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Some of the most exciting innovations in flexible packaging are being driven by the industry's growing focus on sustainability. From increased usage of bio-based materials at the beginning of the process to improved outcomes in the recyclability of end products, the converting process is changing at every stage, and it's exciting!

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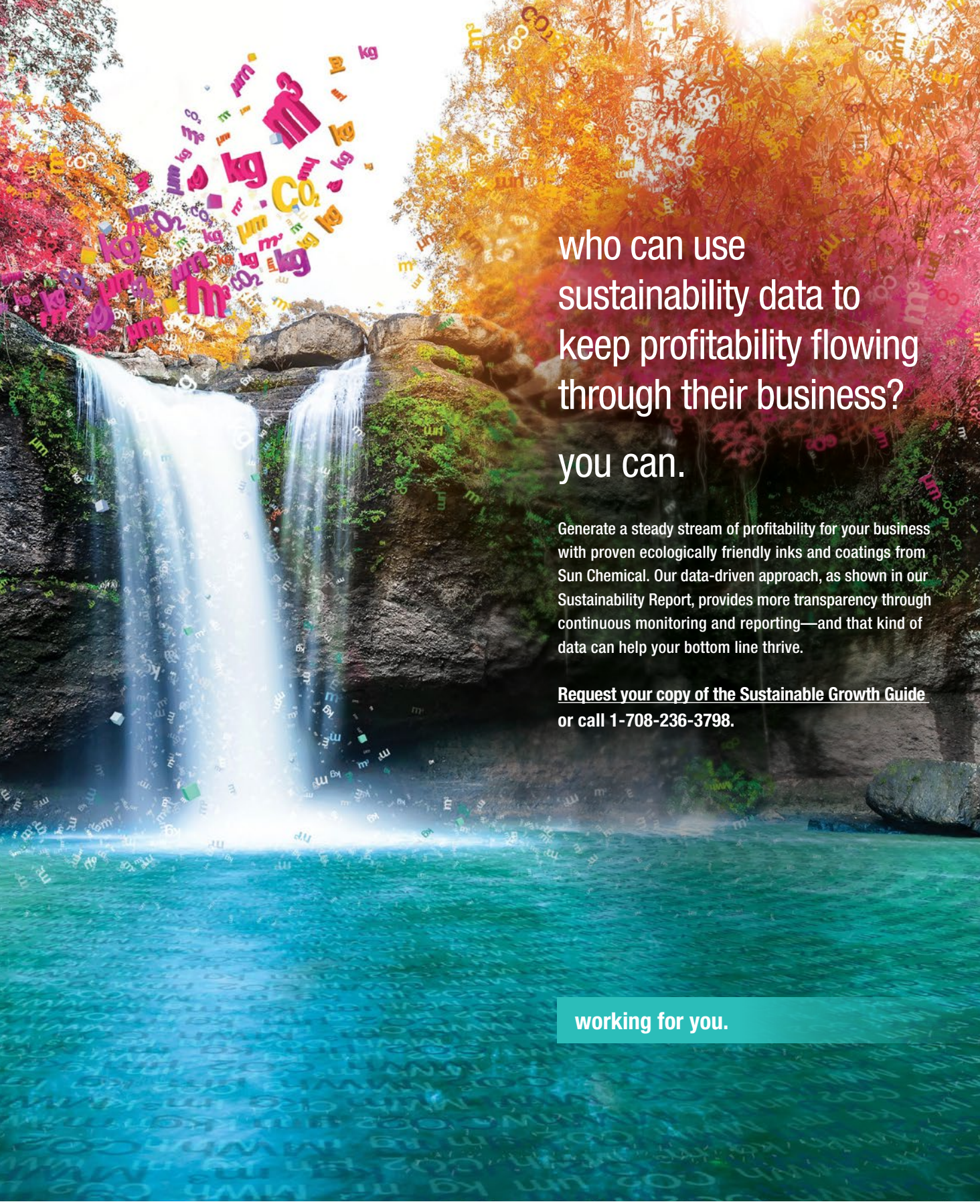

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The "5R" Framework:

An Approach Designed to Reduce Packaging Waste

By **Nikola Juhasz**, Global Technical Director, Sustainability, Sun Chemical

Serious environmental issues and growing climate change concerns are resulting in an increased focus on sustainable packaging.

