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Cover photo courtesy of Universal Robots
I am Steve Zamprelli, and I have the privilege to lead our division until ANTEC 2022. I have been a board member since 2013 and have served on the Executive Committee since 2014.

Since joining this amazing, hard-working and creative group, I have been thinking about future projects to further our cause, and about new ways to provide value to membership. Of course, due to the uncertainties created by the pandemic, projects we had considered were put on hold as we were forced moved in a different direction. Our board is a close-knit group and we really look forward to in-person meetings. This is not the way any of us would prefer to work, and it is especially not how I envisioned the beginning of my tenure as Chair!

We have adapted to a more virtual experience. We had our very first virtual Board of Directors (BoD) meeting in June and though there were challenges and concerns, with patience and help from all involved, it was ultimately successful. We plan to have our fall BoD meeting in October using the same format.

I would like to discuss some of the great things we are doing in order to meet current challenges and changes in our industry. For example, just as business development professionals and sales people have been forced to redevelop their approach to sales through the increased use of software such as Zoom or Teams, we as a division have adapted to current times and are developing ways to help members and keep them intrigued through social media platforms and the digitization of our archives.

We are planning several educational webinars that will be launched soon. Our committees have been working hard to educate and promote new techniques within the thermoforming industry. We are listening to what our members need, and we are continuing to innovate to provide better value. This starts with quality content, both in print and online.

The trade show model across all industries may be changing permanently due to COVID and it has forced many of us to reconsider how we can appeal to our members. Because we have changed our planning to less-frequent conferences, we are planning for more opportunities for our members to learn and engage with each other. Networking has changed dramatically, with people connecting via SPE’s The Chain communities as well as LinkedIn groups dedicated to thermoforming.

We continue to encourage academic partners to utilize our resources, especially scholarships and grants for students. We are here to help educate as you will see with recent scholarship announcements on pp. 10-11.

I appreciate this opportunity to serve as your Chairman and I will continue to work toward a better future for this organization. I look forward to seeing you at events in the future and I am always available to listen to your suggestions and concerns.
HAVE YOUR CAKE AND EAT IT, TOO!

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North America’s largest thermoformer plans to go public through an initial public offering

By Don Loepp, Plastics News

August 24, 2020 - Lake Forest, Ill.-based Pactiv Evergreen Inc. filed a preliminary prospectus with the U.S. Securities and Exchange Commission on Aug. 24, detailing plans for a stock offering. The company describes itself as the largest manufacturer and distributor of fresh foodservice and food merchandising products and fresh beverage cartons in North America.

The company is currently named Reynolds Group Holdings Ltd. of Auckland, New Zealand, and is owned by billionaire Graeme Hart. But the Pactiv name is well known in the plastics market — Reynolds Group bought Pactiv Corp. in 2011 for about $6 billion.

Pactiv Evergreen is a much different company today. The old Pactiv's business included the Hefty, Presto and Slide-Rite plastics brands. Those were spun off in a separate IPO in January as Reynolds Consumer Products Inc.

The Reynolds Consumer Products IPO raised $1.2 billion. The Pactiv Evergreen prospectus says its IPO will raise up to $100 million, but investment firm Renaissance Capital said that is likely a placeholder, and that the actual offering could raise up to $750 million.

Plastics News has estimated Pactiv's thermoforming sales at $2.875 billion and its film manufacturing at $184 million. The prospectus does not break out the company's sales by process, but it does give more details about the operations, which are heavily, but not exclusively, focused on plastics processing.

The company, which is headed by CEO John McGrath, posted 2019 sales of $7.11 billion, and adjusted earnings before interest, taxes, depreciation and amortization (EBITDA) of $1.04 billion. Nearly all the sales are in North America, with 86 percent from the United States and 8 percent from Canada and Mexico, combined.

Pactiv Evergreen has about 15,000 employees at 46 manufacturing and 27 distribution plants. Its substrates include conventional plastics, bio-based resins, plant and paper-based fiber and aluminum.

Most of the plastic products are in the foodservice category, with products including food containers, hot and cold cups, lids, dinnerware and other items used by chain restaurants, convenience stores and institutions including schools and hospitals.

The company claims to have the No. 1 or No. 2 market share in products including containers, utensils, cafeteria trays, meat and poultry trays. It claims to be No. 2 or No. 3 in cups and lids, bakery and snack containers, and fruit and produce containers. Cups and lids accounted for 19 percent of 2019 sales, which was the largest segment for Pactiv. The second largest was paperboard cartons for beverages including milk, which accounted for 16 percent of sales.

The company stressed in an Aug. 24 news release that there is no guarantee that the IPO will be completed.

Graeme Hart has been maneuvering in recent months to pay down corporate debt, most recently selling bonds for Graham Packaging Co. Inc., a major North American blow molder and another part of his plastics packaging empire. Last year Hart also sold a large chunk of the Closure Systems International business.

Tim Burns, senior adviser at Cranial Capital in Cleveland, said in a recent phone interview that Hart is “constantly scouring his portfolio to see what can be sold to refinance the debt.”

Hart started building the plastics business in 2006 through deals with Carter Holt Harvey, International Paper, SIG, Alcoa, Pactiv and Graham Packaging.

Westlake Plastics, Environmental Composites launch joint venture

Company press release / UAS Magazine

August 11, 2020 - Westlake Plastics Company (Lenni, PA) and Environmental Composites, Inc. (Utica, NY) today announced the launch of Aerolite Carbon, a joint product venture resulting in a new advanced composite material technology compatible with standard thermoforming equipment (vacuum forming / pressure forming).

- New innovative material technology allows lighter, more durable carbon fiber drone components at an affordable price.
• Ideal material option for aerodynamic shrouds and other components to reduce weight and ultimately increase flight time.

• Fast and affordable manufacturing using standard thermoforming equipment allows adoption in consumer and specialty drones at even the most competitive price points.

The product supports large volume applications with standard 4’ x 8’ sheet size, capable of being processed in under 2 minutes. Aerolite Carbon was developed to deliver better economy and throughput, while utilizing an existing global supply chain for part conversion. Complex geometry formation and as-molded cosmetic finishes are achieved in a single-step forming process through a proprietary carbon fiber reinforced sheet design.

Aerolite Carbon is an advanced carbon fiber textile impregnated with a proprietary thermoplastic alloy resin. The unique material chemistry and construction allow Aerolite Carbon to stretch uniformly when heated to form deep draws and sharp angles on simple one-sided tooling. Due to the lower cost and high throughput, Aerolite Carbon targets both consumer and industrial applications seeking lightweight performance products at minimal cost. Color matching, as-molded textures, class A surfaces and custom graphics are all possible with Aerolite Carbon.

