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Photo Courtesy of HP Graphics Solutions
Welcome to the first 2021 edition of Thermoforming Quarterly. With optimism creeping upward in many areas, I would like to add to the positive vibes. I am thrilled to report that our first divisional webinar was very successful with over 350 attendees with representatives from over 30 different countries. There were many OEMs and design firms from various industries. Individual demographics suggest a large segment of decision makers, including company owners and presidents.

This was truly a team effort, and on behalf of the SPE Thermoforming Division Board of Directors, I’d like to thank everyone involved for their hard work and dedication to make this successful. Jay Waddell of Plastic Concepts & Innovations and Evan Gilham of Productive Plastics made a formidable team to deliver their insightful and informative technical presentation, “Replacing Steel with Thermoformed Plastics.” And to our sponsors, Joslyn Manufacturing, Plastic Components, and Universal Plastics, thank you for believing in our vision and providing us with the resources to educate the design community. We would not have been able to do this without your generosity and continued support.

As readers will know, we are planning to host our annual conference in-person in Grand Rapids, Michigan, and online this September. The exhibit hall, technical sessions, and additional content will be available online to those attendees who are unable to join us live. New engagement tools will help bridge the gap between in-person and virtual attendees. These tools will also help facilitate conversations not only between attendees and exhibitors, but between the attendees themselves.

Sponsorship and booth space sales are now underway, and each exhibitor will have traditional exhibit space in addition to their own virtual conference booth at no additional charge. So while virtual conference attendees can’t meet with our exhibitors in person, they can still visit with them in our online exhibit hall. We’re also introducing two “Learning Centers” where exhibitors can unveil their latest technologies. We’ve also added some non-compete time to the schedule so that attendees can spend more time on the show floor. I don’t want to ruin all the surprises we are planning, but the conference committee and the board are very excited about our first hybrid event! More details will be revealed on our website as our planning activities continue in the coming months. Registration will open and technical program information will be available this spring.

In this issue, we feature some colorful news and developments from the decorating sphere (pp.13-16). On the sustainability front (pp.18-20), we turn the mirror on ourselves to explore some of the behavioral components associated with human understanding of materials. It’s a fascinating read with implications for marketers, in particular.

Stay safe, stay healthy, stay busy, and stay positive!

Wishing you success in 2021.
There is no substitute for the experience we’ve gained by rolling up our sleeves and working through improvements at every stage of thermoforming technology for over six decades. From process design through putting high-output machinery on the floor, innovation is in our DNA.
Lacerta Group Partners with SK Capital to Drive Next Phase of Growth

SK Capital - Company Press Release

January 11, 2021 – Strategic investment from SK Capital to support Lacerta’s continued leadership in providing innovative and sustainable packaging solutions to a rapidly growing market

Lacerta Group, Inc. (“Lacerta” or the “Company”), a leading designer and manufacturer of specialty thermoformed packaging solutions, announced today a strategic investment from funds advised by SK Capital Partners, LP, a New York-based private investment firm focused exclusively on the specialty materials, chemicals and pharmaceuticals sectors.

SK Capital is acquiring a majority interest in the Mansfield, Mass.-based business. Lacerta’s co-founders, Ali and Mory Lotfi, will continue to retain a significant ownership stake in the Company. Terms of the deal were not announced.

Privately held since it was founded in 1993, Lacerta is a leading provider of innovative packaging solutions primarily serving the food sector. The Company offers a comprehensive range of custom PET packaging products, including a leading line of tamper-evident products sold under the “Fresh N’ Sealed” brand. Lacerta has experienced top-line growth of 25% annually since 2013 driven by a customer-centric model that is supported by product innovation and fulfilment through its extensive in-house manufacturing capabilities. Given that the vast majority of its products are 100% recyclable, and the packaging solutions produced by the Company can be made with up to 100% recycled content, Lacerta promotes a more circular and sustainable approach to food packaging.

Lacerta offers a complete range of manufacturing services, from concept development, prototyping and mold making, to thermoforming, extrusion, printing and quality assurance. The Company operates thermoforming machines capable of producing millions of packages per year. It also has CNC milling machines for mold making and in-house prototyping thermoformers to help turn around prototypes — usually within one week. In a rapid response to the needs created by the current pandemic, the Company has also developed a face shield made from PET resin for use by healthcare and retail workers.

“Ali, Mory and the Lacerta team have built an exceptional business with a best-in-class reputation for customer service, innovation and sustainable products,” said Jack Norris, Managing Director of SK Capital. “We look forward to partnering with Ali and Mory to support the continuation of Lacerta’s extraordinary growth. Our mutual focus is on preserving Lacerta’s customer-centric approach, which is highly differentiated in the market, while at the same time putting in place the required systems, processes and capabilities that will enable the Company to scale alongside its expanding customer base.”

“Today marks the beginning of an exciting new chapter for Lacerta,” stated Lacerta President Ali Lotfi. “We chose to partner with SK Capital given its track record of successfully supporting the growth and improvement of family-owned businesses and the fit between our needs and SK’s capabilities. Our organizations share the same core values and long-term orientation that have been a hallmark of Lacerta’s success to date. We are aligned in our vision to build Lacerta into a world-class packaging solutions provider.

SK Capital Senior Director Dave Mezzanotte added, “We view Lacerta as a platform that can be grown in a multitude of ways to serve a wider range of its customers’ requirements. We’re especially excited about the opportunity Lacerta has to enable its customers to meet their internal sustainability targets by utilizing packaging that’s fully recyclable and incorporating recycled content at increasingly higher levels.”

Latham & Watkins LLP acted as legal counsel to SK Capital, and debt financing was led by Citizens Bank, N.A. Citizens M&A Advisory acted as exclusive financial advisor to Lacerta.
Worlds First No.1 Resin Code Recyclable PET Barrier Material

NS Packaging Staff Writer

February 02, 2021 – Direct oxygen contact with perishable foods has been a problem for food manufacturers since the beginning of time, but not anymore. Placon Corporation announces a new, patent-pending recyclable oxygen barrier material called OxyStar™. When creating our custom food packaging, the number one challenge is figuring out how to help the food last longer.