According to the Environmental Protection Agency, 82.2 million tons of packaging waste was produced in 2018 with 30.4 million tons of that going to landfills. Of special concern is plastic waste which only has recycling rates in 2021 of five to six percent — or about two million tons, according to the World Economic Forum.

To address this issue, major brand owners have joined various regional plastics pacts around the world, including the US Plastics Pact, and made public commitments to, among other things, increase the rate of recycling and recycled material use in their packaging by 2025.

Achieving these packaging sustainability goals occurs when organizations across the entire value chain align their sustainability goals. Partnerships across the supply chain and with trade organizations that share similar sustainability values to deliver bio-renewability, compostability and recyclability, will help the packaging industry move towards reducing waste and becoming a circular economy.

As organizations look for ways to reduce global carbon footprints, they should consider how to incorporate sustainable best practices throughout their operations, products and industry collaborations. Focus on a "5R" framework – reuse, reduce, recycle, renew and redesign – can help guide sustainable best practices and assist brands as they navigate the heightened environmental landscape.

Sustainable Growth with the "5R's"

As brands and their packaging converter partners take steps to reduce their carbon footprints, supplier partners are helping brands and converters achieve their sustainability goals through innovative product technologies, while at the same time advancing internal sustainability programs.

Suppliers are challenging themselves to look for ways to improve their internal processes by monitoring key metrics, such as energy and water usage — actions that are aligned with many of the United Nations' 2030 Agenda for Sustainable Development goals.

In terms of innovation, certain

inks, coatings and adhesives can be important enablers of a sustainable package that contributes to the overall design, functional integrity and performance of the package. These components can determine whether a package is recyclable, bio-renewable, and/or compostable.

In a 5R framework, reuse refers to products designed to contain post-consumer recycled materials, or with protective coatings and resistant inks that offer the durability needed for reusable articles or packaging. Reduce is about enabling overall packaging lightweighting, through protective and barrier coatings, as well as barrier adhesives technologies. Reduce can also refer to minimizing or eliminating waste at converter facilities with printing technologies that avoid press startups and shutdowns. Renew is about designing products with higher biorenewable content, which immediately translates into CO2 emissions reductions. Recycle is about products that enable enhanced recyclability, including repulpability and compostability, of a range of packaging structures. And redesign is about fundamental rethinking of packaging designs and printing processes.

Brand owners and converters can enable reuse by designing products that contain post-consumer recycled content or by using protective coatings and resistant inks that can withstand multiple wash cycles. Barrier adhesives technology and direct food contact inks can reduce packaging layers and weight, while inks with higher levels of renewable content translates into CO2 transmission reductions. Converters can redesign their printing processes by switching to a multi-purpose ink that can be used on different types of presses or even switch to extended color gamut printing to reduce waste.

Washable ink technologies are game-changing, allowing converters to address the demands of brand owners and delivering an immediate and measurable impact for the plastic packaging market. These inks are designed to be removed and separated from recoverable plastic substrates in today's mechanical recycling processes, which improves recyclability of packaging and enables industry certifications that are important for brand owners.

There are some considerations to keep in mind for sustainable product developments. First, new solutions must be designed in the context of properly validating assumptions and confirming that the carbon footprints of alternative package designs are actually achieved. This is done through lifecycle analysis. Additionally, costs must be managed because sustainable solutions generally don't carry a premium in the market.

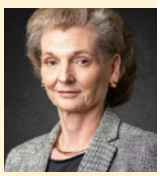
New product developments must comply with current regulatory standards to ensure they're favorable not only for the planet but also for human health. Increasingly, safety and compliance may not be enough. When detection of certain substances is of concern, even at exceedingly low levels, a brand owner's reputation may be at risk. In a circular economy where such substances have to be managed through a full product lifecycle, from cradle to cradle at minimum, "beyond compliance" may become the new standard.

The Future of Sustainable Materials

Committing to sustainability means prioritizing and enabling increased materials circularity. To support this shift, brands and converters should focus on making packaging that is easier to recycle or otherwise recover. The 5R framework can be a guide to help identify areas of waste and determine the best route to commence sustainability initiatives.