Aerolite Carbon was developed jointly by Westlake Plastics (Lenni, PA), a global leader in advanced thermoplastic extrusion, and Environmental Composites, an industry leader in advanced textiles. Using the combined resources of both companies, they have invested in equipment and process technology to achieve a hybrid material, which combines advanced composites performance with thermoformable plastics economics. The result is Aerolite Carbon which allows designers to economically achieve carbon fiber performance in their applications through lower manufacturing costs.

Anchor Packaging buys thermoformer Panoramic, adds to product line, customer base

Plastics News Report

July 10, 2020 - St. Louis — Anchor Packaging LLC is building its presence in thermoformed packaging for fresh food by acquiring Panoramic Inc. of Janesville, Wis.

St. Louis-based Anchor said in announcement for the deal on July 9 that Panoramic has grown at a double-digit annual rate during the past 14 years and that it has a diverse customer base covering both regional and national food processors and retailers.

“This acquisition is strategically important to us for two reasons: It will significantly broaden our offering to attract bakery, produce, deli and confectionery customers,” Anchor President and CEO Jeff Wolff said in a news release. “Also, it expands our capabilities and speed to market across any size customer or project to support the growing needs of our customers.”

The purchase comes a little more than a year after private equity firm The Jordan Co. invested in the company, acquiring an unspecified stake in Anchor.

Anchor had $380 million in sales in thermoforming in North America, placing it at No. 9 in Plastics News’ most recent ranking of thermoformers in the region. It had another $120 million in film and sheet sales in North America. It said its stock product line covers 450 rigid packaging and cling film products.

Panoramic adds $44 million in thermoforming sales in the region, placing it at No. 40 in the most recent PN ranking.

Anchor said the combination of the two companies will position itself with comprehensive products for customers throughout North America, regardless of “the size of customer, product or project.”

Panoramic offers 500 rigid packaging options for bakery, deli, confectionery and produce.

“I truly believe, from the bottom of my heart, this is the right thing to do for Panoramic Inc. and more importantly for all of our employees and our loyal customers,” said Rick Holznecht, the former president of Panoramic Inc.

“We share a joint heritage in that both of our companies were founded and operated as Midwestern-based, family-owned businesses for many years.

“This is an exciting new chapter for Panoramic Inc. and an opportunity to grow with a family of companies that shares our customer-centric innovative vision.”

P&M Corporate Finance served as Panoramic’s financial adviser in the transaction.
Group study launched into PET thermoform recycling

**Plastics in Packaging, A Sayers Group Publication**

July 10, 2020 - The Foodservice Packaging Institute (FPI) has organized a group of industry partners to examine recycling of PET thermoform packaging.

The group is conducting a study to further understand the PET thermoform packaging recycling stream and define the most cost-effective and practical pathways for recovering it. Through the study, the group hopes to establish a common understanding of the most impactful opportunities to increase PET thermoform recycling.

In partnership with FPI, the Association of Plastic Recyclers (APR), the National Association for PET Container Resources (NAPCOR), the Northeast Recycling Council (NERC), The Recycling Partnership, and the Sustainable Packaging Coalition (SPC) will pool data and resources to gain a more thorough understanding of this complex issue. The study is being conducted by Resource Recycling Systems (RRS).

“Each partner has been working to increase recycling of PET thermoforms in different ways, so it’s important to bring all parties together to find a solution,” said Natha Dempsey, president of the FPI. “While we’re making progress, it just makes sense to combine efforts to define a unified path to increased recyclability for PET thermoforms.”

Project partner NAPCOR reports that the volume of PET thermoform material recycled in the US surpassed 100 million pounds (45,359 tonnes) in 2018. Most of this volume was captured in kerbside PET bottle bales and processed with bottles by PET reclaimers who accept them at up to specified percentages of the bale weight.

However, as thermoform recycling increases, so does the prevalence of thermoforms in residential PET bales, bumping up against the limits of PET bottle reclaimer acceptance levels. The study will further explore this, along with other potential PET thermoform recovery pathways.

“We know there is a shortfall of available postconsumer recycled PET to meet stated content goals,” said Darrel Collier, executive director of NAPCOR. “PET thermoforms offer significant performance benefits to consumers and producers and can help increase the overall supply of this valuable raw material. Our research indicates that PET thermoforms can, and are being recycled, though they do pose some technical and logistical collection and sorting challenges.”

This project will explore the potential limitations and obstacles, viability, costs and related metrics of PET thermoform kerbside recycling and other potential recycling pathways. Recycled PET thermoforms can be utilised in the manufacture of new PET containers, strapping and other types of packaging, as well as in polyester fibre applications.

“Common food items are sold in PET thermoform containers and the desire of the public to contribute to the environment through recycling drives their expectations to recycle this material,” noted Lynn Rubinstein, executive director of NERC. “These packages are being put in recycling containers and often treated as a contaminant. Finding a positive economic solution to productive recycling will help the industry and the economy.”

“PET thermoforms represent a viable feedstock to feed the growing demand for recycled PET resin,” added Steve Alexander, chief executive of APR. “We are hearing from more and more markets that are interested in using this recycled material; now we need to figure out how to get it to them.”

This study will utilise combined partner organization knowledge pertaining to potential technical, logistical and market obstacles to increasing PET thermoform recycling, building on collective work to date.

“Americans want to recycle their plastics packaging, but don’t always know what is and isn’t recyclable,” concluded Liz Bedard, senior director of industry collaboration at The Recycling Partnership. “Brands are committed to using more recycled PET in their packaging, but need the valuable supply from kerbside recycling. Finding the pathway to collect and recycle PET thermoforms will allow communities to increase recycling rates and, at the same time, provide a valuable recycled material to the industry.”

The study should be completed later this year.
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- Cut Knife Trim Tooling
- Flat Bed Heavy Sheet Gage Tooling
- Flat Bed Thin Sheet Gage Tooling
- Thermoform Product Development & Sampling
- Matched Metal Foam Tooling

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*Building Tooling for the Plastics Industry Since 1961*
University News

SPE Grant Report

Introduction
The University of Wisconsin-Stout is a career-focused, comprehensive polytechnic university where diverse students, faculty and staff integrate applied learning, scientific theory, humanistic understanding, creativity and research to solve real-world problems, grow the economy and serve a global society.

As Wisconsin’s Polytechnic University, UW-Stout is committed to three tenets: applied learning, collaboration and career focus. Applied learning is at the core of each of our forty-nine undergraduate and twenty-two graduate programs. Students learn theories and best practices in traditional classrooms, then apply them in a variety of laboratory settings. UW-Stout has three times as many labs as classrooms, ensuring students have the resources to fully explore their field of study. In addition, all undergraduate programs require a co-op experience, allowing students to apply their knowledge and skills in a true work environment. This blend of traditional and hands-on learning results in 98.2% of UW-Stout graduates being employed within six months of graduation.