Introducing the world’s first recyclable PET barrier material, OxyStar. Most barrier solutions today are classified with a #7 RIC that cannot be recycled. OxyStar PET barrier material has a #1 RIC, allowing the package to be put back into the PET recycling stream to be used over again. Creating a package that gives your products a better way to stay fresher for longer and increases product shelf life while making a sustainable impact is how we make simply better packaging.

Placon’s OxyStar barrier material utilizes an active oxygen barrier that stops oxygen ingress through a free radical chain reaction within the packaging sidewalls. Throughout the shelf life of the OxyStar active agent, the oxygen ingress will be near zero. OxyStar is made using PET material, which allows it to be the first barrier material with the #1 RIC. This is key to ensuring that we continue to support a close-loop recycling stream for PET plastics.

“OxyStar PET barrier material is bringing a sustainable solution to the barrier packaging space that we have not seen before,” said Brian Hodek, Placon Food Processor Sales Manager. “Being able to create a barrier packaging solution that uses the #1 RIC to maintain a closed-loop recycle stream helps support our mission and vision as a packaging company,” said Hodek. “This barrier application took significant time to develop, but our team has already started working with key customers across the United States and we anticipate many more customers inquiring about OxyStar as we start developing new custom food packaging in the coming months,” said Hodek.

Direct oxygen contact with perishable food, is known to significantly decrease the shelf life of oxygen sensitive products, increasing food waste, and shrinking profits for producers. Food waste is the single largest component of waste in landfills today. Placon’s OxyStar product will help create a closed-loop PET recycling stream as it can be used over again as this packaging application designates the #1 PET RIC.

Ford Designs Clear, Reusable, Thermoformed Respirator to Boost N95 Supply

Sarah Kominek, Plastics News

February 5 – Ford Motor Co.’s new thermoformed PET respirator, which it expects to certify to N95 standards, allows hearing-impaired people who read lips to see the wearer’s face while providing protection for the wearer and people around them.

Amid a shortage of N95 disposable respirators when the COVID-19 pandemic hit the U.S. in 2020, Will Brick, design prototype lead at D-Ford, the automaker’s human-centered design studio, hoped to create a “robust and reusable” respirator “that was easy to manufacture and very low cost so that it could relieve some of the pressure of the demand for the disposable types,” he told Plastics News.

Ford recently received patent-pending approval for the reusable, one-size-fits-all mask.

Testing of the respirator mask “continues this winter,” Ford said in a Feb. 2 news release, “with expected availability sometime this spring.”

Food- and medical-grade thermoformed PET sheet allows the company to “rapidly produce a complex geometry for a flexible respirator body that would fit to the face,” Brick said.

The PET also “has good clarity, it’s very formable, tough, very resistant to cracking or splitting,” he said. “Once it’s formed, it has good mechanical properties that allow it to work with its gasket and special shape of it, allow it to reliably fit and seal to a number of different face types.”

The skin-safe silicone gasket forms an airtight seal, Brick said, which is “paramount” to its efficacy for both the wearer and people in the wearer’s vicinity.

Traditional cloth masks, Brick said, primarily protect “folks in the vicinity of the person wearing” them, “by catching droplets in exhalations that could be carrying virus.”
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A respirator, he said, “is primarily meant to protect the person wearing it. ... There are respirators that have exhaust valves that exhaust unfiltered air while any air coming into the respirator is forced to go through the filtration material or media.”

Ford’s new respirator filters air coming in and out, while blocking droplets with “a solid plastic shield rather than an absorbent material,” Brick said.

The mask also doesn’t fog up glasses, he added.

“People like [clear plastic] face shields because you can see through them but usually the person is wearing a cloth mask underneath,” Brick said.

“One of the things that’s missing during the pandemic is the power of a smile,” Jim Baumbick, vice president of Ford’s enterprise product line management and leader of its Project Apollo personal protective equipment manufacturing effort, said in the release. “This clear respirator promises to improve interactions between neighbors, at the store and for those who have hearing impairments.”

The respirator offers a “safe solution where visible human expression is desired, such as teaching, air travel and sales,” the release said.

Ford has also ramped up its separate initiative to donate and distribute 120 million medical-grade masks to communities in need, including more than 25 million masks over the next five weeks.

The automaker’s #FinishStrong messaging campaign continues Feb. 7, with ad spots during Super Bowl LV, featuring a public call-to-action for “Americans to come together, protect each other and fight COVID-19.”

The spots were created by filmmaker Peter Berg, known for movies including Friday Night Lights, Patriots Day and Lone Survivor.

The company will also share an inexpensive open-source design for a fan and HVAC filter combination that could help reduce virus particle concentrations in enclosed spaces, it said in the release.

“I never expected I would be working on a project like this, but I’m enormously appreciative ... to dedicate time to this kind of project and something that could have a beneficial impact on society,” Brick added. “That’s really special.”

North Carolina Thermoforming Files for Chapter 11, Sale Planned

Don Loepp, Editor, Plastics News

February 10 – Piedmont Polymers & Fabrication LLC is a heavy-gauge thermoformer based in Charlotte, N.C., that focuses on the aerospace and transit sectors.

A thermoforming company in North Carolina is undertaking a financial reorganization and expects to find a new buyer.

Piedmont Polymers & Fabrication LLC is a heavy-gauge thermoformer based in Charlotte, N.C., that focuses on the aerospace and transit sectors. The company was formerly the fabrication division of Charlotte-based sheet and semifinished product distributor Piedmont Plastics Inc.

In 2018, Piedmont Plastics sold Piedmont Polymers to ARC Industries Inc., a Charlotte-based financial services company that specializes in buying “old companies from old guys,” according to its website. ARC Industries has purchased 20 companies since 1999, according to its LinkedIn page. Reached by telephone, Ernest Cutter of ARC declined to comment.


According to documents and audio recordings filed with the U.S. Bankruptcy Court in Charlotte, tPiedmont Polymers’ sales dropped from about $19.2 million in 2019 to about $11.6 million in 2020. Former owner Piedmont Plastics is the largest secured creditor, owed about $5.99 million, according to court documents.

According to the court documents and a recent hearing, Piedmont Polymers has had several prospective buyers visit its 95,000-square-foot operation since the Chapter 11 filing, and the company expects to pick a stalking horse bidder and negotiate exclusively with that potential buyer in the next several weeks.

