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COVER PHOTO: SHUTTERSTOCK



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CONTACT US

AMI

Ground Floor, One Brunswick Square,
Bristol, BS2 8PE, United Kingdom
Tel: +44 (0)117 924 9442
www.amiplastics.com

www.twitter.com/plasticworld
Registered in England No: 2140318

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EDITORIAL

Editor-in-Chief: David Eldridge
david.eldridge@amiplastics.com

Senior Staff Writer: Chris Saunders
chris.saunders@amiplastics.com

Contributing Editors

Jennifer Markarian - jma@amiplastics.com
Mikell Knights - mikell.knights@amiplastics.com

Events and Magazines Director: Andy Beevers
andy.beevers@amiplastics.com

ADVERTISING

Advertisement Manager: Claire Bishop
claire.bishop@amiplastics.com T/ +44 (0)7905 848744

Head of Business Development: Paul Beckley
paul.beckley@amiplastics.com T/ +44 (0) 117 311 1529

Advertising Sales (China/Hong Kong): Maggie Liu
maggie.liu@ringiertrade.com T/ +86 13602785446

Advertising Sales (Taiwan): Ms Sydney Lai
sydneylai@ringier.com.hk T/ +886-913625628

Advertising and Expo Sales (India): Yogesh Vyas
yogesh@exhibetter.com T/ +91 9920735930

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DISCOVER THE AGENDA AND BOOK YOUR PLACE

Techmer PM takes over US colour compounder

US group Techmer PM has acquired full-service colour compounder OptiColor. Techmer PM said the strategic acquisition and the combined technology of the two organisations will further solidify the group's position within the plastics industry.

OptiColor, which has a strong foothold in the colour compounds market, was established in Huntington Beach, California, in 1995. Its expertise lies in compounding custom concentrates, pre-coloured

materials, and specialty dyes into transparent, translucent, opaque, clear, white, and colour products for critical applications, including performance eyewear, military lasers, and sustainable lighting solutions.

Jennifer Bryan, who has been with OptiColor since 2012 and became President and CEO when she acquired the company in 2021, will join Techmer PM as Vice President of Technical Sales in the markets for optics, laser, lighting and sheet.

"This acquisition is a clear demonstration of Techmer's unwavering commitment to the plastics markets," said Jon Rogers, Vice President of Global Sales and Marketing at Techmer PM.

"Through investments in cutting-edge solutions, high-quality people, and expanded customer service, we are dedicated to creating a stronger Techmer to support customers and grow our business."

> www.techmerpm.com
> www.opticolorinc.com

Covestro plans R&D investment

Covestro says it plans to invest around €100m in its global R&D infrastructure and assets over the next three years as it seeks to secure its future competitiveness in what it calls a challenging environment.

To create value for customers and accelerate the transition to a circular economy, the company is focussing on future technologies, and a global digitalisation strategy is seen as a key building block.

It has also enhanced its facilities in Leverkusen and other main R&D sites to support further developments in process technology, and implemented end-to-end digitalisation to record all process-relevant data with regards to in-mould coating. High-performance computers (HPCII) mark the next expansion stage, said the company.

> www.covestro.com

Fakuma visitor numbers decline

Organiser PE Schall says that although the number of exhibitors rose 3% to 1,639 from the number in 2023, the 29th Fakuma trade fair held in Friedrichshafen, Germany, from 15-19 October 2024, attracted a total of 36,675 visitors, 7% less than last year.

However, the trade fair is

becoming increasingly international, with a foreign share of 47.5%, up from 44% in 2023. Of the 1,639 exhibitors 170 came from China, 142 from Italy, 81 from Switzerland, 77 from Austria and 51 from Turkey.

Bettina Schall, Managing Director of PE Schall, said: "Even if the current situation

is clouded and many highly complex problems have to be dealt with at the same time, this concentrated innovative power that was experienced at Fakuma 2024 is a good sign that we are tackling the fields of action with courage and confidence."