Packaging Program
UW-Stout’s Bachelor of Science degree program in Packaging prepares students for technical or management responsibilities in the packaging industry. The program places strong emphasis on the application of theory to strengthen problem solving abilities and challenges students by providing opportunities to solve “real” packaging industry problems in classroom/laboratory settings. Nearly 200 students are currently enrolled in UW-Stout’s Packaging program.

UW-Stout’s Packaging program covers a wide range of applications for diverse industries. Students may elect an “emphasis” option to further explore course and laboratory work beyond the technical core of the program. These specialty areas offer an introduction to specific segments of the wide array of career opportunities for graduates. Areas of Emphasis include:

- Package Graphics Design
- Manufacturing/Quality
- Foods/Packaging
- Business/Sales
- Package Printing
- Package Design, Research, and Development
- Packaging Machinery
- Plastics
- Sustainability

UW-Stout recently completed its first comprehensive fundraising campaign, raising over $40 million in support of scholarships and program improvements. This campaign was comprised of projects across campus, including the Packaging Matters campaign, which included upgrading equipment throughout the Packaging labs. The MAAC thermoformer supported by SPE Foundation was a significant improvement over previous lab equipment.

The MAAC thermoformer was used regularly in the Medical Packaging class representing current technology used by industry partners like Prent, Boston Scientific and Medtronic. Students learned that thermoforming is widely used to create blister packages and clamshells for many products including medical devices. Through lab exercises and discussion, students understood the many advantages of thermoforming, including that it is the least expensive way to form three dimensional packages from plastic. They also learned that usually small parts are thermoformed so large production runs can be done efficiently, and that the thermoforming process can be sterile for medical products.

In the Medical Packaging lab, students learned there are many different ways to mold a sheet of plastic in thermoforming, and how to determine the best technology and material for the product. In this lab, students thermoformed a tray using PETG, HIPS, and HDPE sheets. They learned how to use the equipment and became proficient at creating customized packages with a variety of materials. The lab exercises also taught them how specific molds impacted the performance and quality of finished products. Students regularly evaluated the results and learned how to optimize production with the MAAC thermoformer.
Use of the MAAC thermoformer enables students to use current technology to create solutions to real-world problems. Having first-hand experience of modern equipment is a vital piece to students’ successful education and careers. SPE Foundation’s generous support of this equipment will assist hundreds of Packaging students and professionals for many years to come.

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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?
Problem Solved: Fluid Keeps Extruders Running Cool

By Bruce Adams, Staff Writer, Plastics Machinery Magazine

Editor's Note: This article first appeared in the May issue of Plastics Machinery Magazine.

Problem: Clogged cooling lines on extruders necessitated costly downtime for machine maintenance at a packaging company.

Solution: The company used an organic, water-based product to clean equipment and a special coolant that prevents corrosion and mineral buildup.

Operators of water-cooled extruders for years have grappled with corrosion and clogs. The water evaporates during the cooling process, leaving a host of unwanted solids — corrosion, mineral scale and iron — in the cooling lines. These clogs inhibit cooling and often damage cooler jackets and related equipment so badly that they need to be replaced.

Companies have used treated water, deionized water and glycol to try to prevent these blockages. Some methods have been more effective than others, but few companies have solved the problem so that it doesn’t cause costly shutdowns for cooling system maintenance.

Sonoco Clear Pack in Franklin Park, Ill., has had many years of success cleaning and maintaining its extrusion lines using two products from Chemagineering Corp., a provider of specialty water management products to the plastics industry and other industries.

Clear Pack began using an industrial cleaner called CH-7:54 made by Chemagineering in its extruders more than 30 years ago. It’s an organic, non-hazardous agent for removing scale and iron oxide. It’s designed for severely fouled systems.

“Clear Pack started using the cleaner in 1986, before they were acquired by Sonoco Products Co.,” said Peter Greenlimb, founder and president of Chemagineering.

“I was unaware of the corrosion problems that they were experiencing in their extrusion lines until around 2000.

It was then that the Extrusion Performance Fluid coolant technology was developed. They have been using the coolant in their extruders since 2000.”

Chemagineering offers a two-step process to clean fouled extruders. Step 1 is cleaning the lines with its CH-7:54 Industrial Cleaner. Step 2 is keeping the lines clean with its Extrusion Performance Fluid (EPF), an organic, water-based coolant designed to prevent barrel cooling water system corrosion and mineral scale fouling. Cleaning only needs to be done once if the lines are continually maintained with the EPF.

“It’s really not necessary to periodically clean these systems,” said Greenlimb, who has a doctorate in organic chemistry and has worked in the industrial water treatment industry since 1973. “If you start with a fouled system, you clean it once and, if you consistently use the EPF coolant, you won’t get into trouble with corrosion or scale. The coolant contains inhibitors to prevent corrosion and fouling in the system.”

The cleaning process normally takes approximately four hours.

“You need an hour or two to cool down the extruder and a couple of hours max to clean it,” Greenlimb said. “You dump and drain the old coolant out of the system. Fill it with
fresh water and put the cleaner in and recirculate it for an hour or two and dump it. Then you should flush the system with water before you add the EPF coolant.”

The water in the coolant will evaporate during cooling, so processors need to add more coolant to make sure there is enough in the system to keep the lines cool and clean, he said.

“With high-impact polystyrene production, we’re talking about zone temperatures of 400 to 425 degrees Fahrenheit and any water that is in that system is evaporated completely,” Greenlimb said. “We rely on the efficiency of the heat exchanger to cool the returns from the zones prior to being brought back into the reservoir tank and recirculating back into the zone heater coolers.”

Most extrusion systems have reservoir tanks ranging from 30 to 50 gallons that need to be maintained at a certain level with coolant.

“Typically, the system will use two to four drums of coolant a year, which is roughly 2 to 4 gallons a week of coolant per extruder,” Greenlimb said.

Brian Varley, plant engineering manager at Sonoco Clear Pack, is an extrusion industry veteran. He said he was pleased when he joined the company 12 years ago and learned it was not troubled by fouled cooling lines on extruders.

“Every other extrusion plant I’ve ever worked in, we were changing cooling jackets, sometimes as often as once a week, because they would get corroded and crack, and it was just brutal,” Varley said. “One plant I worked at was running well water through the lines and that was the worst. But I’ve worked other places where they were running decent city water, or, as we call it here, Lake Michigan water because a lot of the suburbs get fed from Lake Michigan. That’s better than well water, but is still fairly hard. That water also clogged up the works pretty quick. I wish I had this product in some of the other places I worked. I think I would have had a lot fewer headaches.”