According to the most recent Plastics News ranking of North American thermoformers, Piedmont Polymers has 20 thermoforming lines. The firm has about 53 employees, according to court documents.

Piedmont Polymers officials and their lawyers did not return messages from Plastics News.
Last year, SPE partnered with Crain Communications, publisher of Plastics News, to launch the Bill Bregar Memorial Scholarship fund. Readers of TQ will be familiar with Bill’s work – he provided an extensive review of our conference every year, going into great detail on the Parts Competition in particular.

Most of our scholarship applicants are engineering and science majors. We are asking members of the plastics industry to help us promote Bill’s scholarship to their families and their friends’ and colleagues’ families. We’re looking for journalism and communications majors. It’s important we find students to benefit from this scholarship whose journalistic integrity is on par with Bill’s legacy. Crain Communications will provide initial funding of $5,000 with additional funding coming through donations. As of February 2021, over $17,000 had been raised.

The SPE Foundation is accepting donations through the Bill Bregar Scholarship Fund website. Apply at www.4spe.org/scholarships.

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The Importance of Controlling Intrinsic Viscosity in PET Extrusion

By Jimmy Shah, Sr. R&D Engineer, Impact Group, Hamlet, NC

Polyethylene terephthalate (PET or polyester), is one of the most commercially recognized, versatile, clear, strong, lightweight, and recycled plastic materials in North America and worldwide. This material was first synthesized in the US in the mid-1940s by Dupont in search of a new synthetic fiber. Later, in the early 1970s, a technology was developed to blow and stretch mold PET into bottles and that’s when single serve water bottles came into creation. Since then, use of PET in a vast range of consumer products applications from food-grade single-serve takeout containers to critical medical & pharmaceutical packaging applications, to the all-present plastic water bottle, has taken off drastically. More than 50% of the fibers commercially available and used for various apparel and industrial applications are made of PET. Extruded PET sheet and rollstock is widely used in the production of rigid packaging through extrusion and thermoforming processes.¹

PET has many advantages, from aesthetics, to barrier properties, to durability, thus making it desirable for wide range of applications across various industry segments. Let’s take a closer looks at each of these:

- **Aesthetics:** PET possesses glass-like clarity to packaging applications which is critical for visibility in consumer products applications.

- **Lightweight:** While PET is heavier than some other commercially available thermoplastics used in packaging such as PP, PET is lightweight in comparison to non-plastic alternatives such as glass and aluminum, allowing for a lower carbon footprint solution.

- **Chemical Resistance:** PET is a very inert material that is resistant to attack by micro-organisms. This attribute means this material does not react with food products, which contributes directly to its safety and explains why it is widely used in food, beverage, and pharmaceutical packaging.²

- **Barrier properties:** PET has excellent oxygen barrier properties making it a suitable material for medium-barrier food and medical packaging applications. Barrier properties can be combined with other proprietary solutions using extrusion and / or extrusion thermal lamination processes to enhance overall material properties.

These attributes are demonstrated among the various forms of PET packaging readily available in the market. In addition to ubiquitous PET water and soda bottles, various clear trays and clamshells for fruits, vegetables, bakery, snacks, and condiments are also made from PET. And with advancements in resin technology, performance grades such as materials with low-temperature impact properties for freezer applications are now available further expanding the capabilities of PET packaging.

Considering the global initiative to improve the sustainability of plastic packaging solutions, the environmental profile of PET means that it is one of the most recycled plastics in the world. This material can be ground, washed, cleaned, melted, and reprocessed in mechanical recycling, or it can be hydrolyzed down to monomer during a chemical recycling process for re-purification and repolymerization.

Adding to its sustainability profile is the energy-efficiency of PET. Although the feedstocks for PET are petroleum based, the environmental impact of this material is lower than non-plastic alternatives such as glass and aluminum. This has to do with the capacity-to-weight ratio, which allows for more product in a lighter weight packaging solution, resulting in less solid waste by weight and fewer emissions.³ Advancements in precision extrusion and materials technology further contribute to the energy efficiency of production.

Most of us can probably picture what PET looks like in its end-use application, but how is it made?

---


PET is made by copolymerizing monomers including Ethylene Glycol and Terephthalic Acid under heat and pressure with the help of metallic catalysts. Polymerization occurs through a polycondensation reaction of the monomers with water as the by-product. As the viscosity increases during the polymerization stage, so does the polymer chain and chain length. The reaction is stopped at the desired polymer chain length which is related to its end-use application. This is measured using an intrinsic viscosity, or IV, testing technique.

**Advantages of Testing and Controlling IV**

There is a great advantage in testing and controlling IV for its processability and overall quality of the product. If a low or unknown IV grade PET is processed, it will produce undesired effects including extrusion pressure and melt viscosity variation. These can result in sheet thickness variation or brittleness. The same follows at the thermoforming process stage with high deviation in the process and scrap rate.

PET does have some processing challenges, particularly now that sustainability has become a pressing issue leading to increased demand for post-consumer recycled content (PCR). Using recycled PET (RPET) changes the IV of the material as the metallic catalyst used in the initial polymerization loses its strength and cannot be revived. Additional factors that affect the IV are drying and processing parameters. PET is hygroscopic, meaning it absorbs moisture very easily, and it must be dried before it can be extruded. When half-dried or wet PET or RPET is processed, it can result in a product with low IV due to its moisture content.

As such, the economics of using an unsatisfactory and unknown IV of PET material are significant. This will further affect the bottom line in terms of unwanted scrap, waste, additional process runs and related costs for both the extruder and thermoformer.

**What is IV and why you should care?**

You have probably heard of the term IV when discussing PET materials, but why is this specification so important? As we discussed earlier, the polymer chain reaction, or polymerization, is stopped at a point when polymer chain length reaches a certain level for its end-use application based on its IV test reading.