> <https://www.fakuma-messe.de/en>

Cabopol increases recycled compounds capacity



IMAGE: CABOPOL

Portuguese compound producer Cabopol says it is duplicating its recycled compounds capacity. The new grade of R-Lacoflex TPE compounds tailored for automotive under-the-hood applications integrate up to 25% recycled material sourced from post-industrial recycling.

It said these compounds offer a reduction of 29% in carbon footprint value compared to previous materials (calculation according to IPCC 2021 GWP100 V1.01, expressed as CO2-

equivalents, based on results from a Life Cycle Assessment studies ISO 14067 & 14040 compliant).

"Our new grade of TPE compounds represents a fusion of innovation and sustainability," said Anselmo Mendes, Head of Sales. "By integrating recycled content into our formulations, we are not only meeting the high-quality standards expected in the automotive industry but also contributing to a greener future."

> <https://cabopol.com>

IN BRIEF...

Honeywell said it plans to spin-off its Advanced Materials business into an independent, US publicly traded company.

www.honeywell.com

Röhm has granted Albis additional distribution rights for Plexiglas and Pleximid moulding compounds in the Scandinavian regions, as well as the Baltic states. Previously, this cooperation covered markets in Turkey and North Africa.

www.roehm.com

www.albis.com

Neste and **Braskem** have announced an agreement on the supply of renewable and recycled feedstocks for polymers and chemicals production, with Braskem products based on these feedstocks expected to be available from the fourth quarter of 2024.

www.neste.com

www.braskem.com.br

Evonik Oxeno to expand PVC plasticisers capacity

Evonik Oxeno, the C4 chemicals arm of Germany's Evonik group, has announced it is "significantly expanding" its production capacities for isononanol-based PVC plasticisers.

The company did not provide details of the new capacities for the INA-based plasticisers, Elatur CH (DINCH) and Elatur DINCD. The capacity expansions will be integrated into the existing network of C4 plants in Marl, Germany.

"The capacity expansion marks another important milestone in the diversification of our plasticiser portfolio," said Frank Beissmann, MD of Evonik Oxeno. "To meet the growing demand for these products, we will begin work this year."

■ Evonik said it is reorganising core offerings in its



IMAGE: EVONIK

Evonik's facility in Marl, Germany

Coating & Adhesive Resins and Health Care business units and selling off non-core businesses which contribute sales of €350m.

Coating & Adhesive Resins will now focus on two areas: liquid polybutadienes as additives for adhesives and sealants or tyres, and specialty acrylics for medical technology and the packaging industry. The business

unit's polyolefins business, with sales of around €100m, will be transferred to Evonik's C4 chain business.

In March, Evonik announced it would cut up to 2,000 jobs, the majority in Germany, by the end of 2026 as part of a €400m restructuring and cost cutting programme dubbed 'Evonik Tailor Made.'

➤ www.evonik.com

Americhem to sell ColorRx in Europe

Americhem Healthcare said it is introducing its ColorRx compounds and masterbatch in a variety of standard colours and base resins to the European market.

"We're furthering our 'global reach, regional focus' by extending Americhem's capabilities to meet increasing European healthcare industry demand for high quality polymer materials," said Barto DuPlessis, Vice President and General Manager, Europe. "Our masterbatch and compounding excel-

lence for advanced surgical instrumentation, robotic-assisted surgery, drug delivery, catheters, hearing aids and more lines up perfectly with the needs of

the European healthcare market."

ColorRx polymers will be produced in one of three ISO 13485 and cGMP compliant global facilities,

ensuring the highest standards of quality and reliability, it said.

The formulations undergo rigorous biocompatibility testing, providing peace of mind for healthcare applications. The company also offers formulations that are RoHS and REACH compliant ensuring that medical devices can be used worldwide, meeting international standards and regulations. Custom colour matching is also part of the offering.