Clogged cooling lines on extruders cause the need for costly maintenance shutdowns and often expensive repairs, if parts can’t be properly cleaned, he said.

“The cooling jackets alone, depending on their size, could cost from $2,500 to $4,500 each,” Varley said. “And then you’ve got the downtime. At our plant, if we’re down, it costs us about $1,000 an hour. If you lose an eight-hour shift to replace the jacket, plus the cost of the jacket, plus the cost of tubing and other related parts that need to be replaced, it ends up getting up into the five digits, $10,000 to $15,000. If we have to buy material on the outside to make up for the lost production, that’s an additional cost on top of that.”

Sonoco Clear Pack operates two single-screw extruders 24/7/355, shutting down for 10 scheduled holidays per year. The plant extrudes sheet made from high-impact polystyrene. A variation of the EPF coolant, ChillCARE Thermoformer Coolant with enhanced protection for aluminum molds, is used in the plant’s thermoformers.

“We have a thermoforming operation. We take our extruded sheet, and we thermoform it into food packaging,” Varley said. “The thermoformers run the material as it’s being molded. It’s only cooled to about 95 to 100 degrees Fahrenheit before it’s trimmed.”

Due to the different cooling requirements of the extruders and thermoformers, the plant needs to use two different coolants. Chemagineering has simplified that for the plant by providing the coolants in two colors, blue and pink.

Chemagineering sells the coolants in 55-gallon drums, 275-gallon totes and 330-gallon totes.
Because the coolant and the industrial cleaner are both organic, non-hazardous, water-based products, they can be disposed of through sanitary sewer systems, Greenlimb said.

“We even had an application of the cleaner used by a remote plant that was on a septic field,” Greenlimb said. “We had to go to the local municipality and ask them if this cleaner after it’s been used could be discharged in the septic field, and it was approved.”

He cautioned that there’s a slight risk the effluent might have very high concentrations of alloyed steel metals after an extruder has been cleaned. In that case, it would need to be disposed of as hazardous waste.

Greenlimb said that about half of his company’s business is in the plastics industry. In addition to offering coolants for extruders and thermoformers, he sells a third variation of it to injection molders.

“I didn’t do any calculations, but I would say one-third of our plastics business is barrel cooling for extrusion, one-third is in thermoforming applications, and one-third is in roll stands and injection molding machines,” he said.
Known for Superior Customer Service and Technical Support
Interview with Juliet Goff, CEO of Kal Plastics (Vernon, CA)

**Editor’s Note:** Juliet Goff is CEO of Kal Plastics, a custom thermoformer in Southern California, and long-time board member of the Thermoforming Division. Juliet recently sat down (virtually, of course) for a discussion about new developments in robotic applications for heavy-gauge thermoforming.

**Conor Carlin:** What inspired you to start thinking about a co-bot in your thermoforming operation?

**Juliet Goff:** This all started when I raised my hand in the Thermoforming Division R&D committee to research where collaborative robots fit in the thermoforming industry today. At that time, and this was about 2 years ago, there seemed to be an anti-robot bias in our industry. The early adopters found limitations when using them as an alternative to CNCs for trimming. Those robots were very expensive, had to be caged, and they were not simple to program. I had stayed on the sidelines with regards to those robots, but was starting to get curious about automation and collaborative robots, in particular.

At that time I was aggressively looking for ways to offset all the pending minimum wage increases, and other cost increases, my business was facing. In addition, I have an aging workforce and the labor market was very tight. So I was (and still am) VERY interested in all ways to automate and/or reduce labor.

**CC:** How did you evaluate the suppliers in the market?

**JG:** My quest began with a lead on a company that rents collaborative robots, Hirebotics, and I contacted them thinking it would be a good place to start. No one at Hirebotics would talk to me until I filled out a questionnaire to qualify us as a potential customer and after which I was told, electronically, that we were not a good fit because we only run (1) shift and they require that the cobots be used at least (80) hours a week. It didn’t matter that I was willing to pay. But again, I was never even able to speak with an actual human in this process so I accused them of using bots to respond to my inquiry! But I did learn that they exclusively rent units made by Universal Robots (UR). So I googled UR and liked what I saw. It turns out they are the global leader in collaborative robots. I found the sales development manager, Cliff Tsugawa, on their website and reached out. I introduced myself, explained what I was interested in, and why (for my business and on behalf of the Thermoforming Division), and he called me immediately. He set up a demo presentation with their local distributor, MSI TEC, and a team from UR for the following week!

**CC:** What was the first project where the robot was integrated?

**JG:** During the demo we learned their product is SUPER easy to program (my 12-year old could program it), had a low-cost to entry (as compared to CNC equipment), and no wait to get a unit. The challenge was going to be in adapting our process to achieve success with this technology. It’s all about how you set things up and make sure the starting point is always the same. This sounds simple, but it’s really not in a contract manufacturing environment. There are payload limitations so we had to find the low-hanging fruit where we would get the best ROI. One of the other challenges we were dealing with at the time was a logjam in trimming. We really needed to get an additional CNC but the lead-times were outrageous. As I recall, it would have taken 9 months to a year to get a new Thermwood and we could not find anything acceptable in the used equipment market. So, we defined this as our low-hanging fruit and we decided to explore adapting the cobot for trimming. The only problem was that this had never been done before! There were no existing adaptive uses like this to prove it would do what we needed it to do. It was all theoretical. Our application was a true beta and we would be taking on all the risk. So we collectively agreed to a stepping-stone approach.

**CC:** Tell us about the development of end-of-arm tooling specifically?

**JG:** The first step, and the details are proprietary, was to work with MSI TEC to develop the end-of-arm tool. The goal here was to create a proof of concept that would give me confidence to be their ‘beta’ in this adaptive use. This was accomplished by moving forward on the engineering and development of the end-of-arm tool with a demonstration at MSI TEC. If successful we would commit to purchasing the UR10. If not successful, we would only be liable for the agreed upon engineering fee for the demo. The demonstration/proof of concept was not perfect but it was enough to make me confident to move forward.

**CC:** What challenges did you face when first integrating the robot with the machine?
JG: The challenges we faced involved adapting my workforce to accept the change, adjusting how we build holding fixtures (we are still struggling, we don’t have the right person in-house), and ultimately we did find limitations. But the limitations we found were not a deal-breaker. We cannot use it for all trimming jobs but we can use it on the more simple trim paths and this is a low-cost alternative to a CNC. By doing so we alleviated the logjam in trimming and preserved the CNC machine time for the more complicated jobs.

CC: How do you view the future for more applications of robots / co-bots in thermoforming? Would you purchase another one?

JG: I definitely plan to purchase another one. They are so easy to program and once my workforce got used to it, and could see the benefit, the feedback was, ‘We should have done this sooner!’