A measure of the polymer’s molecular weight, IV reflects the material’s melting point, crystallinity, and tensile strength. IV is thus a key quality control specification and perhaps the most important characteristic of PET. IV is dependent upon the length of the polymer chains. The longer the polymer chains are, the more entanglements occur. The higher the viscosity value, the stiffer the material. The desired IV of PET is dependent on its application and is classified in different grades below:

<table>
<thead>
<tr>
<th>PET grade</th>
<th>Intrinsic Viscosity [dL/g]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fiber grade</td>
<td>0.40 – 0.70</td>
</tr>
<tr>
<td>Film grade</td>
<td>0.70 – 1.00</td>
</tr>
<tr>
<td>Bottle grade</td>
<td>0.70 – 0.78</td>
</tr>
<tr>
<td>Water and soft drink bottle grade</td>
<td>0.78 – 0.85</td>
</tr>
</tbody>
</table>

As discussed, the mechanical characteristics of PET are better at higher molecular weight (higher IV) and are worse at lower molecular weight (lower IV). Should the IV of the extruded PET sheets drop below acceptable thresholds, the end product’s mechanical properties will be compromised to an unacceptable level, resulting in downstream quality issues in thermoforming processes.

Most extrusion processors of PET require outside sources and labs to perform IV testing, which can take days to weeks to get the results. Most likely, by the time the material IV is known, the quality issue has already been discovered and the material has been rejected.

This is where real-time IV monitoring during the extrusion process comes into play. Real-time IV monitoring identifies any deviation in processing conditions and is able to take corrective action to ensure consistent quality and an efficient production run. These results are benchmarked against the ASTM Solution Test Method for measuring IV and possesses an accuracy of +/- 0.02 dL/g.

**Improving Quality Through Controlled IV in Sheet & Rollstock Extrusion Processes**

As discussed, the mechanical characteristics of PET are better at higher molecular weight (higher IV) and are worse at lower molecular weight (lower IV). Should the IV of the extruded PET sheets drop below acceptable thresholds, the end product’s mechanical properties will be compromised to an unacceptable level, resulting in downstream quality issues in thermoforming processes.

PET grade | Intrinsic Viscosity [dL/g] |
----------|---------------------------|
Fiber grade | 0.40 – 0.70               |
Film grade | 0.70 – 1.00               |
Bottle grade | 0.70 – 0.78               |
Water and soft drink bottle grade | 0.78 – 0.85 |

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Global demand for more sustainable packaging solutions has put the issue of recyclability top-of-mind in the plastics industry. Closed-loop recycling of used PET bottles into new food-grade PET containers presents a significant opportunity to extend the environmental benefits and sustainability of PET. Extensive life-cycle analysis studies have examined PET’s energy use and greenhouse gas emissions and have consistently shown this material to offer an excellent sustainability footprint for packaging applications. In addition, the safety and use of PET have been repeatedly demonstrated through extensive research, scientific test studies, and regulatory approvals for its use and reuse.\(^5\)

There are now more opportunities to use recycled PET in packaging applications than ever before. Infrastructure established over the past decade has made it possible to produce RPET solutions that meet the same quality and safety standards as virgin PET. The use of post-industrial regrind integration provides an additional means of improvement to reduce the amount of virgin plastics. When supported by technological advancements in PET extrusion and through the use of real-time IV quality monitoring processes, circular-economy practices mean never having to sacrifice quality in your PET packaging solutions.

Jimmy Shah is a Sr. R&D Engineer at Impact Group and is based in North Carolina. He began his career with Impact Plastics as Extrusion Process Engineer and today is an integral part of the research and innovation team. Jimmy’s expertise lies in sheet extrusion, material formulation for multi-layer high barrier and non-barrier food and medical packaging applications with a focus on optimization of product using sustainable material resources for new product and process development from the concept phase to the commercialization. Jimmy is an active member for Society of Plastics Engineering (SPE) and serves as a Chair for Young Professionals Committee (YPC) by SPE that helps connect young professionals to industry veterans.

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Digital Thermoforming: A Small Blue Ocean with Big Opportunities

By Thomas Giglio, HP Latex Large Format Business Lead, North America

For many years now, thermoforming companies have searched for technology which can inject life into an aging, analog industry comprised of long runs, extended lead times and limited vertical market expansion. It is a culture searching for ways to reach new customers with new applications in order to stay relevant in a fast-changing market. The recent pandemic has only accelerated this need.

In 2018, HP Inc. answered the call to many of these desires with the introduction of the HP Latex R Series printer, an industrial-level digital printer platform that is capable of printing directly onto various materials and thermoplastics, both rigid and flexible. The technology in HP’s exclusive Latex ink allows for high pigment (density), high temperature, and high elongation without the many gaps previously experienced with conventional and digital UV-curable and solvent inks, such as loss-of-density, cracking, re-wetting and chipping.

HP’s Latex inks were introduced to the market at the DRUPA trade fair in Germany in 2008, offering a sustainable solution of water-based inks to an industry that was accustomed to printing with solvent-based inks with hazardous air pollutants (HAPs), volatile organic compounds (VOCs), and a distinctive smell. Though only available in roll-to-roll printers at the time, HP’s ink technology has since advanced to a current fourth-generation ink set, rolled out with the commercialization of the R Series printers. This new generation has a much more appealing ecological footprint as it does not use reactive monomer chemistry.

Many print service providers (PSPs) that print graphics for the sign and display industries are switching their printing technology to HP Latex inks because they produce high-quality, vibrant colors on a number of substrates, all withstanding the rigors of the thermoforming process. Odorless prints, no HAPs, low VOCs, and user-replaceable printheads are several of the advantages that drive the printing industry to adopt HP Latex. One standout feature was the introduction of HP Latex white ink on the HP Latex R Series: once a challenge for any digital printer, but now a viable, easy-to-use and attractive solution.

Certain end-users such as sign shops, screen printers and commercial printers are now able to reach a broader customer base with more applications. Companies that were only offering signage now offer high-demand décor solutions such as feature walls, wall coverings, canvas printing, and even durable textiles. This transformation allows companies to tap into a new wave of products, all driven by personalization and shorter runs and faster go-to-market development. These companies now address a larger customer base, win larger margin potential, and have breathed new life into their sales and operations teams.

A Thermoforming Renaissance

Thermoformers that were previously only producing for a limited market are now reaching more customers with more solutions and venturing to leverage the technology to pull them into new markets.

