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RECENT INNOVATIONS IN BIOPLASTICS

TECHNOLOGY UPDATE: PLASTIC POUCHES

ADVANCES IN STRETCH AND SHRINK FILM



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Plaskolite buys acrylic sheet plant in Mexico

US-based thermoplastics producer Plaskolite has begun producing Optix G Series cell acrylic sheet at its new plant in Matamoros, Mexico.

It says it is the only stocking manufacturer in the North American market producing extruded, continuous cast and cell cast acrylic sheet.

"We're thrilled to start production just three months after the acquisition of the Matamoros facility," said Ryan Schroeder, Plaskolite president and CEO. "This fast

start is a boon to our customers in North America, who now have the ability to source all three types of acrylic sheet along with the rest of the industry's broadest portfolio of thermoplastic products from the same manufacturer."

Plaskolite bought the land, buildings and equipment at the Matamoros site from Trinseo in a transaction announced in April. As production ramps up, Plaskolite anticipates the plant will employ 75 full-time employees by Q4,

when the Optix G Series offering becomes fully available in textures, colours and custom thicknesses.

Cell cast acrylic sheet has the highest molecular weight and hardness, and best craze resistance, of the three types of acrylic sheet, according to Plaskolite. It is used in many applications including display, signage, construction and marine products.

The Matamoros facility complements Plaskolite's existing cell cast operations at its Girona, Spain facility.

➤ www.plaskolite.com

Oben expands in flexpack

Peru-based packaging manufacturer Oben has acquired the flexpack film manufacturing facility of Mexico's Agusa.

Through the deal, it acquires the company's KristaFilm brands and portfolio of BOPP, CPP, metallised, and PE films.

The acquisition is a strategic expansion of Oben's production capabilities in North America and will help it meet growing demand.

"This acquisition is an important milestone in our strategic plan and reinforces our commitment to provide high-quality products and fast delivery to our customers in North America," said Gonzalo Belaunde, CEO of Oben.

Oben's portfolio includes BOPP, BOPET, BOPA, BOPE, CPP, extrusion coated and thermoformed products.

➤ www.obengroup.com

Röhm buys PC film division from Sabc

Röhm of Germany is to buy the polycarbonate films and sheet business of Sabc.

It previously announced its intention to purchase the business in December 2022.

"This is a milestone on our road towards becoming a world-leading multi-mate-

rials manufacturer of high quality, transparent films and sheet," said Michael Pack, CEO of Röhm.

The Sabc products, made by its Functional Forms business unit, are mainly sold under the name Lexan. Röhm's transparent

sheet products are sold under its Plexiglas and Acrylite brands.

"Our customers will now be able to acquire Plexiglas, Acrylite and Lexan products out of one hand," said Pack.

➤ www.roehm.com

➤ www.sabc.com

Polycarbonate's role in speed record

A speedboat powered only by the wind - which glides across the water at 80 knots - is hoping to break a world record next year.

The SP80 will have its first test 'drive' along the French Mediterranean coast this summer. The goal is to set a new world speed record.

The cockpit is made of 12mm-thick solid polycarbonate sheets from Exolon Group that are thermoformed by French company Vitalo/Starplast.

The transparent sheets provide optimum visibility thanks to their high optical quality. They can be hot and cold formed.

➤ www.exolongroup.com



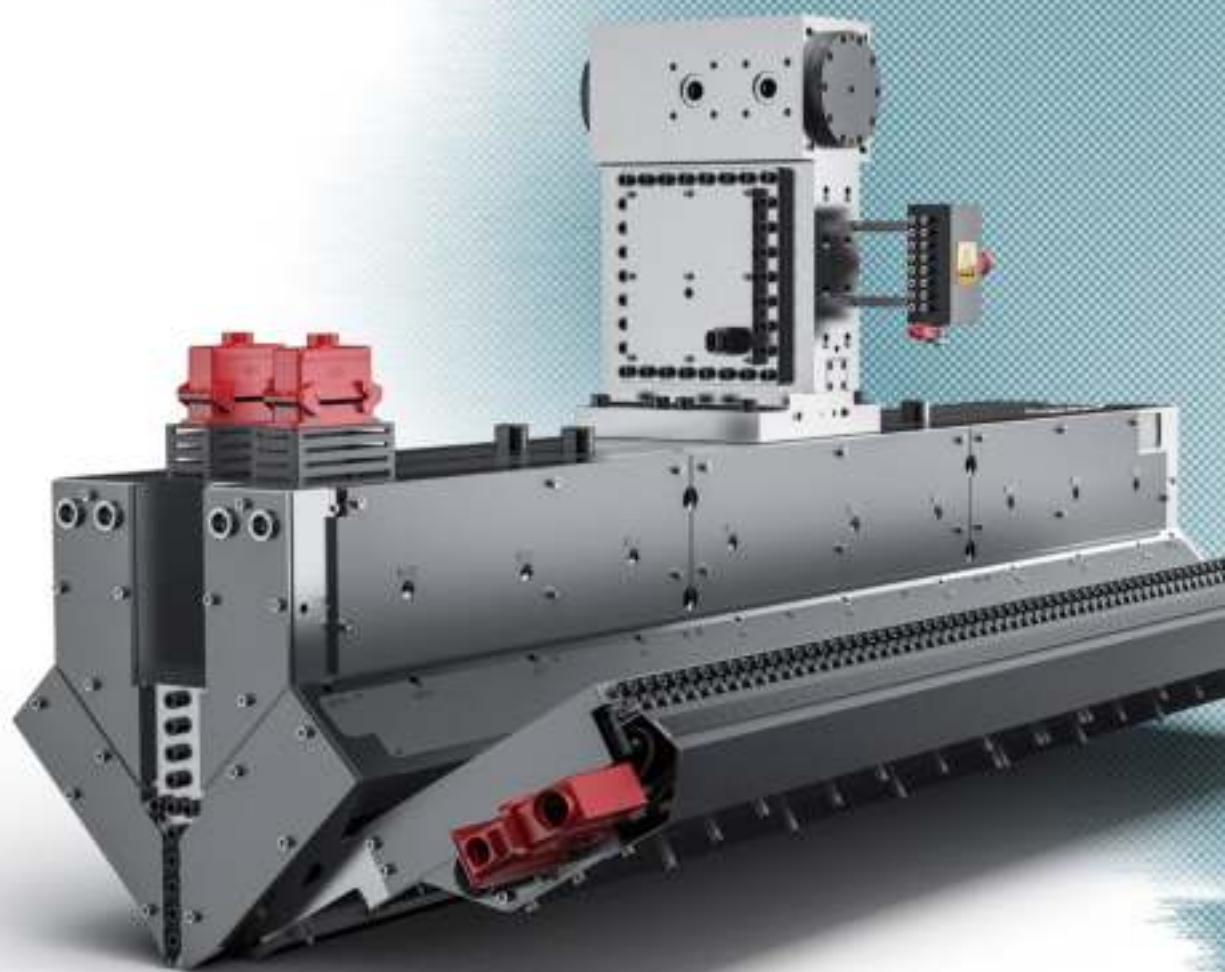
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Snack pouch is easy to open

Walki has launched an easy-open pouch concept for snacks such as nuts and dried fruit.

"We set out to innovate a pouch that consumers can open in a controlled and easy way," said Andreas Rothschink, head of product development and technical service for consumer packaging at Walki.

Laser and specially formulated PE films allow for controlled tearing. The pouch is constructed with a laminate of an MDO-PE film and a new LDPE-based film. The laser preformation in the centre of the side gusset fold of the bag is the starting point for the opening. By weakening the laminate in a controlled way, the material is thin enough to allow for a controlled opening of the pouch but still thick enough to protect the snacks inside.

The pouch was developed in collaboration with packaging machinery manufacturer Rovema. Because it is made only from PE, the pouch is easy to recycle in the relevant plastics stream.

■ Read more about pouches in our feature on [page 39](#).

➤ www.walki.com



The easy-open pouch is based on different PE films

Sales and service in S. Africa

Reifenhäuser has founded a new subsidiary in Durban in South Africa.

The new company, Reifenhauser Southern Africa will directly serve Angola, Namibia, Botswana, Zimbabwe, Madagascar, Malawi, Mozambique and South Africa.

"This will take our sales and service offering, and technical support, to a new level," said Mohamed Timol, managing director of the new company.

Blown and flat film technologies will now be directly provided in the region for the first time. Customers will also have direct access to services and components including Kdesign cooling ring products.

➤ www.reifenhauser.com

Opportunities for PVC recycling

US trade association The Vinyl Institute has awarded more than US\$460,000 of funding to six organisations in the first round of its Viability recycling grant initiative.

The programme, which launched earlier this year, will make up to US\$1m in funds available annually over the next three years. It is funded by Formosa, Oxy,

Shintech, and Westlake.

Recipients of the first round of grants include: the Chemical Fabrics and Film Association (CFFA); Kelly Green Board; and the Vinyl Siding Recycling Coalition.

CFFA intends to use the grant to expand roof membrane recycling to an industry-wide programme - build it, improving logistics, expanding its recycling

network and developing end markets for recycled PVC material. Kelly Green Board is developing a circular use of PVC roofing membrane - making a roof board that contains 50% post-consumer roofing membrane and 50% post-consumer carton packaging material that can be reused in its new roofing system.

➤ www.vinylinfo.org

Nefab buys US-based PolyFlex

Nefab of Sweden has bought US-based PolyFlex Products - a manufacturer of industrial packaging and other products.

PolyFlex operates in four locations in both the US and Mexico.

It specialises in returnable and plastic solutions including heavy-duty thermoforming.