I am sure the technology will continue to advance and some of the limitations we see now will be addressed. It will be very exciting when the payload capacity is such that a cobot will be able to load and unload formed sheets in excess of 20 pounds.

I think the greatest opportunities, at this time, are for the OEM that is doing the same thing 24/7. It is a little more challenging for a shop like mine that does contract work but the adaptive use we developed has been a win for us.

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Thermoforming Evaluation Of Coextruded Multilayer EVOH/LDPE Film/Foam

Claudio Souza, Jingxing Feng, Andrew Olah, Eric Baer, Gary Wnek, Case Western Reserve University, Cleveland, OH

This paper was first presented at ANTEC 2020 - The Virtual Edition

Abstract

A multi-layered film/foam system having 16, 32, and 64 alternating foam and film layers has been developed using multilayer coextrusion technology. The film layer was based on ethylene-vinyl alcohol (EVOH) copolymer and foam layer on low-density polyethylene (LDPE). The cellular structure was characterized by scanning electron microscopy investigating the effect of the number of layers and layer composition on the film/foam structure. The film/foam materials produced exhibited variable properties, such as density, cell size, cell density, and mechanical properties by changing the layer number and composition. The stress-strain behavior of these film/foam materials at several temperatures was examined. The stress-strain curves obtained were referenced to understand the influence of temperature on the uniaxial deformation process. This information provides insight into the material properties and process conditions influencing thermoforming behavior and performance. The thermoformability of the film/foam materials were evaluated. Optimum forming capacity was achieved at 60ºC. These film/foam materials showed a lower reduction of thickness in the sidewalls, as well as a higher dimensional uniformity in the thermoformed product.

Introduction

Plastic foams are widely used for different applications because of their outstanding properties such as lightweight, mechanical, thermal, electrical, insulation and acoustic properties. These outstanding properties lead cellular plastics to have a wide range of applications and end-use industries, namely, construction, medical, automotive, and packaging industries [1].

Ethylene-vinyl alcohol random copolymers (EVOH) are largely used in the food packaging sector, due to excellent barrier properties to gases, solvents and aromas, and with outstanding chemical resistance. However, their barrier properties can be dramatically deteriorate by moisture sorption. In order to protect the material they are usually coextruded between other structural materials, such as polyolefins, into multilayer structures. These multilayer structures are in many instances thermoformed into food packaging trays and containers [2].

A novel technique to prepare coextruded multilayer film/foam structure was recently proposed and developed by Baer and coworkers [1]. Multilayer co-extrusion consists basically in a system of multiple single screw extruders with melt pumps, a co-extrusion feedblock, a sequence of layer multiplier element, and an exit die. The flow rate of each component layer can be easily controlled by the melt pumps. In the feedblock, the melt streams are merged as parallel layers. In the multiplier, each element doubling the number of layers by first slicing vertically the layer, the spreading them horizontally, and finally recombining. An assembly of n multiplier elements produces a film with 2(n+1) layers. The thickness of the individual layers can vary from 1 mm thick tape to as thin as 25 µm with individual layer thickness down to less than 10 nm [3,4].

Multilayer coextrusion is a cost effective processing technique that can be used to combine polymers with widely dissimilar properties into multilayered structures that exhibit a synergistic combination of properties that would be unavailable in a single material. Layered polymeric systems are important in achieving films that exhibit a desired mix of end-use characteristics. Mechanical, optical, gas barrier, electronic and aesthetic properties can all be improved through multilayering. Multilayer coextrusion technology also provide a unique research tool for studying phenomenon including interdiffusion, crystallization, and adhesion due to their large interface to volume ratio [5-7].

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</table>

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mechanical properties and gas permeability. Amorphous materials can be thermoformed over a wider range of temperatures. However, semicrystalline polymers, such as EVOH, are more difficult to thermoform because they must be thermoformed within a narrow temperature range around the crystalline melt point. Furthermore, optimization of the thermoforming process can be relatively difficult to achieve when a coextruded multilayer structure is processed [2,8].

Materials

A two-component microlayer coextrusion setup with layer multipliers was used to co-extrude film/foam layered structures. The foam layer material was a blend of LDPE 5004I and LDPE-grafted-maleic anhydride (LDPE-g-MA) GR202 with melt flow indices of 4.2 and 8.0 g/10 min (190°C/2.16 kg) supplied by the Dow Chemical Company. The blend composition was 80 wt % LDPE and 20 wt % LDPE-g-MA. The dry blend of LDPE and LDPE-g-MA was further mixed with both a chemical blowing agent and a nucleating agent. The film layer was EVOH E171 copolymer based with 44% ethylene content with melt flow indices of 1.7 g/10 min (190°C/2.16 kg) supplied by Kuraray. Azodicarbonamide (Galata Chemicals) 2 wt% was used as the chemical blowing agent for foaming LDPE blend. The nucleating agent in the foam layer was 1 wt% Talc (Jetfine® 1H, IMERYS Talc).

One extruder contained the foam layer polymer (LDPE), chemical blowing agent (Azodicarbonamide) and nucleating agent (Talc) and the other extruder contained the film layer polymer (EVOH). After merging in the twocomponent feedblock, the foam and the film layers were formed into multilayers using the layer multipliers. Scheme 1 gives a general overview of the two-component coextrusion setup. Total pump rate in both extruder was varied to change the volumetric composition of film and foam layers in each sample.

Three, four and five layer multiplication elements were used to produce 16, 32 and 64 layered film/foam structure and the temperature was set at 195 °C. The temperature of the extrusion system was below the decomposition temperature of the chemical blowing agent so that the azodicarbonamide did not fully decompose to create large foam cells. A 3” exit die was used at the end of the multipliers. A chill roll setup was used as a sheet takeoff.

Scheme 1. Schematic of multilayer film/foam coextrusion process.

Scanning electron microscope (SEM) (JEOL) was used to observe the film/foam layered structures in each sample. Film/foam samples were cut in extrusion direction with sharp blades at room temperature and then sputter coated with gold (10 nm) for observation in the SEM with an emission voltage of 30 kV. The cell size and layer thickness of each film/foam samples were determined from SEM micrographs.

The density of as-extruded film/foams was measured using a density balance (Mettler Toledo, Columbus, OH). The liquid media was ethanol to ensure wetting of the sample surface. Because the film/foams had a closed-cell structure, the mass/volume method for density determination was accurate.

Tensile tests of as-extruded film/foams were conducted on a mechanical testing machine (Instron, Norwood, MA) at different temperatures. The film/foam samples were cut into rectangular microtensile bars with a top area of 1.0 x 6.0 mm2. The strain rate for the deformation study was 100%/min. The load–displacement data were obtained from the testing equipment and were converted into stress–strain curves. The Young’s moduli of the specimens were calculated using the stress–strain ratio for 1% deformation.