Duo-Form Manufacturing in Edwardsville, MI, is a prime example of this renaissance. Known for supplying the RV industry with thermoformed plastic parts such as shower units, bath tubs, and trim components, Duo Form embraced the R Series to decorate shower enclosures with many types of marble designs, offering customization to an industry which had no such capability, especially for smaller orders which needed to be turned faster. They installed their first R Series printer in 2019 and have since added two additional units. In addition to adding the production capacity, Duo Form is now producing a line of customized Personal Protection Equipment (PPE) along with a line of artwork. Core markets for RV products are evolving with many, historically sterile, parts.

For other companies, this technology has enabled them to offer more solutions and capabilities to the same customers while at the same time adding capacity to attract new clientele.

United Visual Branding (UVB) in Tampa, FL is a national sign manufacturer that fabricates sign structures and channel lettering relative to overall brand identity to many companies, including high-end automobile manufacturers. While
LOW FLEX™ FORMER SERIES
- LF5.0 Shown – 190 Ton
- Numerous quick change features
- Easy maintenance access

LINEAR RAIL TRIM PRESS
- LR5 Shown - 45 Ton
- Side Loading of Tool
- Numerous quick change features
- Precise tolerances via linear rails

TECHNOLOGY
- Flat Bed Formers
- Form-Trim Models
- Linear Trim Presses
- Linear Vertical Press
- Heavy Duty Presses
- Tilt Bed (IML)
- Linear Pre-Punch
- Linear Scoring Station
- Rotary Drum Former

PROCESSSES
- PP, PET, HIPS, OPS
- PLA, HDPE, PS Foam
- In line/Roll Fed
- Cups, Car Cups, Lids
- Retort Products
- Tamper Evident
- Hinged Trays
- Storage containers
- T1ML

VALUE
- Energy Efficient
- Production Rates
- Move Times
- Ease of Access
- Reliability

SERVICE
- Training Classes
- On line help
- Process Training
- After hours help
- Included start up service

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thermoforming is not UVB’s core business, they do produce turnkey solutions which also include thermoformed sign faces. These are the types we all see when we visit the automotive dealerships. The artwork for these brands often necessitates a match with the formed shape, achieved through a process called distortion printing.

For successful distortion printing, the thermoformer must employ a stable environment, eliminate variables, and ensure consistency and replication. This has typically been a trial-and-error process. Ultimately, however, it will force companies that do a lot of distortion printing into digital printing one way or another due to the huge savings potential on labor and materials. In UVB’s case, they worked with Distortion Arts, a unique art services bureau in Ontario, Canada.

UVB printed a handful of stable parts with a proprietary grid from Distortion Arts and then shipped the parts to Canada. The Distortion Arts engineers then altered the artwork to compensate for such variances as tool temperature, heat, sag, and cooling. Once the grids were analysed VR SIMs (virtual 3D models) were provided for customer approval and the final artwork was adjusted so that UVB could print and exactly match the tool shape when formed. Time savings were significant, leading to a foundation for repeatable results.

While outdoor signs are a large part of UVB’s core business, they are also using the R Series printing technology to offer wall graphics and floor graphics to the same customer base.

For HP, work continues to create a network for its thermoforming program. From software to the actual thermoforming machine, the ecosystem is showing signs of development.

The addition of post-printing coating systems and coating formulations is especially important. For sign makers, expected outdoor life is approximately 5-7 years. For specialty and aftermarket applications, the parts may be subjected to extreme temperatures, abrasion, and stress which would be over and above the capabilities of the Latex ink unprotected.

HP has partnered with Polymeric Imaging (coatings) and Burkle (coaters) so that customers have an open-architecture of experts that work together to provide solutions. Additionally, HP has a strong relationship with Primex Plastics (substrates) and MAAC Machinery (thermoforming machines). This is especially important as many applications are broad and require strong subject-matter expertise and collaboration from more than one company.

HP continues to forge ahead with newer devices. New additions to the product line include the HP Latex 700 and 800 Series, 64-inch roll-to-roll printers that are suitable for printing to films, adhesive products and other roll goods, all with the same core technology that is found in the HP Latex R Series.

Many companies can now take advantage of HP Latex technology and collaborative expertise from reputable partners.
Since 1965, our mission: The design and manufacture of the most advanced and energy efficient thermoforming machines in the world, for the processing of thermoplastic materials.

O.M.G. srl currently offers a wide variety of standard series machines for both thin and heavy gauge applications, as well as highly customized complete packaging lines, and custom thermoforming systems.

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Call O.M.G. for all your thermoforming application needs!!
People’s Perception: Highlights of In-Depth Psychological Market Research on Bio-Based Products

Reprinted with permission from Bioplastics Magazine, Issue 06, Nov/Dec 2020

In recent years, numerous B2C online surveys and focus group analyses have been conducted to understand what consumers think of bio-based products. It is well known, however, that other methods such as in-depth psychological interviews are better suited to explore deep-seated opinions, prejudices and contexts. This gap is being filled now by the novel approach used in this project. Instead of conducting the umpteenth standard survey, nova-Institute used the expertise of the renowned specialist market research company 0 (Cologne, Germany) to gather the information needed about the consumer mind set. September is one of Germany’s market leaders in deep psychological market research.

In this project, this methodology has now been applied for the first time to questions with relevance to the bio-based economy – with partly astonishing results.

Guiding principles of the in-depth interviews are professional naivety, open interviewing and customer centric approach. The picture below shows the bio-based product samples from different product categories that were shown to the participants, without any explanation about their origin.

The interviewees held the items in their hand during the session, which gave a good frame for an in-depth interview. The interviewees were asked to sort the items three times: once according to their perception whether the items could be made out of a bio-based or fossil-based feedstock, the second time according to importance of the feedstock for the product category and the third time according to preference for a bio-based feedstock.

**What are plastics made of? Consumers generally have no idea about mineral oil being the feedstock. It is a widespread perception that plastics are bad and kill animals in the sea**

When it comes to plastics, the interviewees mainly thought of negative aspects, but almost no one was aware that they are made from crude oil: “Something chemical, industrial, artificial ingredient, when it comes to ingredients I don’t really know”. The respondents were very surprised to learn that plastics are actually made from crude oil and can be made of plants.