➤ www.americhem.com



IMAGE: AMERICHEM

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India's SCIL to acquire Heubach

Sudarshan Chemical Industries (SCIL), an India-based colour group with manufacturing facilities in Roha and Mahad, is set to acquire Germany-based Heubach Group with the aim of creating a global pigment company combining SCIL's operations and expertise with Heubach's technological capabilities.

Post-acquisition, the combined company will have a broad pigment portfolio and a strong presence in major markets including Europe and the Americas.

The Heubach Group has 17 manufacturing sites globally and became the

IMAGE: SCIL



Sudarshan's state-of-the-art warehouse in Roha, India

second largest pigment player in the world after acquiring Clariant's pigments business in 2022. But the group has faced financial challenges over the

past two years due to rising costs, inventory issues, and high interest rates and it filed for insolvency in April this year. Sudarshan said the acquisition will address

these challenges with a clear turnaround plan.

Rajesh Rathi, MD of SCIL, said, "We will carefully integrate these two companies to create a truly global pigments company, with [Heubach's headquarters in] Frankfurt remaining a strategically important location. SCIL is known for its agility and efficiency, and we will embed this culture throughout the combined company."

The acquisition is expected to close in 3-4 months, subject to approvals from regulators and SCIL shareholders.

> www.sudarshan.com
> <https://heubach.com>

Lanxess exits polymer business

Former plastic resins giant Lanxess is exiting the last remaining polymer business by agreeing to sell its Urethane Systems business, which generated sales of around €250m in the past year, to UBE Corporation of Japan for around €500m.

The Urethane Systems business comprises five manufacturing sites around

the world as well as application laboratories in the USA, Europe, and China. UBE will take over all operations, along with around 400 employees.

"The sale of Urethane Systems marks another milestone in our fast transformation into a pure-play specialty chemicals company, as we are

divesting the last remaining polymer business in our portfolio," said Matthias Zachert, Chairman of the Board of Management of Lanxess.

The group said it intends to use the proceeds to reduce its net debt, and the transaction is set to close in the first half of 2025.

> <https://lanxess.com>

Feddersen invests in Trebo

KD Feddersen Holding, parent company of Feddersen Group, is expanding its expertise in the circular economy by granting a convertible loan to Danish waste sorting company Trebo, which is to be transformed into shares in the company as part of the next financing phase.

Trebo helps plastics processors to sort their mixed or multi-component waste back into mono-material fractions, thereby reducing the carbon footprint and the need for new materials, said Feddersen in a statement.

> <https://kdfeddersen.com>
> www.trebo.dk

BASF presents new corporate strategy

At its Capital Markets Day in Germany, BASF presented a new corporate strategy.

During his key note speech, BASF Chairman Markus said: "The strong and broad portfolio of chemical businesses at our core is what makes BASF most relevant to customers

globally, across a wide variety of industries. Our standalone businesses serve distinct industries and are less connected to our integrated value chains. Going forward, we will unlock the value of these businesses."

By delivering superior

offerings to its customers, BASF wants to grow profitably and create value for shareholders.

The group said it will also strengthen capital discipline with lower capital expenditures and will continue its cost savings programmes.

> www.basf.com

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Experts address PFAS issues at plastics expos in Cleveland

More than 100 industry experts will speak at the four free-to-attend conference theatres at the AMI Plastics World Expos, which take place on November 13-14 in Cleveland, OH, USA.

Compounding World Expo is one of the shows at the event organised by *Compounding World* publisher AMI.

"The free conference programs are always a major draw at the Plastics World Expos in Cleveland and provide a fantastic opportunity for attendees to explore key industry trends and emerging technolo-

gies", said Andy Beevers, Events Director at AMI.

A wide range of hot topics and innovative technologies will be covered in the conference sessions, including: PFAS challenges; graphene opportunities; market trends; AI for new product development; regulatory developments; enhancing bioplastics; factory digitization; upcycling plastic waste; computer simulation; the future for plastics packaging; process optimisation; boosting recycling rates; applications in electric

vehicles; and lots more.

