of seeing our program as a model for other educational institutions. We are eager to assist other institutions in replicating this successful industrial-educational model in their curriculum,” said Tabrizi.

For more information: University of Wisconsin-Platteville, Center for Plastics Processing Technology; Dr. M. Tabrizi, (608) 342-1115 or [tabrizi@uwplatt.edu](mailto:tabrizi@uwplatt.edu). |

## PTi Donates \$2,000 to Thermoforming Division Scholarship Fund

Extrusion machinery manufacturer, Processing Technologies, Inc. (PTi), endowed the Thermoforming Division Scholarship Fund with \$2,000 at the Cincinnati Conference.

PTi President Dana Hanson said, “We are a long-time contributor to the Thermoforming Division and as such we wanted to make a contribution to the future of the industry. Our view is that scholarships are an important way to ensure continued research and development in the thermoforming and extrusion sectors of the plastics industry.”

Located in Aurora, IL, PTi is a leading manufacturer of high-performance, precision-built single screw extrusion systems for the plastics industry. Since 2001, PTi has been a sponsor and exhibitor at the annual Thermoforming Conference. |

## UMASS Lowell Expands Into Nanotechnology Testing

In addition to the use of two thermoforming machines in laboratory courses, the Plastics Engineering Department at the University of Massachusetts - Lowell has two groups of students conducting research who are also using the machines for ongoing projects.

The first group is conducting research that combines thermoforming with nanotechnology. They are using carbon nanotubes that are arranged in a specific pattern and transferring that pattern to a polyurethane film using a Lyle model 1620 thermoforming machine.

A second group is using a Maac ASP thermoforming machine to study the stretching behavior of various sheet materials in plug assist thermoforming.

For more information, visit the UMASS Lowell Plastics Engineering website: <http://www.uml.edu/college/Engineering/plastics/aboutUs/overview.html>. |



## PMC at Penn College to Launch Thermoforming Center of Excellence

Released: December 7, 2007  
Official News Release  
Special to: The Society of Plastics Engineers

Responding to the growing demands of the region's plastic processors, the Plastics Manufacturing Center at Pennsylvania College of Technology is in the early stages of launching a Center of Excellence program for thermoforming in alliance with the Thermoforming Division of the Society of Plastics Engineers and the plastics industry.

The planned facility will be utilized by thermoformers, sheet extruders, resin suppliers, mold builders and equipment manufacturers. The plastics program at Penn College is recognized as one of only five ABET-accredited programs nationally. The PMC is one of the top plastics-technology centers in the country, with extensive material-testing laboratories, industrial-scale process equipment, world-class training facilities and highly skilled consulting staff.

The PMC, in concert with the plastics faculty of Penn College, proposed a Ben Franklin grant to acquire funds to construct and staff a Thermoforming Center of Excellence. A recent letter from the CEO of McClarin Plastics, Todd Kennedy, emphasized the industry need for thermoforming education and industry-development services. The National Society of Plastics Engineers has pledged to support a national thermoforming center. In addition, many companies have expressed interest in supporting a much-needed thermoforming center.

Formation of the Thermoforming Center of Excellence will bring national recognition to Penn College's plastics program and provide much-needed graduate engineers for the future of the thermoforming industry.

"Although the center's primary focus is to assist regional companies, it will be recognized nationally as one of two or three research centers for thermoforming in North America," said PMC Director Hank H. White. One of the most significant issues facing the plastics industry is the need for employee understanding of plastics technology

to capitalize on the latest advances in the industry. The PMC addresses this and other issues facing plastic processors, such as new-product and process development and new-materials evaluation and development.

The center at Penn College will explore fundamental relationships between resin, processing and product properties. The infrastructure, including equipment and staffing, will be developed in the first year. Member recruitment will also be a major goal. Developing specific projects for industry and technology transfer will begin as the industrial thermoforming equipment is acquired. Additionally, the academic program will strengthen its curriculum for thermoforming education.

Members of the Thermoforming Center of Excellence will participate in focused research and benefit from the comprehensive knowledge base available at Penn College. There are significant opportunities for plastics processors to improve their productivity and competitiveness through material and process improvements. The capability to "bring some science" to what has been, to date, a very empirical process, will allow the center to make key contributions within the thermoforming industry.

The PMC is able to assist with new-product development; material selection, testing and analysis; custom compounding; process improvement and development; and workforce training. Plastics professionals provide customized, on-site training programs, as well as on-campus courses. Services from qualified consultants are tailored to plastics product and process needs.