**Food/Drink-Packaging (partly bio-based)**
**Bio-based polymer Baby Toys by bioseries**
**Biocomposite Body care containers and comb**
**Biocomposite Plastic cutlery**
**T-Shirt made of lignocellulosic**
**Biodegradable garbage bags**
**„Xugar”: Only the product itself was shown. The packaging (wood origin) wasn’t revealed**
**Bio-based polymer tupperware**
**Bio-based Bottle opener and Shoe-horn**
Easy thinking: plant features are projected onto the product – chemistry is toxic magic

The knowledge of chemistry is very low and the transformation from liquid mineral oil to solid plastic works like a miracle. Chemistry is toxic magic. In this way, the properties of the raw materials are transferred directly to the end products in consumers’ minds. Wood is hard, resistant and durable; analogously it should only be used to make hard, resistant and long-living products.

<table>
<thead>
<tr>
<th>Plant characteristics</th>
<th>Expected product characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hard</td>
<td>Hard, resistant, long-living</td>
</tr>
<tr>
<td>Soft</td>
<td>Soft, flexible, short-living</td>
</tr>
<tr>
<td>Virgin agricultural</td>
<td>Clean, natural, uncontaminated</td>
</tr>
<tr>
<td>Recycled/saved from</td>
<td>Particularly environment-friendly, but might be polluted, low in quality: suitable for single use</td>
</tr>
<tr>
<td>garbage</td>
<td>High quality but too precious for single use</td>
</tr>
<tr>
<td>Vegetable (quickly</td>
<td>Healthy/good influence on the product Rather soft and not resistant</td>
</tr>
<tr>
<td>growing)</td>
<td></td>
</tr>
<tr>
<td>Biowaste/compost/</td>
<td>Unhygienic, smells bad, might be polluted</td>
</tr>
<tr>
<td>“alive”</td>
<td></td>
</tr>
</tbody>
</table>

First generation feedstock for single use applications

For soft and single-use applications, interviewees prefer first generation feedstocks: “Food crops are a high quality feedstock, but they are perceived less valuable than virgin lignocellulosics since food crops grow faster.” The understandable transfer of raw material properties to the product also works for these feedstocks: “This plastic product could be made of corn, because corn feels like plastic” – so it’s only logical you can make plastic out of it. Only very few respondents were aware of the discussions on food or non-food crops for industry, which seems to be mainly a discussion in the political area.

Nobody understands bio-based and all believe plant-derived products will be biodegradable

Products made from plants are biodegradable to consumers. Meaning: It will biodegrade if one throws it in the compost or in the forest. Thus: “Everything made out of plants is environment friendly”. The term bio is linked to organic, in contrast to bio-based, which was not understood or misunderstood. Consumers understand plant-based.

<table>
<thead>
<tr>
<th>Wording</th>
<th>How consumers understand those wordings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plant-based / based on plants</td>
<td>▪ Products made out of plants are perceived as natural, environment friendly and healthy</td>
</tr>
<tr>
<td></td>
<td>▪ What kind of plant it is, isn’t asked by the consumers. Could be any kind of plant: Grass, Flowers, Trees, Bamboo, …</td>
</tr>
<tr>
<td></td>
<td>▪ The aspects of the plants are also expected for the end product: f.e. soft plant = soft products</td>
</tr>
<tr>
<td>Bio-based</td>
<td>▪ Is perceived as an artificial creation – no one likes to think about the meaning</td>
</tr>
<tr>
<td></td>
<td>▪ Bio is linked to organic and since the feedstock of plastic is unknown to many, consumers can’t do anything with it</td>
</tr>
<tr>
<td></td>
<td>▪ The wording wasn’t used for the exploration, since the wording does not explain the plant origin</td>
</tr>
<tr>
<td>Degradable/Biodegradable</td>
<td>▪ Consumers don’t know the difference between those two wordings</td>
</tr>
<tr>
<td></td>
<td>▪ Plastic is nondegradable to consumers.</td>
</tr>
<tr>
<td></td>
<td>▪ Products based on plants are degradable to consumers. Meaning: It will degrade if one throws it in the compost or in the forest</td>
</tr>
<tr>
<td>Plastic</td>
<td>▪ Mineral oil feedstock is often unknown</td>
</tr>
<tr>
<td></td>
<td>▪ Feels artificial, might be created in a lab: Is antiseptically clean</td>
</tr>
<tr>
<td></td>
<td>▪ Plastic-Evileness is linked to selected products: e.g. straws</td>
</tr>
<tr>
<td></td>
<td>▪ Is always available and cheap: Can’t be made out of renewable resources</td>
</tr>
</tbody>
</table>

Some products are more relevant as others

Highly relevant is the replacement of evil products with bad eco-image: Water bottles, coffee cups, garbage bags, wrapping. This applies especially for the consumer groups Healthy optimizers and Ascetic moralists, as they have a high motivation to make efforts. For the Lifestyle posers, bio-based products give the opportunity to show off with fancy products. Also highly relevant are products that influence the body, get in touch with food and drinks and give opportunity to a great visibility and offer potential to show off: Tupperware, plastic cutlery, water bottles, coffee cups, wrappings as well as baby toys such as teethers or rattles.
**Consumers want to be educated by the politics**

Consumers feel overwhelmed, not competent and not responsible for the decision which materials are good or bad. Respondents wanted a simple, official and trustworthy label to help them identify the good materials. This result calls into question the numerous consumer awareness projects currently underway. Perhaps the development of a labelling system would be more helpful.

**Findings for consumer communication strategies**

An important finding from the in-depth interviews was that respondents were not per se curious about the origin of the feedstock: it’s NOT top of mind. This has as a consequence that communication of feedstock basis of a product can bear considerable risks – or good potential if played well. When the feedstock topic came up during the interviews, the respondents raised many further questions:

- Which plant is it? How does this influence the product? How green is the feedstock? How valuable? How tasty?

- The good image of the umbrella term plant-based can then even turn around when it comes to the images of the different feedstocks.

- As a consequence, “the holy leaf loses its sanctity”, meaning that the good image of something natural is questioned more and more.

Bio-based shopping bags – the market introduction and consumer campaigns for biodegradable shopping bags in Italy a few years ago apparently had a positive impact on the public awareness.