Uniaxial Orientation behavior of each film/foam system was investigated on microtensile bar (1.1 x 60 x 40) mm3 at different temperatures. Tensile tests were performed in a mechanical testing machine (MTS Alliance RT/30) with a strain rate of 100%/min and the stress-strain curves were generated from the load-displacement curve obtained from the machine.

Mechanical Thermoforming

The as-extruded film/foam samples were cut into square specimens with a dimension of 60 mm by 60 mm square for thermoforming. The mold for thermoforming consisted of...
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two matched stainless steel parts. The shape of the mold was semi-spherical with a diameter of 23 mm and a height of 13 mm. The film/foam specimen was loaded in the mold and was compressed at different temperatures. At room temperature, the pressure was maintained for 10s and the specimen was removed from the mold afterwards. For the others temperatures the pressure was maintained for 5s. To identify of the local strain across the film/foam sample during thermoforming, grids were drawn to map the deformation. The change of distance between grid lines was used to determine local strain.

**Discussion**

Multilayer film/foam specimens having 16, 32, and 64 layers and several compositions were successfully produced by microlayer coextrusion process. Microcellular film/foam with good layer structure was achieved and investigated to determine the effect of some important properties, such as morphology, mechanical properties, and thermoformability.

The morphology of EVOH/LDPE film/foam with 16 and 64 Layers at 50/50 compositions is shown in figure 1. The material shows good layer structure with clean layer and cell boundaries. By changing the composition and number of layers of LDPE foam and EVOH film is possible to achieve different foam and film layer thickness. The film/foam with 16 layers shows mostly single layer cells and straight and parallel layer boundaries. However, with 64 layers the boundaries become more tortuous.

![Figure 1. EVOH/LDPE film/foam (50/50) morphology extrusion-direction as-extruded. a) 16 Layers, and b) 64 Layers.](image)

The film/foam shows good interfaces without delamination. The foam layer is based on a blend of LDPE and LDPE-g-MA. The latter works as a compatibilizer and improve the adhesion between the film and foam layer. Furthermore, EVOH copolymer is partially compatible with LDPE, due to 44% polyethylene content. The strong adhesion between the film and foam layer are due to the reaction between the MA group from LDPE-g-MA with the hydroxyl groups in EVOH during the extrusion process. The samples have the same total thickness (1.1mm) by controlling the speed of chill roller.

By increasing the number of layers, we reduced the cell size, without adversely affecting the density. Figure 2 shows that in the EVOH/LDPE film/foam (50/50 system), the cell size was reduced from 104 µm to 56 µm when the number of layers was increased from 16 to 64. However, at low concentration of the EVOH film layer the cell size and density do not change significantly.

![Figure 2. Effect of number of layers on EVOH/LDPE film/foam properties. a) Cell size, and b) Total density.](image)

**Properties EVOH/LDPE film/foam 16 Layers System**

The characteristics of EVOH/LDPE multilayer film/foam as-extruded with 16 layers are described in Table 1. With the decrease of film layer concentration, the foam layer thickness increases, the film layer thickness, and total density decrease. The average cell size in the foam layer decreases from 104 to 53 µm when the foam composition increases from 50% to 95%. The total density of the film/foam is highly adjustable with the composition of the system. The density decreases significantly when the foam layer composition increases to 95% in volume.

<table>
<thead>
<tr>
<th>EVOH/ Film (vol.%)</th>
<th>LDPE/ Foam (vol.%)</th>
<th>Average Film Layer Thickness (µm)</th>
<th>Average Foam Layer Thickness (µm)</th>
<th>Average Cell Size (µm)</th>
<th>Film/ Foam Density (g/cm³)</th>
</tr>
</thead>
<tbody>
<tr>
<td>50</td>
<td>50</td>
<td>40</td>
<td>101</td>
<td>104 ± 35</td>
<td>0.70</td>
</tr>
<tr>
<td>30</td>
<td>70</td>
<td>35</td>
<td>105</td>
<td>84 ± 23</td>
<td>0.61</td>
</tr>
<tr>
<td>20</td>
<td>80</td>
<td>26</td>
<td>126</td>
<td>62 ± 20</td>
<td>0.59</td>
</tr>
<tr>
<td>10</td>
<td>90</td>
<td>15</td>
<td>171</td>
<td>58 ± 15</td>
<td>0.56</td>
</tr>
<tr>
<td>05</td>
<td>95</td>
<td>10</td>
<td>180</td>
<td>53 ± 15</td>
<td>0.47</td>
</tr>
</tbody>
</table>

*Table 1. Characteristics of EVOH/LDPE Multilayer Film/ Foam 16 Layers*
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Mechanical Properties of EVOH/LDPE film/foam 16 Layers System

Figure 3 shows the mechanical properties of as-extruded film/foam with 16 Layers at room temperature and strain rate of 100%/min. The load-displacement data were obtained from the testing equipment and converted into stress-strain curves. The material shows good mechanical properties and typical plastic-elastomeric behavior under tension for all compositions. The highest maximum stress, elongation at break, and Young’s modulus with all four compositions are shown in Figure 3 and Table 2. All samples have maximum strain larger than 60% indicating their potentials to forming. Initially the polymer shows a reversible elastic deformation. At a certain amount of stress, deformation becomes irreversible, which is recognizable by a yield point in the true stress-strain curves. After the yield point, a decrease in stress is observed, which is usually referred to as strain softening whereas the 10/90 sample exhibited constant stress with the increase of strain.

Figure 3. (a) Mechanical properties of as-extruded EVOH/LDPE multilayer film/foam 16 layers at room temperature; (b) Mechanical properties of film/foam at low strain.

<table>
<thead>
<tr>
<th>Film/Foam Composition</th>
<th>Tensile Strength (MPa)</th>
<th>Elongation to Break (%)</th>
<th>Modulus (MPa)</th>
</tr>
</thead>
<tbody>
<tr>
<td>50/50</td>
<td>16 ± 0.2</td>
<td>410 ± 45</td>
<td>420 ± 11</td>
</tr>
<tr>
<td>30/70</td>
<td>12 ± 0.1</td>
<td>70 ± 21</td>
<td>371 ± 2</td>
</tr>
<tr>
<td>20/80</td>
<td>10 ± 0.2</td>
<td>66 ± 18</td>
<td>272 ± 4</td>
</tr>
<tr>
<td>10/90</td>
<td>6.0 ± 0.1</td>
<td>59 ± 20</td>
<td>152 ± 1</td>
</tr>
<tr>
<td>EVOH Film</td>
<td>55.0</td>
<td>600</td>
<td>1040</td>
</tr>
<tr>
<td>LDPE Film</td>
<td>7.0</td>
<td>500</td>
<td>300</td>
</tr>
</tbody>
</table>

Table 2. Mechanical properties of as-extruded EVOH/LDPE multilayer film/foam 16 layers at room temperature.