"Through this acquisition,

we further strengthen our market position in the Americas - and in the lithium-ion battery (LiB) and e-mobility segments," said Per Öhagen, president and CEO of Nefab.

In the last few years, Nefab has acquired a number of leading companies in the areas of thermoforming and sustainable packaging. Following the

acquisition, it will have more than 4500 employees across 35 countries.

Darrell Tiedeman, COO at PolyFlex, added: "Our Americas market presence, competitive portfolio and engineering know-how complement the Nefab strategy, and we look forward to continuing our growth journey.

➤ www.nefab.com

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Would you like to know more? Let's get in touch!



Top: Partly coated with anti-fog



Bottom: Stacked packaging, coated with anti-block

Van Meeuwen Additives
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Online registration opens for AMI's US plastics expositions

Online registration has opened for the AMI Plastics World Expos, which run in the USA in November.

Taking place for the fourth time, the event will be the largest plastics industry gathering in North America this year. It brings together four focused exhibitions – **Plastics Recycling World Expo**, **Compounding World Expo**, **Plastics Extrusion World Expo** and **Polymer Testing World Expo** – and is held at the Huntington Convention Center in Cleveland, Ohio on 15-16 November 2023.

By registering in advance, visitors receive free admission to all four exhibitions – featuring more than 300 suppliers – and to five conference theatres hosting technical presentations, educational seminars and business debates. Attendees and exhibitors will also have the option to buy tickets (US\$50 each) for a networking party at the Punch Bowl Social on the evening of 15 November.

"The event will provide visitors with a great opportunity to meet and compare suppliers from around the world, as well as giving them the chance to learn from business leaders and technical experts in the conference theatres," said Andy Beever, events director at AMI. "When we ran these expos in Cleveland last year,

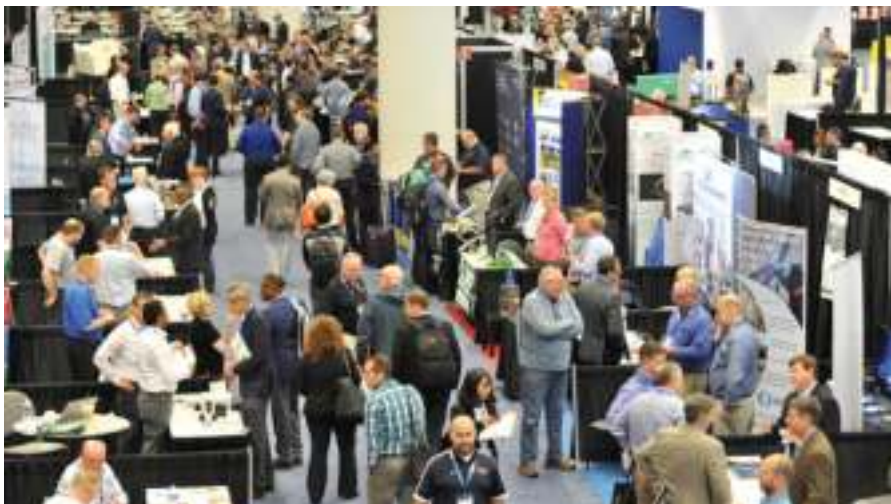


IMAGE: AMI

Last year's event in Cleveland attracted more than 4,600 visitors

they attracted more than 4,600 visitors – including buyers and specifiers from leading extruders, recyclers, compounders, OEMs and brand owners."

The four expos will occupy the largest halls at the Huntington Convention Center. They will feature an array of manufacturers of extrusion, compounding, recycling and testing equipment, plus suppliers of polymers, additives and related services. The five conference theatres will feature more than 100 expert speakers over the two days, including influential representatives from leading compounders, extruders, recyclers and testing organisations.

The exhibitor line-up already includes: AdvanSix, Ampacet, BASF, Buss, BYK, Chroma Color, Clariant, Cloeren, Coperion, CPM, Cumberland, Davis-Standard, Dover Chemical, Entek, Erema, Evonik, Farrel Pomini, Galata Chemicals, Genox, Gneuss, Graham Engineering, Heritage Plastics, IMCD, JSW, KraussMaffei, Leistritz, Lindner, Maag, Milliken, MDI, Netzsch, NFM, NGR, Nordson, Omya, Orion, Perkin Elmer, Polystar, PTi, Q-Lab, Reifenhäuser, Sanitized, Sesotec, SI Group, Steer, Step 2, Struktol, ThermoFisher, TPEI, US Extruders, Vecoplan, Wacker, Windmoeller & Hoelscher and Zwick/Roell.

A few booths are still available. To find out more about exhibiting at any of the expos, visit www.amiplastics.com/events/exhibitions. To book your free ticket for the expos and conferences, which is valid for both days of the event, visit: www.ami.ltd/PWExpos-NA-register.

VDMA: low expectations for 2024 sales

Orders for German plastics machinery have slumped in the first quarter of the year.

VDMA, the organisation that represents machinery makers, reported a 33% decline in new orders,

compared to the same period in 2022.

"That probably means fewer orders on the books that can be processed and converted into sales in 2024," said Thorsten

Kühmann, managing director of the association's plastics and rubber division.

This comes on the back of a 6% decline in orders in 2022, compared to 2021. Despite this, turnover in

2022 was healthy – showing 10% growth compared to 2021. Order books are still full, suggesting a good sales year in 2023, according to VDMA.

➤ <http://vdma.org/kug>

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Corbion halts plans for French PLA plant

Following a review of the investment case, Corbion said in June that it will not go ahead with a planned PLA bioplastics plant at Grandpuits, France.

TotalEnergies had announced plans to invest more than €500 million (US\$561m) to convert its Grandpuits refinery into a zero-crude platform back in September 2020. As part of the project, Total Corbion PLA

was to build a 100,000 tonnes/year PLA plant, which would have been the first PLA production site in Europe.

The company says it remains committed to the growth of its Luminy PLA bioplastics. It said the project cancellation will not affect its global sales and marketing network, or the 75,000 tonnes/year PLA production plant it opened in Thailand in 2018.

> www.totalenergies-corbion.com



US-based TekniPlex has modernised its Global Innovation Center in Holland, Ohio. The improvements enhance its role as a hub for materials science research & development in areas such as packaging for healthcare and food & beverage, says the company. The facility recently hosted students from the Toledo Technology Academy of Engineering for a tour that was relevant to their coursework.

> <https://tekni-plex.com>

Nova considers prospect of Canada pyrolysis facility

Nova Chemicals and Plastic Energy are to explore the feasibility of developing a pyrolysis-driven recycling facility in Ontario, Canada.

If built, it would be the largest of its kind in Canada with a potential initial capacity of 66,000 tonnes/year.

"Post-use plastics offer tremendous value to furthering the circular economy," said Greg DeKunder, vice president of Nova Circular Solutions.

Recycled polyethylene made using Plastic Energy-produced feedstock,

called Tacoil, has identical properties to virgin PE and can be used in food contact and high-performance applications. Plastic Energy has two commercial plants in Spain, as well as new projects in Europe and Asia.

Carlos Monreal, CEO of Plastic Energy, added: "Advanced recycling will continue to be important for the North American market by providing a solution for incorporating recycled content into food-grade packaging."

> www.novachem.com

www.filmandsheet.com



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Green revolution: advances in bioplastics

Recent innovations in bioplastics include projects looking at wood, carbon dioxide and cellulose as raw materials – and investments to boost BOPLA and bio-based PP and PETG

The development of bioplastics continues to accelerate – whether it is new commercial grades or basic research projects that are looking for new sources of raw materials for monomer.

Avantium has been awarded a €1.5 million (US\$1.67m) grant by the EU's Horizon Europe programme for leading the Hiccups R&D programme.

Hiccups aims to demonstrate the use of CO₂ as a feedstock for the production of polyesters. The grant will be paid out to the company in tranches over four years.

One of the company's technology platforms, called Volta Technology, uses electrochemistry to convert CO₂ into chemical building blocks and polyesters.

Under the programme, Avantium will convert CO₂ from biogas – produced at wastewater treatment plants – into polylactic-co-glycolic acid (PLGA). PLGA with 80% glycolic acid or more has an excellent oxygen and moisture barrier and good mechanical properties, says the company. It is also recyclable, home compostable and marine degradable.

Other Hiccups partners include Nova Institute (Germany), VTT (Finland), Sintef (Norway) and Walki (Finland).

"We look forward to working with like-minded organisations on carbon capture and utilisation (CCU)," said Annelie Jongerius, technology manager at Avantium and scientific coordinator of Hiccups.

"This grant reflects our expertise in the conversion of CO₂ into high-value polyesters."



IMAGE: VTT

Cellulose scale-up

Finnish research centre **VTT** has invested €1.5 million (US\$1.67m) to scale up a pilot plant for making cellulose film.

The material can be used to replace conventional plastic film in food packaging. The investment will allow the plant to begin testing and developing processes to enable mass production of these films.

"There is a great need to replace polypropylene film with a more sustainable alternative," said Ali Harlin, research professor at VTT. "The new facility is a step forward in making sustainable materials more mainstream."

The pilot plant's focus is to improve barrier properties and to make packages from the new materials. VTT estimates that the material could have wide industrial use within five years. It says it is already working with more than 30 partners.

"We've received feedback from our customers that they can't tell the difference between our cellulose-based films and traditional plastic wraps," said Harlin. ➤

Main image:
VTT is scaling up its pilot plant for making cellulose film

IMAGE: AIMPLAS



Above:
Aimplas is taking part in the Preserve project to improve the performance of bioplastics

Lignin polymer

Researchers at **Boston College** in the USA have used photocatalysis to partially depolymerise lignin and produce chemically recyclable polymers.