Technological innovation is a result of the entire market and value chain, from retailers and brands to suppliers, converters, recyclers, nongovernmental organizations and legislators, all communicating openly, working together and being aligned towards the achievement of sustainability goals. ■

ABOUT THE AUTHOR



Dr. Nikola Juhasz, Ph.D. is the global technical director for sustainability at Sun Chemical, where she engages with internal and external stakeholders to formulate sustainability-driven technical strategies and oversees the corresponding innovation and product development programs across all of Sun Chemical's product lines and technology platforms. To learn more about Sun Chemical's sustainability initiatives, including Sun Chemical's SunEco portfolio of solutions and the 5R framework, download Sun Chemical's Sustainable Growth guide at https://www.sunchemical.com/sustainable-growth-with-the-5rs/.

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How Pouch Converting Technology Can Protect Your Materials Investment

By **Scott Fuller**, Pouch Equipment Product Line Manager, CMD Corporation

Thanks to dazzling artwork and the latest in science and technology - from the extruder to the printer to the laminator, today's packaging film is eye-catching and durable.

It's stunningly beautiful. And expensive. New sustainable film is no exception.

By the time the parent-roll gets to the converting machine to be made into pre-made pouches, it is at the most expensive point in the 'film-making' process.

As much of that valuable film as possible should end up as a successful package -and as little as possible in the scrap bin.

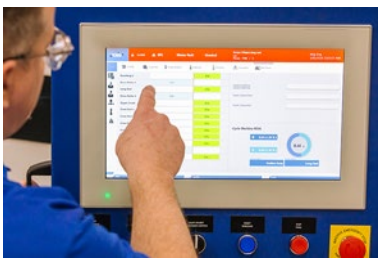
Technology has come a long way to preserve the investment that brand owners make in the materials which ultimately must protect and promote their products.

Here are suggestions to utilize that technology to get the best overall efficiency and least amount of waste in your pre-made pouch converting process.

Choose machines that utilize a shorter footprint and reduced web path – this results in less material needed at thread-up, better web control and less waste.

Pouch machines have historically been very long. Threading up the entire length of a 50 or 60 foot machine uses a lot of film, and when adjustments are made at the back of the machine, a lot of material can be wasted waiting for the adjustment to work its way to the front.

Reducing the machine length and shortening the web path allows for better web control and more efficient adjustments. This makes so much sense that CMD reduced the overall length of the 760-SUP machine by 11 feet, and the web-path by over 20 feet.



Insist on a system that is easy to use so operators can competently dial in recipes for fewer mistakes, waste and downtime.

Today's machines offer sophisticated controls systems that are capable of automating much of the process. The unresolved step was not the capability of the machinery; rather, it was a matter of refining why, and how the operator needed to interact with the machine. Simplifying the process and incorporating ease-of-use concepts are critical to closing this gap.

The updated design of the CMD stand-up pouch system focused on simple, fool-proof adjustments throughout the machine, and intuitive touch screen controls with data-rich reports to predict and prevent downtime.

Your system should have robust sealing technology with a wide operating window and a methodology to confirm that the pouches you produce are not only beautiful, but strong, with no leakers.

With today's technology, there is no reason converters and brand owners can't have verifiable data on their pouch quality, and with the price of the film being converted, it makes good sense to expect it.

A reliable system will consistently produce the same quality throughout your production run – resulting in less waste and fewer complaints on final package quality.

Your pouch machine should consistently produce the same results, without the need for constant minding or excessive readjustment. This reliability also means you make fewer adjustments and save time.

Much is invested in producing the perfect aesthetics for your packaging. Utilizing ever-improving converting technologies to ensure the most efficient use of that investment is a wise strategy for growth and success.

Metropolitan Tea Company's compostable tea overwrap.

Sustainability Beyond Recyclability

By **Nathan Klettlinger**, Global Marketing Director for ProAmpac

More brand owners are setting sustainability targets and greener legislative initiatives are on the rise making more sustainable flexible packaging a core decision for many brands and retailers. By adding sustainability to the essential packaging requirements of cost, machineability of material, barrier requirements and shelf appeal, converters are navigating an increasingly complex environment.