The 100+ speakers include senior representatives from companies such as Accredo Packaging, ADS Pipe, Amcor, American Chemistry Council, AMI, Ampacet, Blue Diamond Industries, EFS Plastics, Keller and Heckman, KW Plastics, Revolution Company, Routsis Training, Teknor Apex, TerraCycle, Valeron, WM and many more.

The conference theatres run alongside four focused exhibitions - the Compounding World Expo,

Plastics Recycling World Expo, Plastics Extrusion World Expo and Polymer Testing World Expo - which feature more than 370 leading suppliers of machinery, materials and industry services.

Attendees will benefit from an authoritative overview of global PFAS challenges thanks to a presentation by Ruxandra Cana, partner at leading legal firm Steptoe. This keynote talk takes place at 9:30 AM on Wednesday, November 13, in the Compounding Theatre. >

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In addition, leading experts on PFAS regulations will come together for a panel discussion on this critically important topic at 3:00 PM on Thursday, November 14, in the Extrusion Theatre. The line-up of expert panellists includes: Jay West, Senior Director for Chemical

Products and Technology at the American Chemistry Council; Kathryn Skaggs, partner at Keller and Heckman; and Tom Lee, PFAS Team Leader at BCLP Law.

The event will also provide opportunities to discover the latest developments in alternatives to PFAS

polymer processing aids (PPAs). For example, Frank Neuber, Technical Field Specialist at Clariant, will introduce organic, PFAS-free processing aids in his talk at 11:30 AM on Wednesday, November 13, in the Testing and Technology Theatre.

Later that day, BYK's latest work on developing

and applying PFAS-free PPAs will be presented by Tom Inch, the company's Market Manager for Thermoplastic Additives. His talk is at 2:10 PM in the Compounding Theatre.

These presentations are part of the two-day conference program taking place during the AMI Plastics World Expos. In addition, attendees can visit the focused expos featuring more than 370 companies, providing an opportunity to discover and compare new materials and processing technologies.

Find out more about the free-to-attend conference at Compounding World Expo by clicking [here](#).

To register to attend the Cleveland events, click [here](#).

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Jennifer Markarian investigates new materials and additives used in bio-based plastic compounds along with the launch of biomass-balanced polymers



IMAGE: SHUTTERSTOCK

Emerging bioplastics show better performance

Bioplastics are a diverse category of thermoplastics made from bio-based feedstocks. Some bioplastics are biodegradable (able to biodegrade under specific conditions, such as in industrial composting), while others are not. Because a primary reason for using these materials is to help achieve sustainability goals, both the end-of-life plan and the ability to use renewable (rather than fossil-based) starting materials are important.

Terms to explain the types of plastics in the bioplastics category are in flux and not always used consistently. A commonly used definition is that “bio-based” polymers are those made from renewable carbon (from plant, animal, or fungal sources) that can be identified and quantified using a radiocarbon (C14) method, such as ASTM D6866 or ISO 16620-2, rather than using fossil-based carbon raw materials. Industry members see increasing support for using “bio-based” for segregated, C14-identified content but not for

“mass-balanced” (sometimes called “bio-attributed”) polymers which are made using processes that combine bio-based feedstocks with fossil-based feedstocks. In this method, the feedstocks are not segregated before the reactor, so the polymers do not necessarily have biocontent that can be experimentally measured via radiocarbon analysis. They can, however, be certified under programs such as ISCC Plus (see box).

The **US Department of Agriculture’s BioPreferred Program** was created by legislation in 2002 to help develop markets for bio-based products. The program specifies a minimum bio-based content (with the amount depending on the product category) to qualify for the BioPreferred program and to use its label. Currently, this bio-based content must be third-party certified using ASTM D6866.

TÜV Austria’s OK Biobased Program also uses radiocarbon testing to confirm bio-based carbon

Right: NatureWorks and IMA Coffee have developed a compostable coffee pod solution

content for products that use its labels for ranges of bio-based content, with a minimum of 20%.