As an inedible component of biomass, lignin has many functional groups that are attractive for chemical synthesis. Depolymerising lignin without destroying the more valuable cellulose and hemicellulose has been a significant challenge, say the researchers. Existing biomass processing procedures tend to induce extensive condensation in lignin - which hinders its chemical utilisation - or fully depolymerise lignin to make monomers that are hard to separate for subsequent synthesis.

The new process takes advantage of the high selectivity of photocatalytic activation of a particular bond in lignin by a chemical called TBADT. The availability of electron mediators or scavengers promotes cleavage or oxidation of this bond, respectively, enabling a high degree of control over the depolymerisation and the density of the C=O (ketone) functional group in the products. The resulting oligomers can be readily used to synthesise polymer networks by reactions between C=O and branched -NH2 as a dynamic covalent cross-linker.

“Importantly, the resulting polymer network can be recycled to enable a circular economy of materials directly derived from biomass,” said the researchers in a paper published in *ACS Central Science*.

Slaughterhouse waste

Aimplas has begun coordinating a new 13-partner European project called Ellipse - which will use slaughterhouse waste - and pulp & paper sludge - to make cost-efficient polyhydroxyalkanoates (PHAs) for agricultural and personal care applications.

It will be co-processed with other organic wastes such as sludge from the dairy industry and glycerol from the biodiesel industry.

The research is funded by the European Union under the Circular Bio-based Joint Undertaking (CBE JU). It has been allocated around €5.5 million (US\$6.1m) over a 48-month period.

The integration of the slaughterhouse and pulp & paper waste streams as biorefinery feedstocks will help to reduce the volumes of landfilled waste, with added advantages of water recycling, decreased soil degradation, groundwater pollution and methane emissions.

The project will be able to cope with at least 100 tonnes of slaughterhouse waste and 20 tons of wastewater sludge from the pulp & paper industry. The technology will use 20,000 tons of rumen content waste and 50,000 tons of pulp & paper sludge per year.

Meanwhile, the **BeonNat** project - of which Aimplas is a member - has demonstrated the potential of biomass to produce bioplastics.

In the first stage of the project, the 16-member consortium assessed the suitability and industrial applicability of different species, including Siberian elm, common juniper, rosemary and birch. The species were grown at six locations in Germany, Spain and Romania.

The project chose six of the most promising

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Right: Films made from PBS in the Rubio project are recyclable and biodegradable

species to assess their suitability for use in the manufacture of the end products. For example, black poplar grown in Zamostea (Romania) and blackwood acacia grown in Moara (Romania) have shown promising results in the production of lactic acid for making bioplastics.

Aimplas is also taking part in the **Preserve** project to improve the performance of bioplastics so that they not only ensure optimal preservation of food and beverages, but also protect non-renewable resources in the environment and on the planet.

Within the project, Aimplas is working on the development of PHA-based water vapour barrier coatings to improve the properties of cellulose-based packaging. It is also developing reinforcement materials in conventional compounding and flat sheet extrusion processes to improve the mechanical properties of recycled bioplastics. It is also involved in chemical and enzymatic recycling processes to give a second life to the newly developed packaging.

“Our aim is to minimise the use of fossil-based plastics by encouraging the development of bioplastics with the same and even better properties,” said Lola Gómez, principal investigator of the project at Aimplas.

Here, work is being done to improve properties such as the development of barrier coatings based on proteins and PHA, the use of e-beam irradiation to improve barrier and mechanical properties, and developing polymer reinforcement technologies to improve the properties of recycled bioplastics.

Film from plants

Partners in the pan-European Rubio project have used ‘regionally available’ plant residues to create recyclable, biodegradable materials.

As part of the project, the **Fraunhofer Institute for Applied Polymer Research (IAP)** is developing new types of a bioplastic called polybutylene succinate (PBS) – and, with Polifilm Extrusion has



IMAGE: POLIFILM

developed an initial commercial product.

The PBS films are recyclable, biodegradable and can be processed on standard extrusion lines.

“There are currently only three types of PBS on the market – and these are suitable only for a limited number of processing methods and applications,” said Thomas Büsse, head of the processing pilot plant for biopolymers at Fraunhofer IAP.

Real conditions

Chaire CoPack, AgroParisTech and the University of Montpellier have conducted a scientific study that validates the biodegradation of certified compostable food contact packaging in industrial composting facilities.

The preliminary report of the study provides evidence that certified compostable packaging is a viable sustainable solution to waste management in the food packaging industry, says **TotalEnergies Corbion**.

The test used 20 tonnes of food- and bio-waste collected from households, along with 323kg of assorted certified compostable packaging. In

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IMAGE: NOVAMONT



Above: Novamont's Mater-Bi material is widely used to make products such as shopping bags

parallel, a 'control' compost test was conducted with no packaging added.

"The results send a strong signal to governments across Europe to grant certified compostable plastics access to biowaste collection and composting infrastructure," said Paolo La Scola, public affairs manager at TotalEnergies Corbion.

The research, carried out over a four-month period, took place with real industrial composting conditions without forced aeration. Researchers from the University of Montpellier and AgroParisTech monitored the study in collaboration with the industrial composting platform of the Syndicat de Centre Hérault in Aspiran.

BOPLA tie-up

TotalEnergies Corbion has also teamed up with **Changsu Industrial** for the market promotion, product development, and research and development of new technologies and applications of biaxially oriented polylactic acid (BOPLA).

"The bioplastic industry in China has seen tremendous growth with new technological breakthroughs in bio-based materials," said Mou Qingying, vice president at Changsu Industrial.

Changsu is a producer of speciality plastic films. BOPLA is made from bio-based PLA using biaxial stretching technology.

One collaboration involves the development of BOPLA-based adhesive tapes made of Changsu's BiOnly, which will replace conventional material. New regulations have already been announced to encourage the adoption of biodegradable materials in China's postal service by 2025 - which is where this will be used.

Bio-based PP

US-based **Citroniq** and **Mitsui Plastics Inc**, part of Japan's Mitsui group, have signed a letter of intent covering large-scale supply of bio-based PP, which is to be produced by Citroniq using biogenic feedstocks and renewable energy.

Citroniq co-founder Mel Badheka said: "Together, MPI and Citroniq will be able

to provide customers with global-scale supplies of 'drop-in' sustainable resins much faster than the alternatives, resulting in meaningful reductions in their carbon footprint, on schedule with their carbon reduction targets."

In a statement announcing the agreement, Citroniq said its plant at Kansas in the US has more than 360,000 tonnes capacity for green PP and a "highly competitive cost position."

At the same time, **Braskem** says it is evaluating a US-based project to convert bioethanol into physically segregated bio-based PP. The company is currently exploring partnerships with several clients, brand owners, and suppliers.

Braskem, which is already a leader in bio-based PE, said its bio-based PP would be a drop-in solution offering the same technical properties and recyclability found in its current PP portfolio but with the additional benefit of a negative carbon footprint.

The company said the US is home to the largest ethanol industry in the world with ample technology, infrastructure, and supply availability for the project.

Compounding in China

BASF is to establish compounding capacity for its compostable Ecovio polymer in Shanghai, China, with commercial quantities of material expected to be available from mid-2023.

The first compound products will include film grades for applications such as compostable shopping and organic waste bags, soil-biodegradable agricultural mulch films, and packaging.

Ecovio compostable polymers comprise a blend of BASF's petrochemical-based Ecoflex PBAT and renewable polymers such as PLA. They comply with all requirements of both EU and US food contact regulations.

Right: UPM and Selenis will develop sustainable PETG for applications including heat shrink sleeves



IMAGE: SELENIS

Novamont bought

Versalis, a division of Italy-based Eni, has taken full ownership of bioplastics supplier **Novamont**.

The company, which had a 36% stake, has now bought the remaining 64% that was owned by Mater-Bi - which is controlled by Investitori Associati II and NB Renaissance.

The next steps of the deal - and the timing of its closing are subject to approval by the

relevant authorities, says Versalis.

Novamont is a strong player in the development and production of biodegradable and compostable bioplastics – including its Mater-Bi material – while Versalis says it has a strategy that is focused on chemistry from renewables.

Research wing

Romania-based **Kik Compounds** has opened a new wing at its R&D laboratory. The new facility is located at the Institute of Multidisciplinary Research for Science and Technology (ICSTM) within Valahia University.

Kik says that its products retain the quality and technical features of traditional plastics but are both recyclable and biodegradable. They are made with recycled vegetable resources, such as coffee waste and used corn oil, so as not to contribute to deforestation or food insecurity.

“This facility represents a significant step forward in our mission to develop sustainable solutions and ensure a greener future,” said Germano Craia, CEO of Kik. “We strive to push the boundaries of innovation and establish new standards for biodegradable plastics.”

PETG partnership

UPM Biochemicals and **Selenis** have formed a partnership to develop sustainable PETG – which is used in applications including heat shrink sleeves.

UPM will supply Selenis with its bio-based mono-ethylene glycol, to make partially bio-based PETG.

The MEG is produced from hardwood from forests in Germany, where the company is building an industry-scale biorefinery to convert woody biomass into biochemicals.

“Selenis pursues a strategy to reduce the carbon footprint of its products and partnerships like ours are at the heart of a greener, more sustainable chemistry,” said Michael Duetsch, vice president of biochemicals at UPM.

Marta Matos Gil, chief sustainability officer at Selenis, added: “We centre our innovation efforts in markets where the pressure for recyclable solutions is higher – because the life of the product is shorter – meaning end of life solutions are more critical.”