Even though recyclable films are an option in some applications, it is not a universal fit. For example, traditional cosmetic web (PET/PE/foil/PE) and paper/poly/foil/poly structures offer good stiffness, barrier and filing on high-speed machines, but are challenging to make recyclable. Also, high residue products or products that require a barrier such as foil to meet shelf-life requirements are not currently eligible for recyclability through existing streams. Fortunately, there are other options to suit end-product requirements while supporting customers' sustainability goals.

Post-Consumer Recycled Content

One of the simplest ways to increase sustainability of a package is by including post-consumer recycled content (PCR). There are two primary types of PCR: mechanical recycled PCR and chemical recycled PCR. Mechanical PCR is the most readily available and can be used at various percentages in film layers.

During the mechanical recycling process, polymers are reduced in size via grinding, then they are melted, pelletized and mixed with virgin resins during extrusion. Both PET-PCR from water and soda bottles, as well as PCR-PE from milk jugs are available for films. PCR-PET can be added at relatively high levels to film and performance and appearance is nearly unaffected. PCR-PE can also be added at varying levels but may be more noticeable in films at higher levels due to the presence of small gels in the product.

Resins recycled via chemical or advanced recycling offer properties far superior to mechanically recycled resins. During the chemical recycling process, polymers are broken down chemically into simpler molecules. Though more limited in availability, investment in chemical recycling is growing. Chemically recycled resins are ideal for applications where the packaging use is sensitive to the appearance of gels or inclusions, or where strength cannot be compromised.

Renewable Materials

Another option for sustainable packaging is that made of bio-based renewable materials. Paper is the most widely recognized renewable material, but bio-based polymers are also available. By incorporating a renewable material, packaging users can reduce fossil-fuel-based plastics while often reducing their carbon footprint. The reduced reliance on virgin polymers helps support sustainability goals without sacrificing product protection. If a customer does pursue a renewable resin alternative, a Life Cycle Assessment should be performed to quantify the carbon reduction.

Bimbosan's infant nutrition pouch from renewable resin.

Compostable Materials

Compostable materials are a well-known alternative to conventional films where the end-product would render recyclability unavailable. Available in both paper-based and film-based versions, compostable materials are ideally suited for high-speed machines that require stiffness or which have high residue like food waste that would render the product non-recyclable. Compostable structures can be designed with standard and high barriers and can either be designed to compost in industrial composting facilities (136oF) or in home composting bins. Since industrial composting facilities and home compost are suited to hold the organic residue left with some end-products, this material is an ideal alternative for food and lawn care brands with specific sustainability goals. Also, compostable packaging can be ideal for high-speed machines which require stiffness to ensure performance on high-speed filling machines.

In all, material science continues to innovate sustainable alternatives to conventional laminated films to ensure end-products that are ineligible for recyclability can still be packaged to help customers achieve their goals. With the emergence of new technologies, packaging is becoming more sustainable without sacrificing product protection. However, the key to optimal sustainability initiatives is to ensure the packaging material selected suits the end-product to ensure that the two are compatible for the ideal end-of-life disposal scenario. ■

ProActive PCR High Barrier Rollstock fabric roll halfside.

ABOUT THE AUTHOR

Nathan Klettlinger leads the ProAmpac strategic marketing team whose goal is to promote profitable growth and align company objectives with customer needs. Nathan held roles in product development, product management and market segment management. He has a Bachelor of Science in Chemical Engineering and an MBA from the University of Akron.

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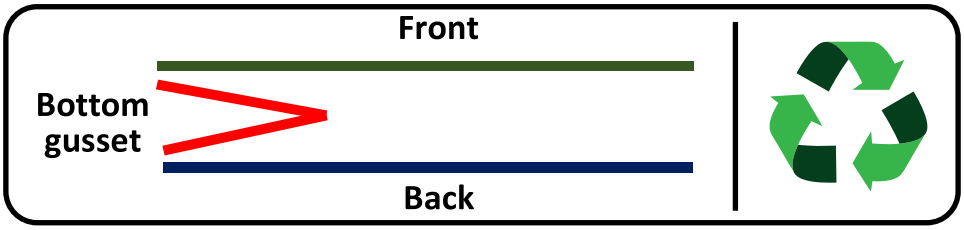

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The Catbridge Difference

Using an innovative, customer-centric approach to design and engineering, Catbridge has emerged as the leader in state-of-the-art web converting solutions. What makes Catbridge different is their commitment to tailored solutions to meet the customer's needs. Unlike many of its competitors, Catbridge Machinery conceptualizes, engineers, builds, programs, calibrates and tunes every piece of equipment they sell, with customer input playing a role throughout.