For more information, contact White at (570) 321-5533, or send e-mail to [cwhite@nct.edu](mailto:cwhite@nct.edu).



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## MARK YOUR CALENDAR!!!



The Thermoforming Board of Directors has taken your advice from your completed surveys and beginning in 2008 we will be going back to our old dates –

### DATES:

Saturday, September 20th,  
2008  
through  
Tuesday, September 23rd,  
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# “Crossing Frontiers – Knowledge: The Key to Your Success”

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**Thursday 3 April 2008**

 18.00-20.00 Conference Registration  
 20.00-22.00 Welcome Reception

**Friday 4 April 2008**
**General Session**

 08.45-09.00 **Introduction**  
 Kitty Beijer, Chair ETD  
 Hubert Kittelmann, Conference Chair  
 09.00-09.45 **Thermoforming in Central and Eastern Europe**  
 Kalman Wappel / ECEBD, Hungary  
 09.45-10.30 **“Travelling Lite”**  
 Rik Hillaert / Samsonite, Belgium  
 10.30-11.00 Coffee Break  
 11.00-11.45 **“Superior Interior”**  
**Forming / Laminating Applications at JCI**  
 Hans-Jörg Sakowsky / Johnson Controls Interiors,  
 Germany  
 11.45-12.30 **The “TRUE” Origins of the Computer**  
 Dr. Ing Horst Zuse / Germany  
 12.30-14.00 Lunch and Parts Presentation  
 14.00-15.30 **“Art to Science, Controlling Your Process”**  
**T-Form Update**  
 Fabian Beilharz / IKT Stuttgart, Germany  
 Marco Smit / TNO Industrial Technology, Netherlands  
**“Automation in Thermoforming”**  
 Erwin Wabnig / Kiefel, Germany  
 15.30-16.00 Coffee Break  
 16.00-17.30 **“Real Cool Tools”**  
 Peter Schwarzmann / Illig, Germany  
**“Plug-In,” Plug Materials Influence on Final Part  
 Quality in the Thermoforming Process**  
 Marco Jungmeier / Jacob Kunststofftechnik, Germany

**Material Technology Sessions**

 14.00-15.30 **Bioplastics – The Beginning or the End?**  
 Dr. Michael Thielen / Polymedia Publisher, Germany  
**“Peek Performance”**  
**Application in Polyetheretherketone**  
 Mike Percy / Victrex, UK  
 15.30-16.00 Coffee Break

 16.00-17.30 **“Under the Skin”**  
**Colour and Gloss Management**  
 Thomas Höfels / Senoplast, Austria  
**“Reading Between the Lines”**  
**Improving Sheet Extrusion**  
 John Vlachopoulos / McMaster University, Canada  
 18.30-23.00 **Gala Dinner and Boat Trip** on Board M/S “La Paloma”

**Saturday 5 April 2008**

 08.00-08.45 Conference Registration  
 08.45-09.30 **Reach for the Sky – High Performing Parts**  
 Jim Griffing / Boeing – Material and Process Technology,  
 USA  
 09.30-10.15 **How to Mobilise the Full Potential of the Organization**  
 Ton Aerdt / Blom Consultancy, Netherlands  
 10.15-10.45 **Nanocomposites**  
 T.B.A.  
 10.45-11.15 Coffee Break  
 11.15-12.30 **WORKSHOP I**  
**Thermoforming vs. Alternative Technologies**  
 Andy Eavis / Thompson Plastics Group, UK  
**WORKSHOP II**  
**Shorter Lead Times – Fact or Fiction**  
 Rich Freeman / Freetech Plastics, USA  
 12.30-14.00 Lunch  
 14.00-15.30 **WORKSHOP III**  
**Analysing Thermoforming Material**  
 Fabian Beilharz / IKT Stuttgart, Germany  
 David Liebing / IKT Stuttgart, Germany  
 Karel Kouba / Accuform, Czech Republic  
 Rupert Gschwendtner / Kiefel, Germany  
 Lennart Ederleh / IKV Aachen, Germany  
 Peter Martin / Queen’s University Belfast, UK  
 Marco Smit / TNO, Netherlands  
**WORKSHOP IV**  
**Thermoformers “Go Green” and Save Money**  
 John Jonckeeere / Vitalo, Belgium  
 15.30-16.15 **IML and Bottleforming**  
 Reiner Albrecht / Illig, Germany  
 Hubert Kittelmann / Marbach, Germany  
 16.15-16.45 **Conference Summary and Close**  
 Hubert Kittelmann and Ken Darby

2007 may well prove to be the year that sustainability became a household word.