The stress–strain relationships at different temperatures for 10/90 composition is presented in Figure 4 and Table 3 shows the mechanical properties. It can be characterized with a yield stress followed by a yield plateau with strain hardening behavior. For all forming samples, as forming temperature increases, elongation at failure increases while tensile strength and modulus decrease. However, at 100°C the behavior changes and the elongation at failure decreases.

Figure 4. (a) Mechanical properties of as-extruded EVOH/LDPE multilayer film/foam 16 layers (10/90 composition) at different temperature; (b) Mechanical properties of film/foam at low strain.

<table>
<thead>
<tr>
<th>Temp. °C</th>
<th>Tensile Strength (MPa)</th>
<th>Elongation to Break (%)</th>
<th>Modulus (MPa)</th>
</tr>
</thead>
<tbody>
<tr>
<td>40°</td>
<td>5.6 ± 0.1</td>
<td>187 ± 51</td>
<td>110 ± 1</td>
</tr>
<tr>
<td>60°</td>
<td>4.1 ± 0.1</td>
<td>222 ± 44</td>
<td>44 ± 2</td>
</tr>
<tr>
<td>80°</td>
<td>2.9 ± 0.2</td>
<td>251 ± 67</td>
<td>27 ± 0.4</td>
</tr>
<tr>
<td>100°</td>
<td>1.6 ± 0.1</td>
<td>142 ± 43</td>
<td>16 ± 0.6</td>
</tr>
</tbody>
</table>

Table 3. Mechanical properties of as-extruded EVOH/LDPE multilayer film/foam 16 layers (10/90 composition) at different temperatures.

Uniaxial deformation behavior of the as-extruded EVOH/LDPE multilayer film/foam was investigated on microtensile bars (1.1 x 60 x 40 mm3). Tensile tests were performed with a strain rate of 100%/min at different temperatures (Figure 5). Similar to thermoforming procedure, specimens were heated prior to testing. The material shows uniform deformation at 60°C and 80°C with a maximum local strain of 220% and 240% respectively. The maximum local wall thickness reduction was around 40%. However, at 100°C the EVOH/LDPE multilayer film/foam shows non-uniform deformation with rupture of the LDPE cells and, hence, significantly deteriorates the microstructure. The maximum local strain is 300% and local wall thickness reduction is 60%. The transition in mode of micro-deformation is around the melt temperature of LDPE (110°C), where the deformation is more severe and flow-like.
performed with a strain rate of 100%/min at different temperature.

### Table 2. Mechanical properties of as-extruded EVOH/LDPE multilayer film/foam 16 layers (10/90 in volume).

<table>
<thead>
<tr>
<th>Composition</th>
<th>Strength (MPa)</th>
<th>Elongation to Break (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>EVOH Film 60º</td>
<td>2.9 ± 0.2</td>
<td>142 ± 43</td>
</tr>
<tr>
<td>LDPE Film 40º</td>
<td>5.6 ± 0.1</td>
<td>222 ± 44</td>
</tr>
<tr>
<td>EVOH Film 80º</td>
<td>12 ± 0.1</td>
<td>187 ± 51</td>
</tr>
<tr>
<td>LDPE Film 60º</td>
<td>16 ± 0.2</td>
<td></td>
</tr>
</tbody>
</table>

The stress–strain relationships at different temperatures are characterized with a yield stress followed by a yield plateau. However, at 100ºC the EVOH/LDPE multilayer film/foam shows uniform deformation at 60ºC and 80ºC with a maximum local strain of 220% and 240% respectively.

The maximum local wall thickness reduction was around 60% at 80ºC, while it was around 65% at 100ºC. The wall thickness reduction of the EVOH/LDPE multilayer film/foam is significant for the development of film/foam with extraordinary barrier properties that can be produced in large scales. The mechanical properties of EVOH/LDPE are attractive since it can be achieved more than 100% of elongation at break, which allows an evaluation of thermoforming performance. Finally, multilayer coextrusion technology is able to develop a new and exciting material with enhanced properties and several potential applications.

### References

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What’s the matter with recycling?

Editor’s Note: This article has been adapted from an original blogpost by Mark Remmert, Executive Director of Green Dot Bioplastics (Emporia, KS). I have inserted my own comments at several points to elucidate and expand upon certain topics where the plastics industry does not have consensus. Despite the desire to be green, the truth is usually found in shades of grey. We invite readers to send us comments on this or other topics at cp carrot@gmail. com.

Reduce, Reuse, Recycle.

We’ve been hearing this phrase and teaching it to our children for more than 40 years. It’s ingrained in our collective consciousness: if you care about the planet, then you recycle.

The petrochemical and fossil fuel industries put forth compelling facts and figures and marketing messages like this infographic showing how plastics can be recycled to the point that waste and landfill of plastics is virtually eliminated. But the reality is that after four decades of talking about the importance of recycling, more than 90% of plastic still ends up in the landfill or leaked into the environment as land and ocean waste.

Of course, we all agree we should recycle all the paper, glass, aluminum, and plastics that we can. So why hasn’t plastic recycling delivered on the promise to eliminate plastic waste?

Why is plastic recycling a failure?

Today we use five times more plastic than we did in 1980, so clearly “reduce” hasn’t worked. “Reuse” hasn’t worked either. Forty years later, there is still virtually no “reusable” packaging for consumer goods. The “recycle” component has been highly dependent on the ability to send waste to China or SE Asia which is no longer an option thanks to cross contamination. In the best of circumstances, no more than 10% of plastic has ever been recycled.

So, why hasn’t the model worked in the past, and why is it unlikely to work in the future? Even if it was fully implemented, would it solve our plastics problems?

The simple lifecycle vision from traditional plastics manufacturers ignores some very basic issues and is therefore fundamentally flawed. Here are the key issues:

1. Plastics are not endlessly recyclable. Unlike glass and aluminum, plastics lose much of their physical strength with each heat exposure. Therefore, every time plastics are melted and formed into a shape, a film, or a foam, they lose much of their strength. Seldom will plastic manufacturers recommend using more than 25% recycled plastic in most applications – sometimes as little as 10%. And many, many, applications cannot use any recycled material at all due to regulatory and compliance issues (think food contact, FDA compliance, healthcare, food packaging).

   Each lap around the recycle loop requires 50%, 75%, or even 90% new virgin fossil fuel plastic for the recycled plastic to be functional. After a few laps the recycled material is completely useless and must be bled off into the landfill or incineration stream.