Soil improvement

Delegates at last year’s *Agricultural Film* conference in Barcelona – organised by **AMI** – heard how

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IMAGE: AIMPLAS



Above: The BeonNat project has demonstrated the potential of wood as a source of bioplastics

developers have come up with new biodegradable film formulations that can also help to improve soil properties.

Chelo Escrig Rondán, agriculture and aquatic environment group leader at Spanish research organisation Aimplas, explained how active substances – such as fertiliser – can be incorporated into biodegradable plastic film, for applications such as mulching.

The active substance can be adsorbed by porous materials such as hydrophilic silica, which is then incorporated into a plastic matrix such as an extruded film. One example is to add an anti-fungal additive to mulch film, at a loading of around 0.3%. Aimplas tested it against typical fungi, in comparison with standard biopolymer film. At 24°C, a standard film saw 50% infection with both *Botrytis cinerea* and *Aspergillus niger* after seven days. In each case, the anti-fungal film reduced this to zero. At 8°C, *Botrytis cinerea* managed to infect the standard film completely – but this was reduced to 67% on the anti-fungal film.

“Mulching with anti-fungal film can be used for watermelon crops, as a measure to combat fungal growth during all stages of cultivation,” he said.

Compost containing 10% of the biofilm also broke down completely over three months, with no toxic effects, he added.

Faster composting

At the same event, Hugo Vuurens, VP of business development at **CJ Biomaterials**, told delegates that the company’s polyhydroxyalkanoate (PHA) material – when combined with PLA – could help to speed up the composting of agricultural film.

PHA is made industrially using bacterial fermentation, in various carbon-chain lengths.

“Many bacteria produce and use PHA as an energy storage material,” said Vuurens. “Theoretically, more than 150 types of PHA can be created.”

PHAs can also be crystalline, semi-crystalline or amorphous – which leads to a variation in properties. Crystalline PHA, for instance, has a flexural strength of around 1400MPa, while that of amorphous PHA is around 4MPa. The material is also far more biodegradable than materials such as PLA – with both amorphous and semi-crystalline versions biodegrading under both industrial and home composting conditions – as well as in soil and the sea.

“PHA is enzymatically digested, while synthetic biodegradable polymers are hydrolysed,” he said.

In addition, CJ Bio and PLA manufacturer **NatureWorks** recently created a partnership to develop materials based on their PHA and PLA portfolios.

One area is to combine the two in products such as agricultural film in order to improve properties and speed up composting. Adding 5-10% amorphous PHA to PLA can help to make the film more ductile, said Vuurens.

In addition, it could speed up industrial composting – though he stressed that tests were still ongoing, and not yet conclusive.

Because of this, he said it could find wide use in agricultural film, as it will biodegrade quickly in soil – meaning that it can be left on the land at the end of the season.

In a small screening study, it did not affect cabbage yield compared to commercial PE and PBAT mulch films. Microscopic analysis showed that decomposition occurred on the surface after three months.

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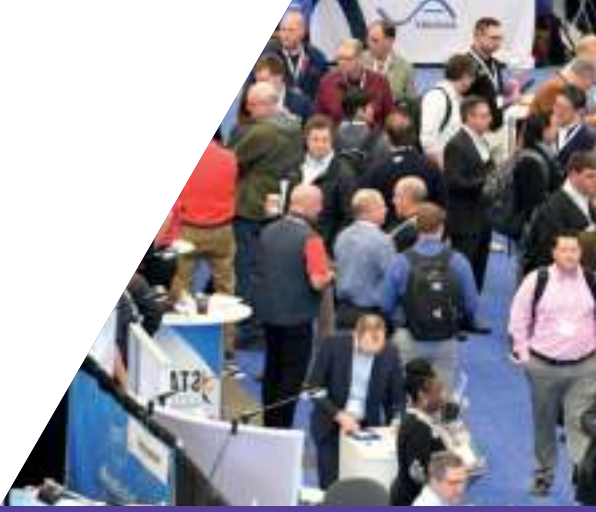
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**Subject to approval.

Has the EU put single serve capsules at a crossroads?

Martyna Fong, author of AMI's report *Single Serve Capsules - Global Market Overview 2022*, looks at the potential impact of the EU's proposed Packaging and Packaging Waste Regulation on the single-use capsules industry.

Over 80 billion single serve capsules were filled in 2022 globally: 27bn in aluminium and 53bn in plastic formats (see [Single Serve Capsules - Global Market Overview 2022](#) published by AMI). The three main systems - Nespresso, K-cup and Dolce Gusto - accounted for a vast majority of the market globally in 2022, with a clear trend towards rationalisation of systems supported on the market.

Plastic capsules have grown rapidly but the tables had recently turned in favour of aluminium for the Nespresso compatible designs. Leading brands and retailers have strategically switched from plastic into aluminium in the past couple of years.

Nespresso has put all its efforts in establishing the collection and recycling infrastructure for its used capsules. Following Nespresso's open invitation in March 2019 to join forces in its recycling scheme, several alliances were formed to collect and recycle capsules.

Meanwhile, plastic capsules designs must be adjusted to present a recycling-ready PP solution, which includes polyolefin based lidding film. Provided that other materials in the multilayer structure do not

exceed 5%, the capsules can be recyclable in the PP stream. The industry has turned to more sustainable start-of-life and a number of big customers now specify the use of PP with renewable content.

Composting is a relevant end-of-life option for single serve capsules, given the weight of the organic matter packaged versus the weight of packaging. But fillers and brand owners have struggled to commit to compostables due to a disjointed and unclear legislative framework for bio-resins.

In context, only 4% of the global capsules market is using compostable solutions. There are high growth prospects for this segment to develop, particularly with the legislative context

around the new Packaging and Packaging Waste Regulation (PPWR) in Europe.

Draft regulation

Proposed changes to the existing Packaging and Packaging Waste Directive (PPWD), as per the released draft of 30 November 2022, have a potentially profound impact on the future of the single serve capsules market. Legislative framework for bio-plastics is also subject of revision, both in terms of accommodating organic recycling in the definition of recycling and also in terms of harmonising definitions and labelling approaches.

The draft PPWR says capsules will be considered packaging, and hence will

be governed by the packaging laws. The draft regulation says the mandatory method for all capsules' disposal will be in industrial composting conditions. This has brought about a high degree of turmoil in the European single serve capsules industry. Given the importance of Europe in the global market, the impact of changes would be global. Unsurprisingly, the first quarter of 2023 has seen a hive of lobbying activity.

This lobbying has resulted in draft amendments to the revisions proposed in the draft PPWR, which were submitted by the rapporteur of the ENVI committee, Frédérique Ries on 11 April 2023. The amendments remove the phrase 'as well as coffee or



IMAGE: SHUTTERSTOCK

tea system single-serve units' from Recital 11, and point g (capsules) from Article 3 mandating composting as end-of-life. Ries gave the following justification for the amendments pertaining to capsules: "Mandatory compostability for certain types of packaging should be limited to applications where the organic content is difficult to separate from the packaging [...] the single-use unit needed to hold a coffee or tea can be made of aluminium or plastic and can already be sorted and recycled. Recycling should be favoured in order to keep the materials in the circuit as long as possible, whereas after composting and anaerobic digestion, virgin materials must be sought to make new products."

Furthermore, the inclusion of beverage system capsules in the definition of packaging also changes in the proposed amendment with the addition of "... intended to be disposed empty after use" in Article 3(1)(a).

Compostable or not

If the above proposed amendments meet the acceptance of the European Parliament, we will see a relatively undisturbed organic growth trajectory of the single serve capsules market with the necessary

adjustments to drive more sustainable disposal, but format and material changes will be based on voluntary EPR initiatives, as opposed to mandated.

But what if the original stipulation for all capsules to be composted is sustained? Within two years of the regulation coming to force, all European coffee capsules system would need be composted either via compostable plastics or cellulose/fibre-based solutions. At this point there are 11 major capsules systems on the market in Europe, of which each is designed within specific material parameters in mind.

First and foremost, it will not be feasible (either technologically or commercially) to simply substitute the capsule design into compostable. What this means is that some brands/designs will be forced out of the competitive landscape. Second, while some excellent compostable solutions already exist for major systems such as Nespresso or A Modo Mio, we are risking an influx of "value" compostable solutions that are not fully optimised in terms of coffee preservation as well as brewer interaction. Consequently, a sub-standard experience may see consumer preferences shift away from the single serve

About the report and author

AMI's study **Single Serve Capsules - Global Market Overview 2022**

provides a detailed overview of the single-serve capsules systems available on the market and maps out the supply chain in the major end-use geographies. The study gathers production details on a site-by-site basis and these building blocks create an analysis of demand. Martyna Fong,

Director Market Intelligence at AMI, has led the development of AMI's rapid expansion of Capsules events and consulting. Contact: martyna.fong@amiplastics.com



format altogether, thus forcing a downward spiral of single-serve formats.

Next: the scale. There were 55bn empty capsules produced in Europe in 2022, of which only around 2bn compostable, so mandating material change would turn the supply chain upside down. There is a variety of compostable materials available, but a narrow choice of compostable high-barrier films. The competitive landscape will accommodate more suppliers, which is positive, and in the meantime the market will have to accept medium-barrier solutions with an impact of shorter product shelf-life in logistics and distribution. Compostable solutions still come at a

steep price premium, but economies of scale and market forces will likely help manage the new cost structure.

This magnitude of change within a very tight timeline of 24 month isn't feasible. A lead time of 12-18 months is necessary for empty capsule production set-up and there are still severe delays with part availability and international logistics. In addition, certification process for industrial composting standards takes several months to obtain.