Plastics are at the forefront of the new sustainability movement. As a prime transformer of plastics, the thermoforming community has a unique opportunity to play a leadership role in this new industry sector. As a service to our readers, the editors of the **Thermoforming Quarterly** will dedicate a new section of the journal to news and articles related to sustainability and thermoforming. As always, reader contributions are welcomed and encouraged.

### Understanding Sustainability: Keeping it Simple

Tim Ritter, Universal Protective Packaging, Inc.

Sustainability is a broad, encompassing concept ultimately aimed at minimizing human impact on the environment and maximizing the outcome for future generations. As it relates to the packaging industry, sustainability is mostly about optimizing a package's life-cycle impact (i.e., minimizing environmental impact). Thermoformed packaging is at the forefront of the sustainability discussion because it is plastic and it is disposable. As thermoformers, you can take some simple steps to make your business and products more sustainable.

1) Recycling 100% of internal plastic scrap. All of the raw material waste generated in thermoforming operations can be easily reprocessed and returned into clean raw material supply. By doing this you can keep manufacturing waste from going into landfills and reduce the amount of virgin raw material required for your operations.

2) Using post-consumer-recycled plastic. Plenty of post-consumer-recycled (PCR) plastic is available to be converted into film and used to manufacture your thermoformed packages. This material has already been through at least one consumer life cycle as a drink bottle or some other package and would have otherwise been destined for a landfill.

3) Using bio-polymers and low-impact hybrid materials. Many advancements have been made in a variety of alternative "plastics" for thermoforming like the corn-based

film PLA. PLA is a clear packaging film that is well suited for a variety of thermoformed packages but it requires careful and unique manufacturing and handling processes. You can also thermoform other materials that are partially or entirely derived from non-petroleum sources. In addition to being made from sustainable resources many of these materials are biodegradable, industrial compostable, or even water-soluble.

4) Designing packages for minimal impact. You can create thermoform designs that minimize package volume without affecting usability. By reducing package components and light-weighting you can minimize environmental impact and reduce packaging cost at the same time.

All plastic processors including thermoformers should participate in industry forums on sustainability and material life-cycle studies. Involve your technical personnel in the most current education the plastics industry has to offer and invest in technology to keep pace with emerging materials. The movement toward more sustainable packaging solutions is happening now. There is an important place for thermoformers in this movement but you must take the initiative to be a part of it.

### Thermoforming Division Grants Funding to Redesign Blow Molded Sun Stove

At the September Division Board Meeting in Cincinnati, the board approved up to \$1,500 to convert the

design of an existing blow molded sun stove into thermoforming.

The story starts with an engineer by the name of Dick Wareham from Brookfield, WI. During his business travels in South Africa for his mineral-export business, Dick noticed that a significant portion of the population was using wood-burning stoves for cooking. This was a labor-intensive process involving hours of manual wood collection. As an engineer accustomed to looking for efficiency gains, Wareham saw an opportunity in the form of an abundance of natural, solar power: the sun stove. Moreover, the labor to collect wood could be used for other income-generating purposes, thus raising the standard of living.

After looking at existing designs, Wareham determined that a sun stove could be manufactured using a blow molded design. Over time however, it became apparent that the capital costs involved in blow molding were too great to sustain the developing sun stove business. The quantities required to render the process affordable were just not there. Wareham encountered a second, socio-economic problem: the stoves were being heavily subsidized and therefore people were not attaching any value to them. In other words, the most effective way of promoting the sun stove use was for the potential users to see value in their use and then pay for them.

Wareham and his son, Dave, realized that a different approach was needed. After analyzing manufacturing alternatives and working with Ed Probst of Profile Plastics, they decided that thermoforming offered significant advantages that would help support the small sun stove economy. The low run quantities of the sun stove were better served by the affordable costs offered by thermoforming. A strategy was mapped out to convert the existing blow molded

design into a thermoformed one. By funding the design through a grant, the SPE Thermoforming Division allowed the sun stove organization to concentrate on the next task which is to build the new mold in South Africa.

For more information on the Wareham's work with the sun stove go to: [www.sungravity.com](http://www.sungravity.com).