2. Plastic is not plastic. “Plastic” is a generic term for hundreds, if not thousands, of different polymers. These different polymers are produced from different
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chemistries and have different properties which often cannot be mixed or blended. To get a useful recycled plastic material, you need a pure stream of one type of plastic, yet most packaging is composed of multiple plastic and non-plastic pieces.

3. Less than 10% of plastic is currently recycled in the US. Recycling industry proponents talk about achieving 50% recycle rates, which is still well below 85% for aluminum or 65% for paper [U.S. EPA, 2013]. This is an admirable goal, but to achieve those rates would require massive investment in collection, sorting, and recycling infrastructure. It is estimated that only 50% of Americans have access to a convenient recycling facility and we recycle less than 10% of the plastic we produce.

Capturing another 100,000,000,000 to 200,000,000,000 pounds of plastic (still less than half of the annual plastic production) would require $billions in new collection infrastructure. Few if any government or civic entities have the resources to undertake projects of this magnitude, and the plastic industry has steadfastly refused to pay for the cost of collection, sorting, and recycling. Just as the petroleum industry has opposed carbon taxes which offset the negative impact of fossil fuels in the environment, the petroleum plastics industry expects consumers and municipalities (taxpayers) to pay the cost of collection and recycling, then give them back a purified stream of recycled plastics. Understandably, consumers balk at the cost associated with cleaning up the industry’s mess.

4. Contaminated plastics are extremely difficult to recycle. Any plastic used in food service, food packaging, fast food, institutional or commercial use, or restaurant service is contaminated with food and human contact. Outdoor applications like mulch film or lawn and garden packaging are contaminated with soil. These are examples of plastic that is nearly impossible to recycle and, in some cases, is prohibited from the recycle streams.

5. Recycling of traditional petrochemical plastics does not address greenhouse gas emissions and associated global warming. The recycle lifecycle loop still requires massive extraction of fossil fuels for raw materials and energy for production. And the lifecycle loop continues to pump fossil carbon into the atmosphere at every stage – extraction, manufacturing, transportation, recovery, and reprocessing. The environmental impact of the transportation involved in moving billions of pounds of plastic waste around is not insignificant; nor is the cost.

Are bioplastics a better option?

Bioplastics address many of the problems associated with traditional petroleum-based plastics, from production through the entire lifecycle.

At the “beginning of life”, bioplastics made with plant-based renewable raw materials are essentially carbon neutral and eliminate concerns about greenhouse gas emissions and global warming. Biobased raw materials are by definition sustainable since they are grown, not extracted.

Biobased raw materials use only biogenic, or “new carbon”, created by photosynthesis and the sequestering of atmospheric carbon. Fossil carbon, or “old carbon” is then sequestered in the ground in the form of petroleum, natural gas, or coal.

At the “end of life”, bioplastics can play a key critical role in finding alternatives to landfill and plastic waste pollution. Some bioplastics can be recycled in conventional MRFs (municipal recycle facilities) alongside traditional petrochemical plastics so new facilities or equipment are not necessary to process them.

Biodegradable plastics can be returned to nature via composting. Composting provides valuable resources to grow the next generation of plants while at the same time eliminating the cost and energy associated with collection, sorting, recycling, and reprocessing of plastic. Composting also eliminates the need for more landfill space.

Biodegradable plastics could play a huge role in allowing better waste management alternatives for food waste, garden waste, lawn debris, and agricultural waste. Placing these organic wastes in a bag or can specifically for compostables enables a mechanism to easily collect the waste and send it to a convenient composting facility without having to separate plastic food service ware or lawn & garden bags from the organic waste.
**Editor's Comments:**

* Current efforts in chemical recycling are challenging this premise. By depolymerizing PET into DMT and MEG, for example, Loop Industries is able to re-use the same molecule without incurring additional heat histories associated with mechanical recycling.

** Companies such as Revolution Plastics are taking steps to address agricultural plastics recycling. By creating a network of drop-off locations for farmers to dispose of dirty PE films. Revolution is controlling their input costs.

^ Some sustainability experts continue to challenge the notion that bioplastics are inherently ‘more sustainable’ because they require large amounts of water and fertilizer - which leads to runoff and possible eutrophication of waterways.

^^ Composting does offer great promise, yet the infrastructure is even weaker than that of traditional plastics recycling. Regulatory confusion, lack of investment, and consumer behavior all contribute to create significant hurdles for composting.

Graph: Life cycle model
European Bioplastics
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The cover positions are among the most popular sponsorship opportunities in SPE Thermoforming Quarterly magazine. We refer to these three pages as “platinum” sponsorships.

Beginning with next year’s first quarter issue, platinum sponsorship opportunities will be available to sponsors for a period of one year. Once that year comes to a close, we will re-open those coveted platinum sponsorship positions to companies that have not been platinum sponsors in the last 12 months.

Sponsors make the publication of this award-winning magazine possible! The SPE Thermoforming Division’s Board of Directors is grateful for the generous participation of its many magazine sponsors. By enacting this policy in 2021, the Board hopes to attract new sponsors, and to offer the cover position opportunities to as many different organizations as we can accommodate going forward.

Questions? Contact Lesley Kyle, Division Administrator: 914-671-9524 | lesley@openmindworks.com.

SPE Roundup

Knowledge & Networking

SPE is known around the world as a premier source of knowledge and networking for plastics professionals. Despite COVID, the organization has continued to provide high quality programming on a variety of topics. Most notably, SPE pivoted from a live event – ANTEC – to a virtual event with tremendous success, given the timeframe and challenges. Since then, under guidance from the Executive Board and SPE staff, members have seen the development of the “Plastics in…” series of virtual conferences. Plastics in Clean Water, Plastics in Cannabis Packaging, Plastics in Aerospace are just a few of the events that drew hundreds of attendees and helped to raise revenue for the Society. Future events include “Advances in Mechanical and Chemical Recycling” (Sept 24) and the premier of a Spanish-language conference, “Plastics Forum 2020: Nuevas Tecnologías y Sostenibilidad” (Sept 17-18).

ANTEC 2021 – The Hybrid Edition will be launched in March 2021 in Denver, CO. Programming details will be managed by Technical Program Chairs (TPCs) and the Call for Papers is now live. Thermoforming is typically under-represented at ANTEC, so let’s see if we can change things around next year!

For complete details, visit www.4spe.org and review the Events page.

European Thermoforming Division

After the postponement of the 2020 conference in Geneva, the board of the ETD have announced a new date: March 3-5 in Geneva, Switzerland.

The welcome reception will be held on Wednesday evening (3rd March), Thursday/Friday (4th-5th March) are the two conference days.

Conference venue and accommodation: Starling Hotel in Geneva www.shgeneva.com

You will find further details at www.thermoforming-europe.org.
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