Catbridge's highly qualified engineers combine decades of experience in the converting machine industry with the latest computer-assisted design and manufacturing technologies to create the best converting machine design solution for its customers. President, Michael Pappas and Vice President, William Christman, bring an unmatched passion and expertise to the web converting industry. Catbridge Machinery's greatest strength is the ability to provide solutions for a broad range of applications.

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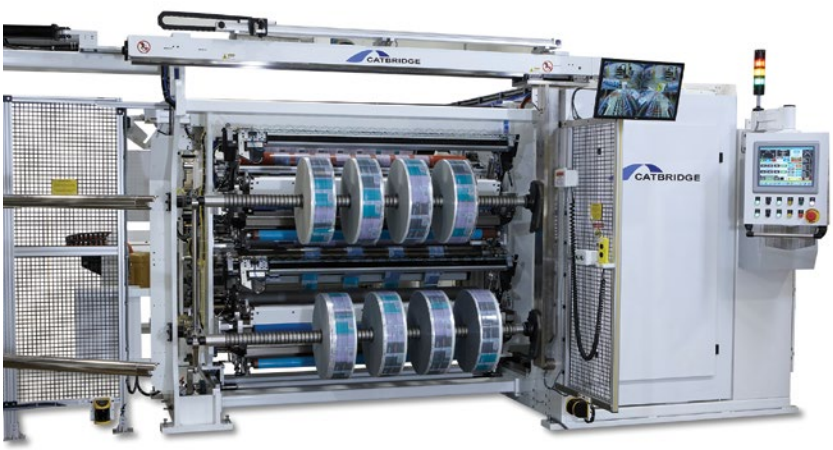
Catbridge Machinery's design and manufacturing facility integrates engineering and construction seamlessly under one roof allowing for unmatched quality control. From start-ups and training to spare parts and remote servicing, Catbridge stays with you for the life of your machine.



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Third-party Certifications Can Validate Sustainability Claims

By **Justine Hanlon**, Global Marketing Manager for Flexible Materials, H.B. Fuller

Sustainability is going mainstream

A 2021 global analysis[1] commissioned by the World Wildlife Fund (WWF) and conducted by the Economist Intelligence Unit (EIU) revealed that the popularity of internet searches around the world for sustainable goods has increased by an unprecedented 71 percent in just five years.

As consumer knowledge increases, there is a growing backlash against "greenwashing" (i.e., making misleading statements or claims about the sustainability of a product or service) and a call for brand transparency. This is leading to brands looking for reliable third-party certifications that capture and explain their sustainability claims.

These certifications tend not to be cheap, and the best certifications take a lot of time, money and technical requirements to fulfill. As the market shifts toward more rigorous testing requirements, there is some concern that an over proliferation of certifying bodies will lead to consumer confusion and decision fatigue. The certification groups will eventually need to consolidate or lead with one voice or risk being ignored by groups that provide clarity.

Groups such as Cradle to Cradle[2] promise one global standard for products that are safe, circular and responsibly made. They use five guiding tenants to drive their holistic approach to certification, including material Health, Product Circularity, Clean Air and Climate Protection, Water and Soil Stewardship, and Social Fairness.

Cradle to Cradle seems like a sensible way to move forward, versus a patchwork of certifications, but unless there is widespread adoption, they will face the same roadblocks as traditional certifying bodies.

Although standards to reduce greenwashing exist, there are terms that, while technically correct, can still lead to misinformation or representation. For example, ecologically, there are benefits to

materials derived from renewable materials, but consideration must be given to how a raw material is sourced. Raw materials derived from animal sources, such as casein adhesive, are less sustainable than plant-based starch, however both are considered renewable resources.