The future of the global single serve capsules industry very much depends on the final wording of the PPWR. The amendments to the revision are due to be submitted in May 2023 and subsequently discussed by relevant committees by autumn 2023. The revisions will likely be finalised by the current EU parliament before May 2024.

■ This is an edited version of a white paper. Download the full white paper [here](#).

Single-Serve Capsules conference

AMI's **Single-Serve Capsules** conference on 26-28 September in Barcelona, Spain, is a unique forum to debate and evaluate the global trends, innovation, challenges and opportunities facing the industry through the value chain of plastic and metal capsules. This includes capsule fillers, coffee roasters, capsule moulders, material suppliers, technology and machinery suppliers.

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Wrap artists: latest in stretch and shrink film

Producers of stretch and shrink films are facing a range of challenges that are common in the film conversion sector - such as the need for greater sustainability

Delegates at this year's *Stretch and Shrink Film* conference in Valencia, Spain heard a number of solutions to the issue of improving sustainability - a key issue the reverberates across the entire plastics sector.

Nicholas Kokel, associate consultant at **AMI**, said that stretch film production is set to increase to 2026, while that of collation shrink film is expected to stay largely flat. At the same time, demand for stretch hoods is expected to increase, while that for shrink hoods will fall. More broadly, the global market for PE films is expected to reach 65 million tonnes in 2025 - with the largest production increase happening in Asia.

Design criterion

A key criterion in future - that of sustainability - which includes factors such as recyclability - and design for recycling.

"Design for recycling criteria are defined to

make high-quality recycled plastic available on the market and reduce the dependency on virgin materials in plastic packaging," said Fabrizio Di Gregorio, technical director at **Plastics Recyclers Europe** and head of RecyClass.

In future, he said, all packaging must be designed for recycling - with an assessment of how recyclable it is. Those in categories A-D - which are at least 70% recyclable - will be able to be placed on the market and will be subject to different fees. Those that are less than 70% recyclable will be banned.

There are also planned rules for minimum levels of recycle: from 2030, for instance, contact-sensitive packaging made from PET as the main component must contain at least 30% recycle; by 2040, this needs to be 50%. Di Gregorio also cited a number of 'recyclability tips':

- If label is needed, use a film label rather than a paper label - as paper generates fibres and use more adhesive;

Main image:
Shrink wrap helps to keep products such as bottles secure

IMAGE: SI GROUP



Above: SI says its Evercycle products help to raise sustainability

- Make sure that film labels are provided with a water soluble/water releasable adhesive (to ensure label separation);
- If printing is required, minimise it - and use polyurethane-based inks rather than those based on nitrocellulose;
- Blending PE with EVA is fine, but keep the VA% as low as possible (less than 5%); and,
- Use only workhorse additives and limit their presence (so avoid bio-, photo-, oxo-degradable additives).

Film improvement

Matej Srabotic, senior market development manager for polymer solutions at **SI Group**, explained how the company's phosphite anti-oxidant can enhance PE and recycled-PE film properties.

An antioxidant's main job is to protect the

polymer - such as LLDPE - during processing or in use. In LLDPE, a primary anti-oxidant (to protect the product long-term) might be phenolic-based; a secondary anti-oxidant (used as a process stabiliser) is typically phosphite-based.

SI says that its Weston 705T secondary anti-oxidants have high solubility in PE, with almost no blooming or plate-out. They are highly reactive with peroxide, and protect against thermal oxidation.

In one example, Srabotic cited its use in LLDPE resin, where it can provide higher melt flow protection and protection against discoloration - with a lower yellowness index, for instance, compared to previous SI grades. It also exhibited a much lower gel count in cast film.

In a second example, to assess its performance in stretch film, a line from W&H was used to cast a film using a 3m-wide die, line speed of 400 m/min and throughput of nearly 1500 kg/h. Films were tested on Highlight and ESTL testing machines. The film stabilised with Weston 705T showed a higher elongation at break and tear resistance, lower gel levels in industrial stretch wrap film (using 1% masterbatch) and one-third the level of plate-out compared to an earlier grade. Die build-up was also reduced.

A different anti-oxidant was also used to boost the performance of PCR-based stretch film. Here, a similar film was produced - using 1% Evercycle LD-104P - and tested. This boosted the performance of the film - with a lower gel count and higher mechanical properties. ➤

Asian expansion in stretch and shrink film

Earlier in the year, AML organised a similar stretch and shrink film event in Bangkok, Thailand - with speakers covering topics from film grades and new machinery to the importance of quality control. Expansion in stretch and shrink film production is expected to be driven by growth in Asia.

Hiroshi Koyama, manager of technical services at **Kuraray Asia Pacific**, told delegates that ethylene vinyl alcohol (EVOH) can make a key contribution towards greater sustainability.

For one, it is recyclable - which can often be done at the same time as recycling the base polyolefin up to a certain level. Several projects - including a sorting test at Tomra, and a

RecyClass project - are assessing ideal conditions for recycling EVOH within flexible film waste.

The material can also be applied to standard processes, such as blown and cast film extrusion.

"It is applicable to conventional co-extrusion and orientation processes," he said.

This includes its use in oriented films, which typically boast a higher strength than non-oriented film. Addition of the EVOH layer can lead to the creation of ultra-high barrier films. It has been used in various applications, including packaging for powdered milk and for meat.

Bio-based materials can also help to boost sustainability. Siwarutt

Boonyarattanakalin, assistant innovation director at **SMS** in Thailand, said the company is using thermoplastic starch-based material as an alternative to conventional resins.

Its advantages include compostability and bio-based content combined with good mechanical and physical properties. SMS' Tapioplast range is derived from cassava and complies with standards including those of the US Food & Drug Administration (FDA).

■ The next edition of *Stretch and Shrink Film* in Asia is in Bangkok again, on 27-28 February 2024. For more details, contact Koos Ahmed (koos.ahmed@amiplastics.com) on +44 (0) 117 314 8157.



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IMAGE: OCS



Above: OCS says its test and measurement systems can identify gels in film - to improve quality

“There are proven additive solutions to re-stabilise PCR feedstock, in order to get the best possible performance,” said Srabotic.

Pallet loads

Lantech has carried out a project to assess the performance of plastic stretch wrap alternatives – such as a paper-based product, a film made from virgin resin, and one made from 30% PCR.

“The test design aimed to produce a fair, accurate comparison of material by weight, cost, and carbon footprint at a required load containment force required for damage free shipment,” said Pat Lancaster, chairman of Lantech.

One surprising result was that 30% PCR stretch film requires more virgin resin than using virgin resin alone. A test load wrapped with PCR-based film needed 270g – of which 189g is virgin resin – to meet the necessary containment force. This compares with 133g of virgin resin, which was used

to make a film that met the same criterion.

“Adding PCR to film is unsustainable,” said Lancaster. “Stretch film should only be recycled downstream.”

Another approach is to reduce the amount of film needed to wrap a pallet safely. This could be achieved in three ways: optimising the setting on existing wrapping machines; replacing older wrapping machines with the latest models; and using higher performance films to achieve the necessary containment force using less film.

In one case, by optimising a legacy machine – through tuning and other methods – helped cut film use by 42%. By replacing an old machine with a newer one saved 28%. Using a higher grade of film – such as a premium or ultra grade – helped to cut material use by 47%. A combination of all three strategies could reduce material use by up to two-thirds, said the company.

However, Spain-based **Saica** makes a variety of stretch and shrink films that use PCR. One example is its 40-micron collation shrink film with 50% recyclate. The film was shown at K2022 as a five-layer coextrusion, to package six 1.5l water bottles. The company claimed “excellent holding force and package integrity for bundle products”.

Similarly, it showed a 60-micron collation shrink film with 50% recyclate, in collaboration with Plastigaur, and a 90-micron shrink hood with 50% PCR for pallet wrapping. Here, the structure was a three-layer coextrusion.

“Converters can develop films with a high percentage of PCR by adapting and tuning their formulations, production equipment and processes,” said Luis Pellejer, director of Saica. ➤



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IMAGE: SHUTTERSTOCK



Above: Pallet stabilisation is critical to ensure minimal product waste

Packaging simulation

Victor Gallego, packaging and transport simulation unit coordinator at **Itene** in Spain, explained how the company has also compared a range of materials for how effectively they stabilised palletised loads. It included the wrapping operation, rigidity and stability tests, elastic and permanent deformations and final measurements (of film tension and film weight).

For instance, the wrapping operation tested

three types of load - salt bags, water bottles and glass bottles - with at least two different types of film. Film tension was measured on a Lantech device. Test films were Kraft paper film, LLDPE made from virgin plastics, and two grades of LLDPE with either 30% or 50% PCR.

Different wrapping scenarios were tried. For instance, salt bags were wrapped 20 times or 26 times depending on the wrap used. Salt bags were wrapped 18 times, glass bottles 30 times.

Results showed that film made from virgin resin was as economical as one with PCR content - as this needed more film. Overall - based on the amount of material used - kraft paper used the most material, followed by 23-micron, 30% PCR film, then 20-micron, 50% PCR film, then 12-micron virgin film.

Gel protection

OCS and **Windmoller & Holscher**, in a joint paper, said that factors such as gel reduction can help to improve stretch film quality, for pallet wrapping - as it was one of the main causes of film breaks on a wrapper.

OCS testing and measurement systems such as

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its FSP600 can identify gels in the film. This was used - integrated into a W&H Filmex II line - to compare virgin films with those containing 30% and 50% PCR.