There are many types of bio-based plastics, including cellulose derivatives, thermoplastic starches, polylactic acid (PLA), polyhydroxyalkanoates (PHAs) and others. Use of PLA is growing in a variety of applications, said Robert Green, North American Regional Sales Director for PLA producer **NatureWorks**, in a presentation at AMI's Bioplastics conference in Cincinnati, Ohio, US in September. PLA can be used in industrially compostable packaging that allows food waste to be diverted from landfills. For example, NatureWorks and IMA Coffee, which makes coffee processing and packaging technologies, presented a new compostable coffee pod solution earlier this year at AMI's Single-Serve Capsules conference in Boston, MA. All parts of the pod - the rigid thermoformed capsule, nonwoven filter, and multilayer top lid - were made with Ingeo PLA. Green also noted that 3D printing is a growing area for PLA.



biomanufacturing process. CJ introduced a semi-crystalline PHA (scPHA), PHACT S1000P, at NPE 2024. The scPHA can be moulded, thermoformed, or extruded. CJ has collaborated with NatureWorks on combinations of CJ's amorphous PHA (aPHA), PHACT A1000P, with

NatureWorks' Ingeo PLA. The aPHA improves ductility and toughness and can improve biodegradability to potentially allow home compostability.

CJ's latest PHA-PLA blended compounds are two grades developed for blown, cast, and machine-direction orientation (MDO) film applications. PHACT CA1270P is transparent, and PHACT CA1240PF is a calcium carbonate mineral-filled, opaque grade. Both are industrially compostable, and the opaque grade is being tested for home compostability. At AMI's Bioplastics conference, CJ Polymer Scientist Akanksha Patel presented data on the performance of the two new compounds in blown film, where they showed good bubble and drawdown stability and a good balance between stiffness, strength, tear, and puncture. Compared to a PLA film, the compounds were extruded with lower torque and had a higher specific output rate. Possible applications include food packaging, shrink wrap, labels, bags, and agricultural mulch films.

California-based **Mango Materials** is making poly-3-hydroxybutyrate (P3HB), which is a type of PHA. The aim is to use biogenic methane as a feedstock, and the company's plant is co-located

Bio-based PHAs

PHAs are biodegradable polyesters that can contain C14-measurable carbon when made using renewable carbon sources as feed to the microorganisms in the bioreactor. PHA-manufacturer **CJ Biomaterials** uses bio-based feedstocks, such as sugars derived from sugarcane or corn, in its

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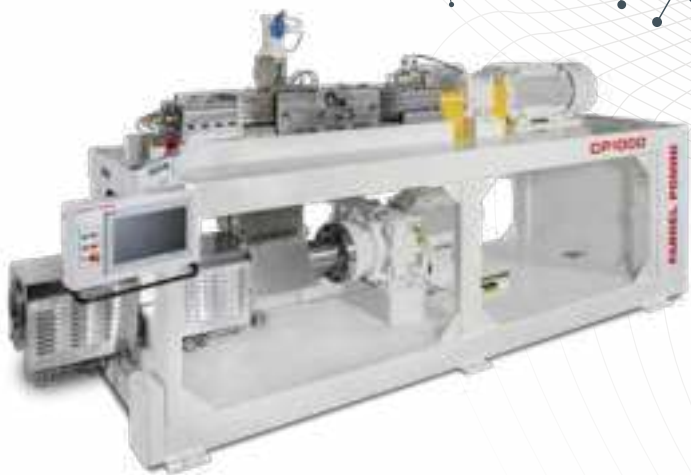
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with a municipal wastewater treatment plant. The biochemical manufacturing process can also use plant-based feedstocks, which has been useful as a starting point while they scale up the methane feedstock, explains Anne Schauer-Gimenez, co-founder and COO at Mango Materials.