More importance is being given to the end-of-life scenarios of all materials – not just certifications that only look at a small part of products' impact on the environment. The greater shift to life cycle analysis (LCA) methodology will hopefully lead to a decrease in the high cost of LCA and increase in acceptance, especially if certifying bodies and accreditation is tied to such a time consuming and currently expensive, but worthwhile, calculation.

Continued need for infrastructure and consumer education

Much has already been written about the lack of recycling processing infrastructure in the U.S., but recent investments show that the plastics industry is willing to step up and contribute to the complicated issue. In 2020, Nestle invested[3] $30 million in Closed Loop Partners' private equity funds to help upgrade U.S. recycling infrastructure and give the company better access to food-grade recycled plastics.

Another recent example is the Recycling Partnership's launch of the Polypropylene Recycling Coalition, an industry collaboration to improve polypropylene (PP) recovery and recycling in the U.S. and further develop the end market of high-quality recycled PP. However, the speed of investment by both government and industry needs to increase. Failure to do so could lead to the wrath of a public that is quickly becoming more sophisticated to sustainability claims and misdirection.

Only 12 percent of plastics were recycled in the U.S. in 2020, while the rest were landfilled, incinerated or exported. Some work has been done around instore collection at drop-off bins. According to How2Recycle, 225 million pounds of recyclables have been collected through their initiatives – a small part of the $183 billion dollar market.

Film producers and packaging converters don't want mono-material going to landfills or incinerators. Polyethylene, from which a majority of film, wraps and bags are made, is a valuable recyclable material driving the American Chemistry Council's Plastics Division decision with a goal for 100 percent of plastics to be "recyclable or recoverable" by 2040.

Low volume or complex products, such as multilayer films or packaging contaminated with food residue, will need further infrastructure improvements or product redesign to meet such ambitious goals. Companies that move too slowly in their sustainability reviews run the risk of having their decisions dictated to them by patchwork government initiatives.

Adding complexity to the issue is the ambiguity and "wish-cycling" around the recyclability of plastic film, bags and wraps. Allowing said material to end up in curbside bins can have the disastrous consequence. Plastic films and wraps have been the bane of many curbside recyclers, due to the damage inflicted on equipment.

Hope for the future

Although there are many difficult sustainability challenges facing the film and coating industry, the great news is that many people are working together across multiple facets of the industry to create a roadmap that helps the environment, consumers, brands and the suppliers. And adhesives play a critical role as an enabler and a must-have technology that makes the world, as we know it, work.

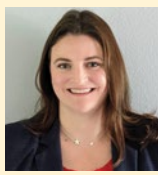
They also help to lay the foundation of a new era of industrial design and manufacturing under resource constraints. Due to its innovation, versatility and flexibility — not only in selecting technologies and raw materials — the industry now has many options that contribute positively to the way products are conceived and manufactured, reused or recycled. ■

[1] https://www.worldwildlife.org/publications/an-eco-wakening-measuring-awareness-engagement-and-action-for-nature

[2] https://www.c2ccertified.org/

[3] https://www.fooddive.com/news/nestle-invests-30m-in-closed-loop-fund-to-expand-sustainable-packaging-use/584872/

ABOUT THE AUTHOR



Justine Hanlon works with brands across the value chain to ensure that adhesives help improve compostability, recyclability and a circular economy. Since 1887, H.B. Fuller has been a leading global adhesives provider focusing on perfecting adhesives, sealants and other specialty chemical products to improve products and lives.

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3 COMPANIES WITH AN INTERNATIONAL VOCATION TO GRANT THE FULL PRODUCTION CHAIN

THE IMPORTANCE OF MONOMATERIAL POLYPROPYLENE LAMINATES IN FLEXIBLE PACKAGING

By **Steve Langstaff**, Business Development Manager Packaging & Sustainability, Innovia Films

There are now polypropylene options available to make high barrier, fully recyclable packaging to replace complex structures.

Last year's COP26 summit reminded us of the importance of reducing the human effects on the environment with specific emphasis on the need to reduce our carbon footprint. It is well recognized that food production is a major contributor to global warming and resource-efficient packaging plays a vital role in reducing the carbon impact by reducing waste and extending shelf life.