Other potential defects include black specks, contamination, die lines and oil stains - which can have different sources. One way of reducing defects was to inject liquid anti-oxidant into the repelletiser at the same time as processing the resin and PCR.

Similarly, **Dover Chemical** said the reduction of gels was critical to allow the production of thinner films that use recycle. Here, a Doverphos LGP-12 was used as a phosphite stabiliser.

The chemical is a liquid phosphate that is not derived from alkylphenols. It is highly soluble in polyolefins.

"Phosphites are sacrificial additives that protect the polymer and other additives throughout the process," said Shawn Cook, technical manager for plastic additives at Dover Chemical.

He said that, after introducing the stabiliser, films contained no gels of 1600 microns or larger.

Higher stability

Lucio Baccaro, of market development at **Sabic Europe**, said that embedding polypropylene (PP) into the stretch film structure can help to improve load stability.

Trends for stretch film include: greater circularity; stiffer and thinner films; and load-securing and pallet stability, he said.

A way to boost stability was to add PP to the formulation, he said. This helps to reduce goods damage, use less plastic per pallet and wrap more efficiently - due to less downtime.

One project saw the production of a five-layer film that included two grades of its Supeer LLDPE around 10% of its 621P random PP. This patented film was produced in collaboration with machinery manufacturer SML.

Using the PP leads to a higher holding force - to improve stability - plus a higher elongation than for the pure LLDPE grade. It also raises tear resistance, meaning less downtime, fewer breakages and higher efficiency.

"End users and brand owners can use less plastic per pallet, have a more reliable wrapping process and comply with sustainability pledges," he said.

Innovation front

Gavin Lewis, innovation lead at **UK Research and Innovation** (UKRI), pointed to several of the organisation's projects that address sustainability.

One, in collaboration with Interface Polymers, involves compatibilization, recycling and surface modification of olefin films. Here, Polarfin diblock copolymers - introduced via coating or additive masterbatch - can enhance the polarity of the surface of olefin films. Trials using small quantities of Polarfin showed improvements in compatibilising waste films contaminated with labels and tape, allowing far higher process tolerance. It can also compatibilise polyamide in olefin films with zero gels.

"Coating olefin substrates with Polarfin allows printing, painting and high levels of adhesion using standard adhesive products," said Lewis.

A second project, CO₂tooClean (with Nextek) uses a supercritical CO₂ process for food-grade recycled films. It boasts high-performance decontamination and oil removal. There is no need for water, drying or toxic chemicals, he said.

The project also studied the removal of inks and fatty oils from films. Oils and inks are key obstacles to the recycling of plastic films, and results from the study are very encouraging, he said.

■ The next *Stretch and Shrink Film* conference takes place in Charleston, USA on 29-30 November 2023. The next events in Europe takes place in Valencia, Spain on 23-25 April 2024. For more details, contact Pranita Nangia on +1 610 478 0800 (pranita.nangia@amiplastics.com).

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IMAGE: SHUTTERSTOCK

Left: UKRI's CO₂tooClean project uses supercritical CO₂ process in the recycling of plastic films

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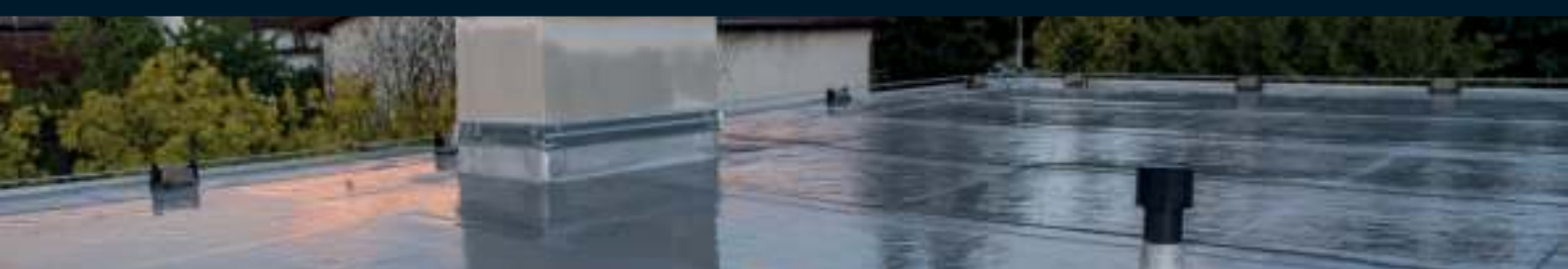
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Standing order: recent news in plastic pouches

Plastic pouches are a unique, lightweight product that can help to reduce environmental footprint - but must be adapted in order to become more recyclable in future

Stand-up pouches are a unique product that could not exist without plastics - and despite their growing popularity, they are now under pressure to comply with legislation that demands greater sustainability.

Mazad Khan Jaudeen, senior technical service engineer at **TotalEnergies**, told delegates at the *Plastic Pouches* conference in Barcelona - organised by **AMI** - how correct design principles can help to create packaging with a lower environmental impact.

"Eco-design considers environmental aspects at all stages of the product development process, striving for products which make the lowest possible environmental impact throughout the product life cycle," he said.

This can encompass elements such as recyclability - such as by using single materials - and downgauging, where tougher materials can ensure reduced consumption. These days, he said, pouches need to combine both these aspects.

He said that new materials such as the company's Lumicene metallocene resins can help to achieve this. Its Lumicene and Lumicene Supertough ranges can be used in MDO applications, in asymmetrical structures and can provide a balance of stiffness and toughness.

One example was seen in a monomaterial PE barrier pouch - produced by blown film extrusion and MDO stretching. An earlier design used using BOPP and PET for stiffness.

"It's gone from unrecyclable to recyclable high barrier packaging," he said. "Barrier properties are replaced by EVOH at such a low level that it doesn't



IMAGE: TOTALENERGIES



contaminate the recycling stream."

Similarly, he presented a PE MDO pouch made by cast film extrusion. Here, the unlaminated 65-micron film was downgauged thanks to

an asymmetrical structure. Good mechanics and processability were possible thanks to Lumicene Supertough, he said.

"Eco-design remains the driver to convert complex multi-materials pouches to mono-material solutions - rendering them recyclable - and downgauging pouches while keeping the mechanics," he said.

Welding benefits

Another benefit is that mono-materials can be combined with ultrasonic welding to produce high-quality, recyclable packaging with a hermetic seal, according to **Herrmann Ultraschall**.

The company says that typical heat-sealing leads to up to 200 leaking packages per 100,000 - wasting more than 4 tonnes of packaged material. Ultrasonic welding, however, typical has one failed package per 100,000 - reducing food waste to 21 kg.

A second advantage is that it can also save energy. Heat sealing requires tools to be at a permanently high temperature. In contrast,

Main image: TotalEnergies says eco-design principles lead to packaging with a lower environmental impact

Right: Saperatec has used PCR materials to create non-food flexible packaging

ultrasonic welding turns on instantly and consumes energy only during sealing - leading to a reduction of around 75% in energy costs.

The company says that because ultrasonic generates heat internally, there is a lower risk of melting the carrier layer. Precise control of energy leads to a smaller process window.

Sticking with sealing, Ton Knipscheer, sales director at **Watttron** in Germany, explained how 'digital sealing' can help reach sustainability targets.

The technology sees the classic seal bar - which has a single heat pipe and no temperature control - replaced with a 'digital seal bar' that has an array of controllable heaters. This means that different products - such as a pillow bag with side gussets, and a pillow bag - can be heated differently.

In digital sealing, only the surface is heated, and it heats up much more rapidly. This saves both process time and energy, he said. A comparison of energy consumption showed that it reduced the energy used in the heat-up phase by nearly 95%, and cut sealing energy in half.

Coated pouch

Tarquin Crouch, head of materials at **Applied Materials**, explained how vacuum coating of pouches can help to improve sustainability.

The company develops roll-to-roll coating systems using a number of technologies including metallic deposition, e-beam evaporation and magnetron sputtering.

"Polyolefin flexpack structures are the main focus for recyclability and development - and these are vacuum-coating friendly," he said.

The company has developed a recyclable retort pouch in collaboration with Brueckner and Mitsui Chemical. Retort pouches are the most demanding volume application in flexpack, he said. They are currently made from "complex mixed materials" including PP, PET PA and foil. The aim here was to eliminate aluminium foil and move to a mono-material design for recyclability. It involved coating thermally stable, high-barrier BOPP film with aluminium oxide or silicon oxide using vacuum coating.

The film was made on Brueckner machinery - including its Lisim biaxial stretching technology - using highly crystalline PP resin. Applied Materials tried a number of coatings before settling on SiOx - which was applied using a Topbeam 2850 EB evaporation system. This melts or sublimates the target material in a crucible to create a plume of atoms - which are deposited as a coating. Mitsui's



IMAGE: SAPERATEC

Takelac WPB series is used as a topcoat.

"We are looking for commercial converter partners to engage in beta-testing and commercialisation," said Crouch.

Other applications include: an all-PE pouch, using AlOx and SiOx, made with Henkel; a bio-based pouch that coats a paper/PEF/bio-based PE film with AlOx; and a BOPE mono-material pouch coated with AlOx - without needing a topcoat.

Delamination recycling

Dennis Meisel, an R&D chemist at **Saperatec**, gave delegates an update on the mechanical recycling of metal barrier flexible materials.

"The low recycling performance of flexible packaging must be significantly improved," he said.

He said the aluminium foil is often still the best barrier to oxygen and water. And, while aluminium-plastic packaging can be sorted effectively for recycling, the plastic is not often recovered.