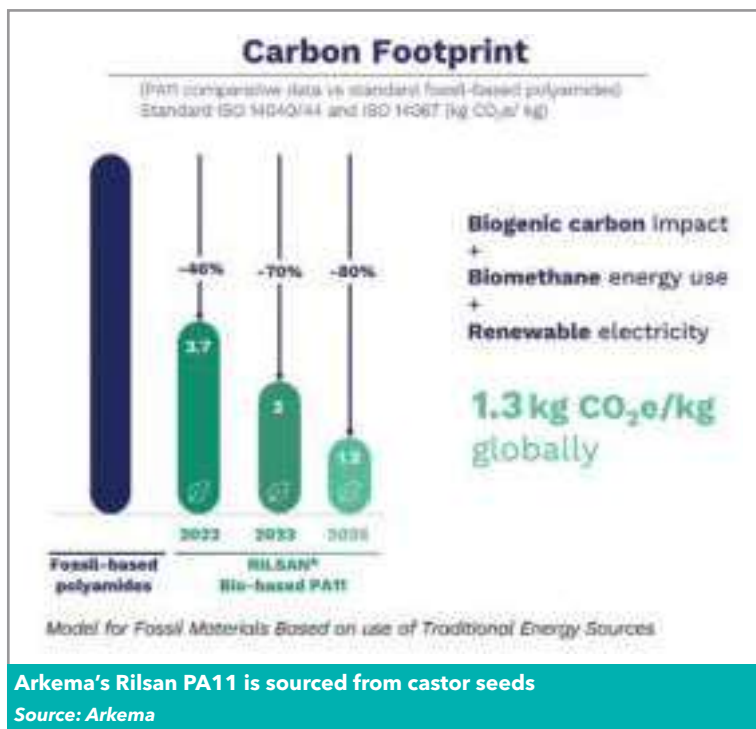
P3HB tends to be brittle and needs to be modified with additives to improve ductility, as well as other additives to meet various application requirements, Schauer-Gimenez explained. Additives need to maintain the biodegradability profile and be compatible with the polymer. Ideally, they would like to use all bio-based additives in their compounds, but currently have some inert ingredients, with formulations ranging from 60 to 90% biocontent in the final pellets. The compounds are available with biodegradable colorants, currently in nine colors. Mango Materials is also evaluating bio-based blacks and biochar blacks.

Currently, the compounds are being evaluated as a replacement for PP in injection moulded applications such as cosmetic packaging. "Our material processes a little differently, but we have successfully moulded using existing moulds designed for PP, ABS, and HDPE," Schauer-Gimenez said. The company is currently taking orders for sampling. It is also scaling up compounded pellet production at its manufacturing site in Vacaville, California, and plans to reach commercial scale by late 2025 or early 2026.

Polyamides and polyolefins

Arkema's bio-based polyamide 11, which is derived from renewable castor seeds, is a high-performance, 100% bio-based alternative to fossil fuel-based PA12. The bio-based content is certified by Beta Testing Labs according to ASTM D6866 standards, and some of the PA11 grades have received the BioPreferred label. PA11 is used in a variety of durable applications, offering a reduced climate impact compared to PA12. This is achieved through its bio-based feedstock, improved energy efficiency, and the use of biomethane as an energy source in production. Additionally, PA11 can be recycled through Arkema's specialty polymer recycling program. The program supports open, closed, and semi-closed loop recycling models for parts made with PA11, further reducing environmental impact.

Eurotec's new Tecomid BIO bio-based polyamide compound made from PA11 has high dimensional stability, low moisture absorption, and allows lightweighting, the company says. Two other new compounds are formulated with PA6.10, which has bio-based content; a PA6.10 compound and a



blend of PA6.6 and PA6.10 are designed for e-mobility cooling systems and quick connectors.

Braskem's bio-based polyethylene, produced from ethylene made from sugarcane, is measurable via C14 methods. Whether the ethylene comes from a sugarcane plant or from a petrochemical plant, the resulting polyethylene is identical, and so polymers of this type are sometimes referred to as "drop-ins" to conventional polymers.

Braskem is moving forward with evaluating production of bio-based polypropylene (PP) in the US. The project involves building a facility to produce bio-based propylene using ethanol from corn, which will be used to produce segregated bio-based PP.