## Sustainability – Is It Truly Sustainable?

Tom Preston, Packaging Development Resources

*(In a very short period of time, sustainability and sustainable packaging have grown from cottage industries to major global trends.)*

### What Does It Mean for Thermoforming?

For those looking for a definition of sustainability and how this applies to them, there is an excellent definition for our marketplace and products developed by the Sustainable Packaging Coalition. However, the basic elements are the same: the key to this new way of thinking is understanding the triple bottom line. That is, to be truly sustainable, products must:

- Be economically viable
- Have intrinsic benefits to humans
- Not harm the environment

Market leaders in food and consumer goods such as Aveda, Procter & Gamble and Kraft Foods have devoted Vice Presidential status to sustainability leaders and have committed a legion of human and capital resources in pursuit of a better sustainable answer for their existing products and new product launches.

Retailers, most notably Wal-Mart, are keeping score and those who do not comply with an improving record will be left behind. Retailer demands are being driven by corporations' internal goals as well as an educated and motivated consumer.

Packaging is not a lone pioneer in this new marketplace of consumer minds. The revolution to convert our homes and offices into more sustainable structures is well underway. An industry-wide push for standards and best practices is being led by organizations such as LEED

(Leadership in Energy and Environmental Design) and the U.S. Green Building Council.

### How Do We Get Our Voice Heard?

Green-washers beware! Today's consumers have a greater understanding of the science in the parcels they purchase. Market leaders like Timberland and Nike are adding elements to the consumer's purchasing criteria by sharing life cycle inputs for their materials and packaging systems. This is prompting new questions about other products and how they are packaged.

Despite significant progress in size, material reduction and the increasing use of recycled content in our products, we are still a target. However, there is an opportunity presenting itself today for us to raise the level of discussion about our materials and their performance, the reclaimed materials market, and the value of low weight-to-performance ratios in a market that is measuring life cycle contributions and carbon footprint.

Working with Non-Governmental Organizations (NGOs) and our customers to establish standards or dovetail with those already under development is a pro-active step that many processors are doing individually. Collaborative effort will raise the entire industry and reduce the skepticism about the motivation or reliability of the product or company-specific messages.

### What Lies Ahead?

With crystal balls in short supply, today's leaders are faced with the decision of what is best for their companies with a new set of measurement criteria. Unlike previous "environmental" movements, sustainability is intended to continue because it is economically viable. Compliance with Wal-Mart standards or other customer-generated standards is going to be the minimum requirement and arguably will not be a final step in our evolution to more sustainable products.

Being sustainable will require us to reduce the amount of material reaching landfill and to lower our energy consumption in the manufacturing processes. By increasing our role in establishing standards that begin with science and data versus emotion and anecdotal information, we will be able to show that our products perform at a very high level relative to substitute materials and processes.

Many sustainability journals offer studies that suggest only the companies embracing sustainable principles will survive. Though this may be a bit extreme, there is mounting evidence in the media and in our discussions with customers that those who adopt these ideals will gain a significant advantage in the short term and establish a growth platform for the future. |



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March 15,  
2008.**

The **Thermoforming Quarterly** is sponsoring a digital photo contest to highlight one or more aspects of the thermoforming industry. One winner will be chosen to receive a new Canon digital camera (value \$250). The winning submission will also be featured in the following quarter's issue.

Criteria:

- We are looking for striking digital photos that feature some aspect of thermoforming: the process, tooling, machinery or parts.
- All photographs should accurately reflect the subject matter and the scene as it appeared. Photos that have been digitally altered beyond standard optimization (removal of dust, cropping, adjustments to color and contrast, etc.) will be disqualified.
- Entries should be submitted with the highest graphic quality in mind. JPEG format is preferred with resolution of 300 dpi.
- Entries must include a brief description of the photo including photographer name, company name and address.
- Images will be judged on originality, technical excellence, composition, overall impact and artistic merit.
- The judges will be a panel of editors and SPE board members.
- Only one winner will be chosen. Based on the number of eligible entries, the criteria may be modified in the future to award multiple prizes.
- All decisions made by the judges are final.