Saperatec has developed delamination recycling for multi-layer composite materials. It has been tested in a Saperatec pilot plant since 2014 for a wide range of applications, he said.

"We're on track to commission our first commercial composite packaging waste recycling plant in 2023," he said.

The technique is based on a new method for recycling aluminium-based composites, which uses hot washing to separate the aluminium parts from the plastic.

It has also begun projects to delaminate products such as aluminium-PVC packaging, metal-polymer composites and aluminium-plastic pipes and panels.

Materials are pre-conditioned for delamination by cutting, fibre reduction and contaminant removal. After delamination, the materials are sorted into polyolefins, high-density plastics and aluminium. The polyolefin fractions are nearly free



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Right: Bernhardt has developed a pouch concept that can purify water to make it suitable for drinking

of contamination – and are suitable for fine melt filtration extrusion – while the aluminium is recovered with over 95% metal content and only 2% oxidation, he said.

Water purification

Plastic pouches are most typically used for food packaging. However, a new concept developed by **Bernhardt-Deltasacs**, uses them to purify water to make it suitable for drinking.

Its water purification bag uses a combination of solar radiation and heat to purify water. A coloured back film heightens the heat level in the bag to around 60°C, though it must also be highly transparent – to allow UV light to enter. The 4-litre container needs to be usable for a complete year (400 cycles).

The concept, called SaWa, kills more than 99.9% of dangerous pathogens, said Pierre-Emmanuel Grandjean, managing director at the company.

The initial brief, to use PE-only, risked UV

IMAGE: BERNHARDT



deterioration and tests showed that multi-layer structures using cast extrusion combining PP, PA and PE could work.

“The external PP face is heat stable and ensures good sealability,” he said. “We included UV-additives using the experience of our suppliers in films used for agriculture in Spain.”

The back film’s coloration is achieved with a masterbatch.

The pouch is assembled from two asymmetric films, which involves careful synchronisation and tension management.

Also, a 38mm HDPE spout needs to be inserted.

The product has achieved an 80% pass rate in a 0.8m drop test. To improve this, the company is looking to use stronger, better material combinations.

The project has now been running for nearly four years – and more than 600,000 bags have been distributed in Eastern Africa and India.

“But there’s still a long way to go address a target group of 2 billion people,” he said.



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Right: Borealis is involved in a number of projects to create all-PE stand-up pouches

Digital packaging

Digital printing can help companies to produce short and long runs in a short timeframe, said Johnny Hobeika, managing director of **Epac Holding Europe**.

He said that the company's ePacOne service can print up to 3 million linear metres each day - increasing to 6m with ongoing expansion. Built on a digital technology platform, ePacOne is proprietary software that allows the company to produce short and long runs that are shipped within 15 business days. On top of this it has begun to offer ePacConnect, which includes serialised QR codes on each pack.

"Each package has its own digital identity, meaning it is uniquely trackable," he said.

Companies such as Creative Nature Superfoods and Snackzilla have both used the service, saying that it "provides full transparency to consumers" and "takes consumer engagement to the next level".

In addition, digital printing uses no printing plates, produces less waste - and VOC emissions - and uses less energy than conventional techniques, he said.

Closing the loop

Chantal Semaan, application technology manager for flexible packaging at **Borealis**, talked about the production of all-PE stand-up pouches - which are designed for recycling.

The company, a major producer of polyolefin resins, acquired flexible packaging recycler Ecoplast in 2018. Ecoplast processes post-consumer PE film waste from various collection schemes. Its portfolio of products includes a number of 100% PCR for non-food flexible packaging. For instance, its Nav 104 is light-coloured LDPE PCR, aimed at film and foil production. Other, more transparent, grades are aimed at collation shrink film and primary packaging where optics are important.

In one example, its CWT100LG was used to

IMAGE: BOREALIS



make an all-PE laminate with 35% PCT content. Here, the packaging also used BorShape mechanical booster to optimise mechanical performance.

In a second example, Borealis, Erema, Hosokawa Alpine, HP Indigo, Karlville and Henkel worked together to develop a lamination PE film containing 40% recyclate. The film was an MDO PE film, using a BorShape FX1001 layer between two layers of HDPE. Properties included increased heat resistance, high mechanical performance and easy processability, said Semaan.

■ AMI's *Innovations in Pouches* conference runs in Barcelona, Spain on 23-24 April 2024. For more details, contact Koos Ahmed on +44 (0) 117 314 8157 (koos.ahmed@amiplastics.com).

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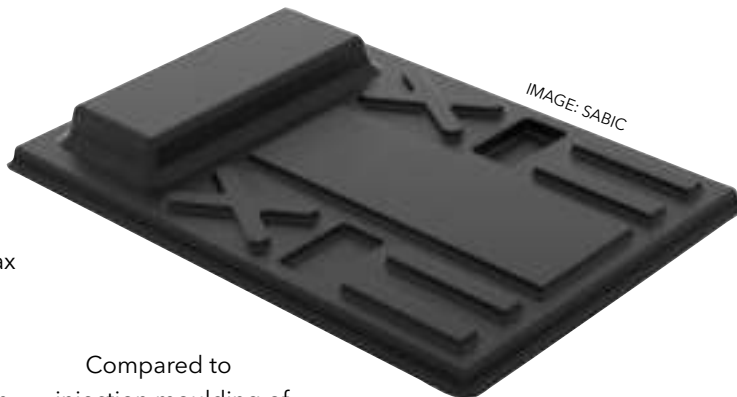
New polypropylene resins aimed at electric vehicles

Sabic has introduced two polypropylene (PP) materials aimed at sheet extrusion and thermoforming for a variety of electric vehicle (EV) battery pack components.

H1090 resin and Stamax 30YH611 resin offer an alternative to traditional sheet metal forming, compression and injection moulding.

The products are 30% glass fibre-reinforced, intumescent, flame retardant (FR) materials and can be used for EV battery pack top covers, enclosures and module separators. Both offer thermal barrier properties that delay or contain thermal runaway propagation.

Extrusion and thermoforming of the materials offer design, system cost, inherent thermal and electrical insulation and weight advantages in comparison with stamped sheet metal, says the company.



Compared to injection moulding of thermoplastics and compression moulding for thermosets - which require expensive tooling - extrusion and thermoforming can be more cost-effective, said the company.

"By providing alternatives to traditional materials and processes, we can enable customers to design and manufacture the next generation of battery components while driving down costs and gaining a competitive advantage," said Abdullah Al-Otaibi, general manager for ETP and market solutions at the company.

Both the short glass fibre-

reinforced H1090 resin and long glass fibre-reinforced Stamax 30YH611 resin feature a combination of intumescence for fire safety with stiffness and ductility. Exposing the materials to vertical and horizontal flames at 1200°C for 10 minutes demonstrates good flame-retardant behaviour, says Sabic.

Other properties include dimensional stability, low coefficient of thermal expansion (CTE) and good creep resistance - as well as electrical insulating properties and low density, said Sabic.

➤ www.sabic.com

RESEARCH

Röhm's research centre

Röhm has opened a new innovation centre at its site in Worms, Germany.

The company is bringing its European research activities to the new complex, which consists of a laboratory building and a technical centre with pilot plants.

"Our innovation centre will become an incubator for technologies in methacrylate chemistry, and strengthen our position in Europe and beyond," said Michael Pack, CEO of Röhm.

A photovoltaic system will cover a large part of the site's electricity needs, while heating is supplied by heat pumps.

Röhm has already invested at the site in recent years, including new production plants and capacity expansions. The innovation centre will create a further 100 jobs at the location.

➤ www.roehm.com

POLYCARBONATE

Solar-powered car soaks up the sun

Exolon is supporting Team Sonnenwagen Aachen - a team of students from RWTH and FH Aachen - at the World Solar Challenge in Australia in October 2023.

As part of construction of the fourth generation of the 'Covestro Adelle' solar race car, Exolon has provided 10mm-thick polycarbonate sheets, which are used in the production of

the car's before 'battery battery cell holder.

To accommodate the large, powerful battery in a small space, the team needed a lightweight material that was easy to process, could be electrically insulated and was flame-retardant.

The car has been built over two years of development and construc-

tion. Numerous innovative materials are used in the car to achieve maximum efficiency in terms of design and performance.

The solar energy generated is fed into the battery, which is shaped to adapt to the vehicle and so make the best possible use of the space. The battery pack can store more than 6kWh.

➤ www.exolongroup.com

SOFTWARE

Profol lifts operations performance with computerised maintenance system

Polypropylene film producer Profol has become the first German user of the Fiix computerised maintenance management system (CMMS) from Rockwell Automation.

Recognising that its maintenance could be enhanced, Profol introduced the Fiix CMMS platform to improve operational performance and quality levels by gathering, analysing and sharing operational data for management oversight and process improvement.

"We have experienced significant improvements in time to repair, quality, sustainability, and waste reduction since implementing Fiix's maintenance management software," said Hannes Becker, assistant technical manager at Profol. "Before, we faced multiple challenges with time-consuming searches for spare parts, compounded by a lack of comprehensive information about equipment."

In the long term, Profol is looking to

automate spare-parts-purchasing processes and integrate Fiix with its existing ERP and MES systems.

Malte Dieckelmann, vice president of enterprise software sales in EMEA for Rockwell Automation, added: "By extracting the right data and putting it in the hands of those who can make the biggest difference, Profol has revolutionised its maintenance activities."

➤ www.rockwellautomation.com

ANCILLARIES

Replacing manual operations

Polipak, a Poland-based producer of multi-layer polyethylene (PE) bags, has installed blenders from Liad Weighing and Control Systems.