It can therefore be concluded that experience and education of consumers eventually pays off. Another interesting difference between the three countries (see below) was that potential health issues due to mineral oil based plasticisers (e.g. in plastic bottles) were only mentioned by interviewees in Germany. Again, this may be attributable to correspondingly higher media coverage of the topic in Germany.

The respondents in Italy, Germany and Poland had serious difficulties differentiating each feedstock. Therefore, a communication of the feedstock basis should bear in mind the following:

**Communicate healthiness and high quality**

- Descriptions on packaging like „without XY“ or „contains no XY“ are very appealing for this type
- Is it important to this type to always get the best quality for himself
- This type is willing to pay a higher price

**Positioning should be „modern trend product“**

- The new aspects of this product should be very visible, so that other people can see what a great product was bought
- Environmental- and health-topics are only used to show off
- This type is willing to pay higher price for products with poser potential

**Deep knowledge**

- Packaging and product should be rather reduced and should communicate sustainability
- 100 % plant-based is important to this type, since he/she will try to buy as environment friendly as possible
- This type is willing to pay a higher price

**Communicate environment friendliness and reduction**

- Labels are very important to this type
- This type has to see a USP, or the product has an attractive price
- Wants good quality at a low price
- Willingness to pay more is low
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 global growth 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. Visit www.4spe.org for details. The question really isn’t “why join” but ...

Why Not?

All four groups may have different kinds of motives to decide for the so-called good alternative.

The results were obtained in the framework of the European research project “Bioforever” which has received funding from the Bio-Based Industries Joint Undertaking under the European Union’s Horizon 2020 research and innovation programme under grant agreement No. 720710. www.bioforever.org


[1] European project BIOFOREVER (www.bioforever.org); This project has received funding from the Bio-Based Industries Joint Undertaking under the European Union’s Horizon 2020 research and innovation programme under grant agreement No. 720710.
Jaime Gomez, SPE President, presented a thought-provoking paper on how broader societal and demographic trends are affecting SPE members. As shown below, the US labor force is changing, and not just from one generation to the next. The way we learn, network, and communicate have profoundly changed, with increasing focus on computer-based learning.

So how can SPE change to meet the new demands from our current and future members? Sometimes change is forced through exogenous shocks. COVID-19 forced us to transition from Crisis Mode to Opportunity Mode. SPE reinvented itself in a matter of weeks, taking full advantage of new remote software platforms to leverage a full ANTEC program into a profitable 6-week event.

Jason Lyons, SPE President-Elect emphasized the importance of the key pillars of SPE: knowledge and networking. While the organization cannot – and should not – try to be everything to everyone, we must always keep our “north star” in mind. By supporting plastics professionals across the world, we enable members to learn from each other and grown networks. This enhances our reputation as a hub of knowledge, where objective, data-driven research and publications are central to the brand’s value.

SPE Financial Report

The 2021 budget is forecast to be similar to that of 2020. The SPE organization has kept expenses low, showing admirable cost management over last three years, while still managing to add staff in critical revenue-generating areas. Significant technology and operational savings were realized through rationalization of certain IT assets and overlapping programs. Publications remain a key driver of revenue, while the virtual ANTEC platform offers new opportunities for sponsorships and advertising.

Revenue is projected to be $3.58 million and expenses are projected to be $3.67 million. Investment accounts are projected to make $90, so 2021 is basically a flat year. 2020 was projected to have a $350k deficit. Actual performance was a positive $90K. This was due to expense cuts made by the staff. However, there is very little room to cut more without affecting operations.

VP Chapters Report

Scott Eastman, VP Chapters, presented new mechanisms for members to organize that would also enable prospective members to form and be recognized by the Society.
This will help drive member engagement and growth. It will also help to expand SPE’s visibility, network, and reputation. Regional Interest Groups (“RIGs”) will replace Special Interest Groups (“SIGs”).

**CEO Report**

CEO Pat Farrey announced that ANTEC 2021 will be held in May, not March as previously planned. This is primarily due to the cancellation of NPE. In the past, ANTEC was either co-located with NPE or hosted during a different month to avoid a conflict. Staff and leadership will continue to explore opportunities for 2024.

SPE’s networking tool, The Chain, has been replaced by new “SPE Communities”. This change was due for two primary reasons: low adoption rates and high software costs. Of the 558 Chain groups created since the platform’s inception, 521 have had 10 or less conversation threads total since 2014. 425 of them had 0 posts, ever. Of the 37 remaining “most active” groups, one-quarter of them haven’t had a post since 2019 or earlier.

The Chain’s software platform costs SPE more than $30K a year to license, and that was negotiated down from a high of more than $100K per year in 2017 and prior. The Chain is a separate platform from the main SPE operating platform, making the login process between the two sites clunky and the synchronization of the user profiles between both difficult and expensive.

If you want to join a community, users will need to subscribe and set up notifications via their SPE account. This only needs to be done once.

Plastics Engineering magazine will become an in-house publication of SPE within a few months. Though previously published by Wylie, there have been many missed opportunities to generate editorial content in concert with SPE sections and divisions. The new approach will allow better communication between staff and chapter members. Farrey and others on SPE staff have deep trade publication experience.

The SPE PlastiVan has developed a new series of educational programming called “PlastiVideos”. Driven by changes in how young people consume content – and accelerated by remote developments in the age of the pandemic – the PlastiVan team is expanding its teaching corps and its social media presence. Both the Detroit Section and the Automotive Division have contributed significant support in the past year to realize these exciting changes.

**2020 Annual Report**

Following the positive reception of SPE’s first annual report in 2019, the Executive Board has approved a decision to issue a 2020 report. It is expected to be published in March.
ABOUT US

The PlastiVan® program is a great way to educate people of all ages about the chemistry, history, processing, manufacturing, applications and sustainability of plastics.

PlastiVan® educators are skilled at tailoring each presentation to meet the needs and grade-level expectations of every classroom and teacher through science, engineering, technology, and math (STEM).

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As a sponsor your company can nurture the development of its future workforce by opening young minds to the value of plastics in our everyday lives and excite them about a career in the plastics industry.

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To bring the PlastiVan® Program to your community, contact Julie Proctor at jproctor@4spe.org.