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~ THE EDITORS

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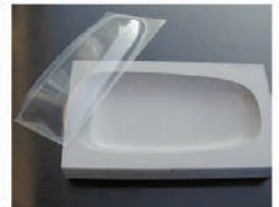
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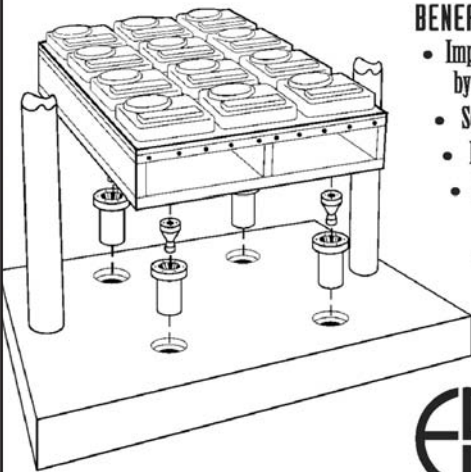


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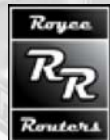
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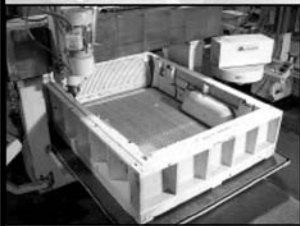
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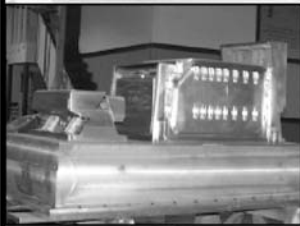




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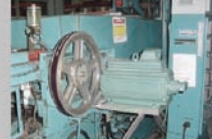
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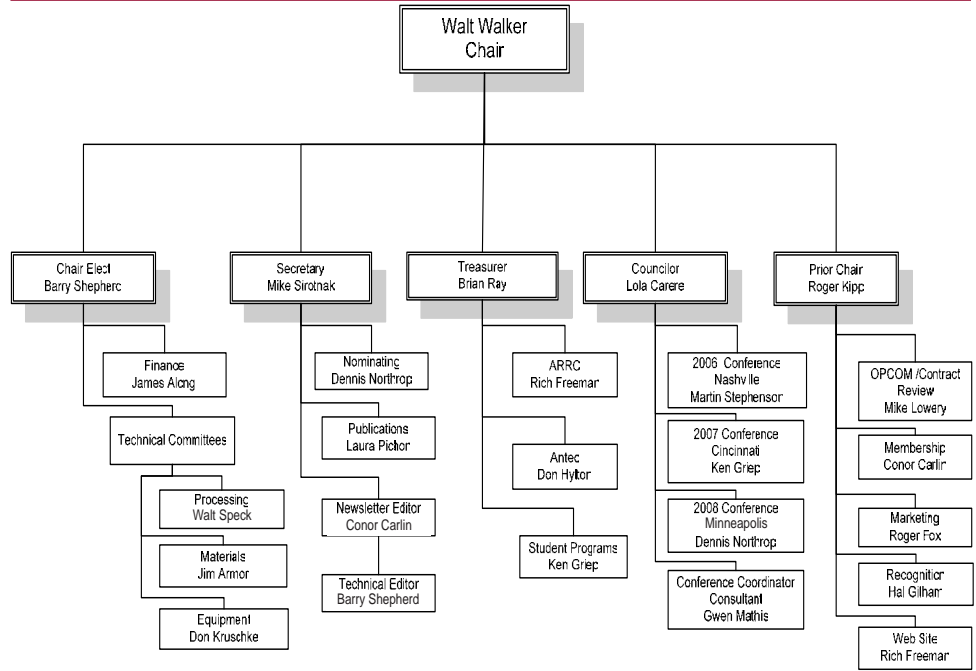
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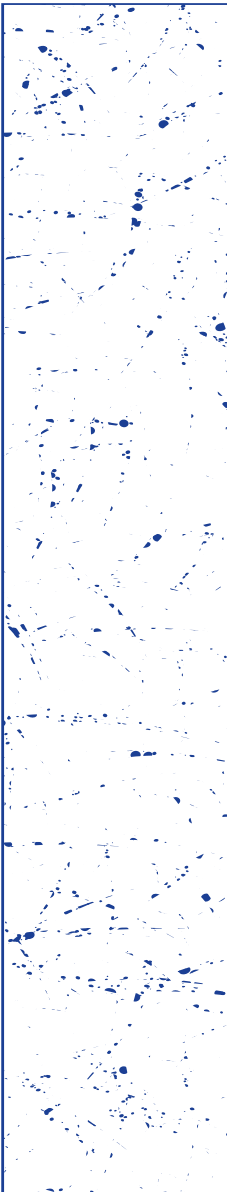
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