The company blends virgin LDPE, MDPE and HDPE resins with post-consumer recycle (PCR) - which was previously done through manual weighing of each ingredient. This resulted in many errors in blend ratios and required additional maintenance because of spilt materials. Plant engineers were responsible for providing production instructions for these blends for each extruder.

Polipak has now installed two automated resin management, blending and distribution systems from Liad.

➤ <https://liad.co.il>

BLENDING

New blenders with sturdy design

Movacolor has launched its new MBS range of blenders.

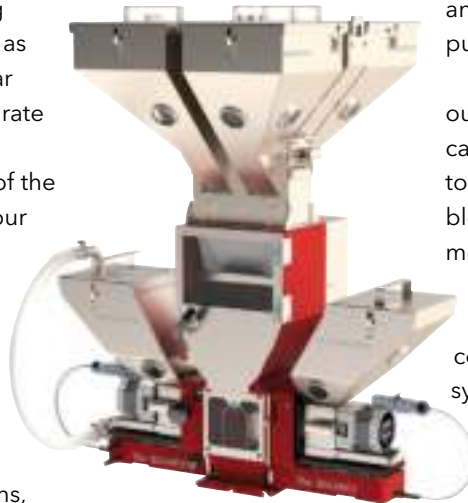
Having compact and sturdy design, there are no mechanical or moving parts in the hoppers - as well as having modular construction and accurate dosing.

"The blenders are of the same high quality as our dosing units and can handle all commonly used materials," said Klaas Talsma, product manager at Movacolor.

As well as 17 standard configurations,

they can also be customized based on the customer's specific requirements, he added.

The standard configura-



tions are divided into three series: the 3 series, 20 series and the 20 Extrusion series. All Movacolor blenders can dose accurately up to 0.02% and the maximum throughput is set at 1600 kg/h.

"Because they are part of our modular concept, they can also easily be upgraded to a Hybrid set-up, where blending and dosing are merged in a single system," said Klaas.

Movacolor offers a free compressed air cleaning system with every hybrid blender sold before October 2023.

➤ www.movacolor.com

CAST FILM

Amut's live demo at Plast in Italy

Amut will run a demonstration of its ACS 2000 cast film line at its premises in Novara during this year's Plast show in Italy, held from 5 to 8 September

2023 in Milan.

The live demo will see a 2000mm-wide, 7-layer cast film line running at more than 1,700 kg/h - making 17-micron film.

Demos run on 6, 7 and 8 September, with shuttle buses provided. The buses leave the show at 1pm every day.

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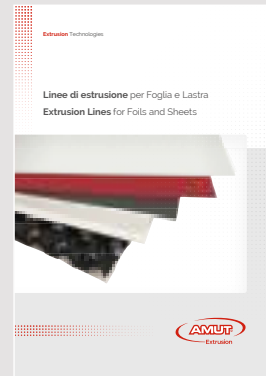
DIING KUEN: BLOWN FILM



In this brochure, Taiwan-based Diing Kuen provides all the specifications of its blown film technology to produce mono, two three, five and seven layers.. The film lines are divided into four categories: HTRL horizontal top rotating; EBLR vertical top rotating; BFL fixed; and other types.

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AMUT: FOIL EXTRUSION LINES



Built on more than 50 years of plastics expertise, Amut's range of extrusion lines for production of foil and sheet covers a broad range of applications. They can produce mono or multi-layer sheet as thin as 150 microns and as wide as 3.3m at rates up to 4 tonnes/hr or more.

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COLINES: BARRIER FILMS



This new brochure from Colines focuses on extrusion lines for the production of barrier films for vacuum and modified atmosphere packaging to preserve foodstuffs and medical products.

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BRUCKNER: BOPP/BOPE FILMS



Brückner Maschinenbau says its BOPP/BOPE film lines offer benefits including high stiffness and sealing strength, excellent transparent barrier, outstanding puncture resistance and linear tear opening behaviour. Find out more in this brochure.

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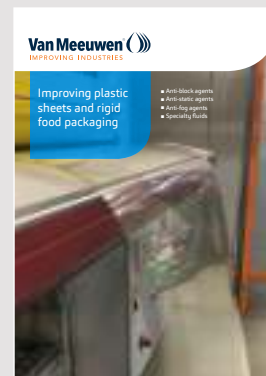
HAN KING



Han King, based in Taiwan, has produced this brochure outlining its machines for blown film extrusion, covering five-layer film, three-layer co-extruded film, agricultural film, geomembranes; plus other products in stretch hood, lamination and bags.

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VAN MEEUWEN: ADDITIVES



Van Meeuwen's functional additive range for plastics film and sheet producers includes anti-blocks, anti-statics, anti-fogs and specialty fluids. Suitable for plastic packaging applications, products comply with EU food contact regulations.

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Vitalo

Head office: Meulebeke, Belgium

Managing director: Daniel Chéret

Founded: 1936

Ownership: Private (owned by Koramic Investment Group)

Employees: Around 800

Turnover: Around €80 million

Profile: Vitalo, founded in 1936, is a specialist in thermoforming solutions and technical foam for acoustic and thermal insulation. Rather than produce standard products, it works with customers to create tailored designs. There are three brands within the company: Vitalo, which specialises in thermoforming; Insulo, which makes technical foam; and Starplast, a specialist in transparent thermoforming.

Product lines: The company produces specialised designs for end customers, rather than selling off-the-shelf products. Its thermoforming products are supplied into a number of end markets, including: agriculture (such as for tractor roofs); packaging (for a variety of products); HVAC (for silo covers); mass transport (such as railway interior panels); medical (for equipment such as scanners); aerospace (glazing for helicopters); and marine (glazing solutions).

Factory locations: The company has five production locations - in Belgium, France, Slovakia and China (two plants). Its international presence allows it to provide short- to medium-series production as well as complete systems. Recently, it used 12mm-thick polycarbonate sheet to produce a thermoformed cockpit for the SP80 speedboat - which will attempt a world-record speed attempt next year.

To be considered for 'Extruder of the Month', contact the editor on lou.reade@amiplastics.com

Film and Sheet FORTHCOMING FEATURES EXTRUSION

The next issues of Film and Sheet Extrusion magazine will have special reports on the following topics:

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Multi-layer packaging
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Mineral fillers for film

Editorial submissions should be sent to Lou Reade: lou.reade@amiplastics.com

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Film and Sheet June 2023

The June edition of Film and Sheet Extrusion has a cover feature on recent developments in film and sheet printing, including company investments and new products. Other articles look at downstream equipment, masterbatch and cooling rings.

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Film and Sheet May 2023

The cover feature of Film and Sheet Extrusion's May 2023 issue reports on how waterproof membranes have been put to use in applications such as mines and landfill sites. Other articles cover advances in converting and bagmaking technology, plus developments in materials handling.

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Compounding World July 2023

The July 2023 edition of Compounding World magazine explores some of the latest innovations in antimicrobials. Other in-depth features in the issue cover recent developments in colour measurement, odour and emission reduction, and materials feeding.

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Plastics Recycling World May/June 2023

The May/June edition of Plastics Recycling World magazine looks at the latest introductions in shredding machinery. It also reviews some new developments in compatibilisers and explores some technologies for handling process waste.

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Pipe and Profile July/August 2023

The July-August issue of Pipe and Profile Extrusion has features on medical tubing, PVC additives, PVC recycling and new extruder technology; plus all the regular features and news from the global industry.

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Injection World July/August 2023

The July-August 2023 issue of Injection World magazine contains features on colour suppliers responding to sustainability pressures, changes in packaging, and the latest in LSR. Plus there is a feature about Arburg celebrating 100 years as a family business.

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GLOBAL EXHIBITION GUIDE

2023	25-27 July	Plastics & Rubber Vietnam, Hanoi, Vietnam	https://plasticshanoi.com/en/
	5-8 September	Plast 2023, Milan, Italy	www.plastonline.org/en
	20-23 September	T-Plas, Bangkok, Thailand	www.tplas.com
	26-28 September	Interplas, Birmingham, UK	www.interplasuk.com
	28-30 September	Central Asia Plast World, Almaty, Kazakhstan	https://plastworld.kz/?lang=en
	17-21 October	Fakuma, Friedrichshafen, German	www.fakuma-messe.de
	7-10 November	Plastimagen, Mexico City, Mexico	www.plastimagen.com.mx
	15-16 November	Plastics Extrusion World Expo USA, Cleveland, USA	www.extrusion-expo.com/na/
	22-25 November	PlastEurasia, Istanbul, Turkey	https://plasteurasia.com/en
	28 Nov-2 Dec	IPF Japan 2023, Chiba, Japan	https://www.ipfjapan.jp/english/
13-15 December	Arabplast, Dubai, UAE	https://arabplast.info/	


AMI CONFERENCES

15-16 August 2023	Agricultural Film North America, Houston, USA
26-28 September 2023	Biax Film Global, Brussels, Belgium
3-4 October 2023	Polyolefin Additives, Barcelona, Spain
14-16 November 2023	Waterproof Membranes, Cologne, Germany
21-22 November 2023	Multilayer Flexible Packaging, Barcelona, Spain
22-23 November 2023	Recycling Flexible Packaging, Barcelona, Spain
28-29 November 2023	Thin Wall Packaging Europe, Cologne, Germany
29-30 November 2023	Stretch and Shrink Film North America, Charleston, USA
12-14 February 2024	Polyethylene Films, Tampa, USA
February 2024	Stretch and Shrink Films Asia, Bangkok, Thailand

For information on all these events and other conferences on film, sheet, pipe and packaging applications, see www.amiplastics.com

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