Although the carbon footprint of the packaging is important, it is usually comparatively small when compared to the product it is wrapping. This is one of the big advantages of flexible packaging, which due to its light weight, is far more resource efficient than cans, bottles, tubs or trays. However, in most countries flexible packaging is not collected and the infrastructure to recycle is restricted. This can result in non-optimal end of life such as landfill, incineration or waste to energy.

The misconception that flexible packaging cannot be recycled is leading some to poor environmental choices, often leading to increases in food waste and packaging with higher Global Warming Potential than flexible alternatives. Fortunately, things are changing.

There are regular announcements in the press regarding flexible packaging recycling investments and private initiatives to collect flexible packaging (for example, UK supermarkets). As governments start to mandate curbside collections of flexible packaging this will accelerate the industry further.

Examination of the front-of-store collection of post-consumer flexible packaging in the UK, shows that around 70 percent of the material is either Polyethylene (PE) or Polypropylene (PP) and that 20 percent is mixed plastic and aluminium foil plastic laminates. Currently the PE fraction is down-cycled to low-grade PE film for use as garbage bags or supermarket carrier bags. The PP fraction tends to go into rigid uses, much of it outside the packaging industry. The laminate fraction in most situations goes, at best, to waste for energy.

However, technology is available to sort, wash and de-ink the PE and PP fractions to allow

Confectionery pouch packs can now be created using all polypropylene laminates, making them more easily recyclable.

them to be "closed loop" recycled; i.e., so they can be used back into high-grade film applications.

Currently no large-scale efficient technology exists to recycle the mixed plastic laminates. So, the current approach is to try and remove them and replace with all PE or all PP structures which form most of the existing waste stream. Mixed polyolefin waste (PE and PP) has a market value, but if the objective is closed loop recycling back into high-grade film, individual streams would be advantageous for film production.

For many primary packaging applications, the high stiffness and transparency of PP has advantages over PE, as PP offers the option to go thinner and to run more efficiently on packaging machines. Both of which results in a lower carbon footprint.

Most laminates in the food packaging industry are formed using the best properties from two or more different materials to achieve the optimum pack performance. A common laminate is a biaxially oriented polyester (BOPET) laminated to a low-density polyethylene (LDPE). The BOPET used on the outside provides pack stiffness and gloss and the inner layer of LDPE offers strong seals and hermeticity.

A more sophisticated laminate is used in some pouch applications where barrier to moisture and oxygen is accomplished using an aluminium foil with a reverse printed PET on the outer face and a Cast PP used as the sealant web. Neither of these packs can be recycled back into film, but both give an excellent pack which serves to protect the contents successfully. In both cases it would be extremely difficult to get an effective pack with only one film.

To replace these laminate types, film manufacturers are developing new films with enhanced properties specifically for pouch applications. An example of this is the production of a more thermally stable biaxially oriented polypropylene (BOPP) to replace the BOPET. These products provide lower levels of shrinkage than traditional BOPPs and in some cases offer a non-sealing top skin to prevent jaw stick during packing.

A top web made from BOPP will never have the same temperature resistance as a PET film, therefore Cast PP seal webs need to be designed with a lower seal initiation temperature (SIT) to prevent serious distortion of the BOPP top web. Cast PP films are now available with SITs around 90-degrees Celsius. Options to replace the established PET/LDPE laminate mentioned above, are also now available.

The choice of barrier to replace the aluminium foil is highly dependant on the end application but several PP alternatives already exist. High barrier metallised films or AlOx and SiOx deposition layers can be used although the latter is expensive. Of growing significance is the use of BOPP/EVOH coextrusions where newer products on the market show reduced humidity sensitivity which look likely to open new ground in retort packaging. Providing the content of EVOH/METAL/SiOx/AlOx represents less than 5 percent of the overall pack structure; then full recyclability will be maintained.

Mono material laminates, as proposed above, can be used in a variety of pack formats including lidding, flow wraps, VFFS, sachets and pouches and in several market sectors including confectionery, baked goods, pet food and snacks. ■

ABOUT THE AUTHOR

Steve Langstaff, CEng (IOM3) in Plastics Engineering with more than 30 years BOPP industry experience, joined UCB (now Innovia Films) in 1990, establishing the foundation of its Pressure Sensitive Label Films business.