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

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

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

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

Join Us!
In 2020, SPE Thermoforming Division Board Members have learned and adapted to fulfilling our mission to promote our industry in new ways. Throughout the pandemic, our board of directors has continued planning virtual events and meetings. It is important that the Division maintain a strong and responsive board of directors that can step up both in good times as well as those we have been facing.

In December we called for volunteers interested in Thermoforming Board membership and held elections in January. During our February 2020 Zoom board meeting, I reported on the election results that were collected with the assistance of SPE Headquarters. I am happy to announce our 2021 class of new and returning Thermoforming Division Board Members: James Arnet, Robert Browning, Steve Clark, Juliet Goff, Roger Jean, Philip Karig and Jim Lyon.

Board positions are voluntary and held by those who work in the thermoforming industry. Held each year, elections are conducted on a rolling three-year cycle. Active SPE Thermoforming Division Members who have shown interest in the board, attended our conference and board meetings, and volunteered on committees are eligible.

I also would like to highlight our thermoforming industry colleagues who have served as board directors in the past who have been granted emeritus status: Lola Carere, Richard Freeman, Steve Hasselbach, Donald Hylton, Roger Kipp, and Gwen Mathis. Learn more about their contributions to our industry on our website: https://thermoformingdivision.com.

Interested in learning more about the Board? Please contact me:

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DATE CHANGE!
ANTEC® 2021 TO NOW TAKE PLACE IN MAY

ANTEC® 2021
REGISTRATION IS NOW OPEN!

There are now two ways to enjoy ANTEC®.

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SPE is expanding ANTEC® 2021 to include multiple attendee options, enhanced networking and an international focus. The 2021 program will include three segments: ANTEC® Industry Insights, ANTEC® Classic and ANTEC® International.

Each segment will be presented virtually. ANTEC® will kick off with Industry Insights, a two-day offering presented via SPE’s exclusive live-streaming service to remote attendees from May 5-7. ANTEC® Classic will offer real-time, remote presentations occurring over 10-days from May 10-21. ANTEC® International, which begins on May 24, will include live online presentations from Asia, Australia/New Zealand, Europe, India, the Middle East and South America. International dates will be announced shortly.

4SPE.ORG/ANTEC21
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Thermoforming Division Membership Benefits

- Access to industry knowledge from one central location: www.thermoformingdivision.com.
- Subscription to Thermoforming Quarterly, voted “Publication of the Year” by SPE National.
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- New and innovative part design at the Parts Competition.
- Open dialogue with the entire industry at the annual conference.
- Discounts, discounts, discounts on books, seminars and conferences.
- For managers: workshops and presentations tailored specifically to the needs of your operators.
- For operators: workshops and presentations that will send you home with new tools to improve your performance, make your job easier and help the company’s bottom line.

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Genesis

Genesis is a comprehensive inventory of stock machines, parts and sub-assemblies that enables expedited deliveries of complete sheet extrusion systems. All systems are current model years and PTi’s latest state of the art technology.

Represented within the scope of the program are ancillary components, including: individual extruders, roll stands, die supports, winders and pelletizers, all of which are available for complete line configuration and delivery within three months.

This unique offering better serves sheet producers by providing quick deliveries on a variety of standard machinery platforms. The Genesis Program results in the immediate availability for a variety of sheet extrusion system configuration combinations, in which the reduction in lead time for these systems represents a significant factor for expediting the product-to-market timing and the pathway to financial success.

PTi also offers a comprehensive portfolio of sheet extrusion machinery technologies and sizes well beyond the scope defined within the Genesis Program.

ALL GENESIS SYSTEMS FEATURE 3 MONTH EXPEDITED DELIVERIES!

Complete Genesis systems are available to meet your exact processing needs. Individual lines sized by process, sheet specifications and output are immediately available and summarized below:

<table>
<thead>
<tr>
<th>Process Type</th>
<th>Process Description</th>
<th>Resins</th>
<th>Gauge</th>
<th>Structure</th>
<th>Rates</th>
<th>Width</th>
</tr>
</thead>
<tbody>
<tr>
<td>COMPACT INLINE THERMOFORMING</td>
<td>Sheet Extrusion / Thermoforming</td>
<td>PS, PP, HDPE &amp; PET (...and more!)</td>
<td>9 – 90 MILS</td>
<td>Mono- and/or Co-extrusion</td>
<td>1000+ pph, 2000+ pph, 3000+ pph, 4000+ pph</td>
<td>36 – 68 inch sheet widths</td>
</tr>
<tr>
<td>ROTARY THERMOFORMING</td>
<td>Inline Rotary Sheet Extrusion / Thermoforming</td>
<td>PS, PP, HDPE (...and more!)</td>
<td>9 – 25 MILS</td>
<td>Mono- and/or Co-extrusion</td>
<td>1000+ pph, 2000+ pph, 3000+ pph, 4000+ pph</td>
<td>up to 55 inch sheet widths</td>
</tr>
<tr>
<td>ROLL STOCK</td>
<td>Sheet Extrusion</td>
<td>PS, PP, HDPE &amp; PET (...and more!)</td>
<td>9 – 60 MILS</td>
<td>Mono- and/or Co-extrusion</td>
<td>1000+ pph, 2000+ pph, 3000+ pph, 4000+ pph</td>
<td>36 - 68 inch sheet widths</td>
</tr>
<tr>
<td>RECYCLING</td>
<td>Extrusion Pelletizing</td>
<td>PS, PP, LDPE, LLDPE &amp; HDPE (...and more!)</td>
<td>Rigid and Film Fluff</td>
<td></td>
<td>1000+ pph, 2000+ pph, 3000+ pph</td>
<td></td>
</tr>
</tbody>
</table>

SECURE YOUR GENESIS EXPEDITED 3 MONTH DELIVERY TODAY!

For more information about whether your project qualifies for a Genesis Program Expedited Delivery, call PTi!
NEW AMUT / COMI ACF 980 Roll Fed Thermoformer (IN STOCK!!!)
Form, Trim, and Robotic Stacker

NEW machines - IN STOCK

NEW, MAAC 5’ x 6’ Single Station Thermoformer
NEW, 5’ x 8’ Comet Single Station Thermoformer
NEW, 6’ x 10’ Comet Single Station Thermoformer

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