Braskem announced in 2024 that it would also be using bio-attributed propylene to make bio-attributed, bio-circular PP. In September this year, Braskem's bio-circular PP was launched under the Wenew brandname for the restaurant and snack food markets. The bio-circular PP repurposes used cooking oil to make propylene, which Braskem says is designed to promote circularity in the food industry.

"Ideal users include Quick Service Restaurant chains, retail food suppliers, traditional restaurants, and snack food companies especially those seeking to enhance circularity from their cooking oil usage," said Bill Diebold, Vice President, Braskem America Polyolefins, in the press release. The PP is a mass-balanced product (rather than a segregated, bio-based product), and is certified by ISCC Plus.

Braskem also announced in September that it opened its new Renewable Innovation Center near Boston, Massachusetts. The new centre will focus on early-stage science and engineering related to the conversion of biomass-based feedstocks to sustainable chemicals and materials.

Formulating compounds

The work cut out for compounders and their supply chain partners is to use their formulation expertise to improve the properties and processability of bio-based polymers, especially those that are not “drop-ins,” to give them functional, aesthetic, and end-of-life characteristics for their intended use. Bio-based materials can be challenging to process, because they can be more sensitive to shear rate and residence time than conventional materials.

Compound and material suppliers should collaborate with the end-user or brand when selecting the best applications for switching to bio-based plastics, said Marissa Hann-Banks, Brands Relationship Manager at **Colortech**, in a presentation at AML’s Bioplastics conference. These discussions will provide details about requirements so that the best balance can be determined for end-use performance, cost, and end-of-life. If an end-product needs to be home compostable, for example, that may limit the additives and specifically the colorants that can be used, said Hann-Banks.

A wide range of mineral or plant-based fillers and fibres can be used in bio-based plastic compounds. Some of these commercially available materials were discussed in *Compounding World* May 2024 issue. ➤

Biomass balance used in new materials

There has been a proliferation of bio-based chemicals that can be used as feedstocks, as the chemical industry works to move toward a circular economy. For the most part, there are not enough of these bio-based feedstocks yet to be efficiently segregated from their conventional counterparts, so they are mixed together during polymer production. The “bio” portion of the end-product may not be measurable, but instead is calculated using mass-balance methods; the resulting materials are being called a variety of terms such as mass-balanced, biomass-attributed or bio-attributed plastics.

For example, **BASF** introduced a biomass-balanced (BMB) version of its certified compostable polybutylene adipate terephthalate (PBAT), Ecoflex F Blend C1200 BMB. Feedstock from waste and residual biomass is attributed to the BMB grade using a mass-balance approach certified by REDcert² or ISCC Plus. The new material has a 60% lower product carbon footprint than the standard Ecoflex F Blend C1200, BASF reports.

Other examples come from toy brands that have announced use of mass-balanced renewable plastics. The **LEGO** toy brand said that in the first half of 2024, 30% of the resin it



IMAGE: BIO-FED

purchased was certified by mass-balance principles, using renewable raw materials such as used cooking oils or plant oils.

Ineos Styrolution announced in March 2024 that toy brand Playmobil would use its bio-attributed Terluran ECO GP-22 BC100. In this BC100 product (100% bio-attributed content), all three of the conventional feedstock components of ABS (styrene monomer, butadiene, and acrylonitrile) are replaced by renewable feedstock. The bio-attributed products are produced according to an ISCC-certified mass balance approach.

Bio-Fed, a branch of the compounder Akro-Plastic in Germany, introduced M-Biobase compounds

that have a lower product carbon footprint than fossil-based plastics. The M-Biobase materials include mass-based PP, made from materials such as residues from vegetable oil refining or used cooking oil, and certified by ISCC Plus. Other M-Biobase compounds contain renewable, organic fillers, such as lignin. Bio-Fed also supplies colour, carbon black, and additive masterbatches using mass-balanced carrier materials.

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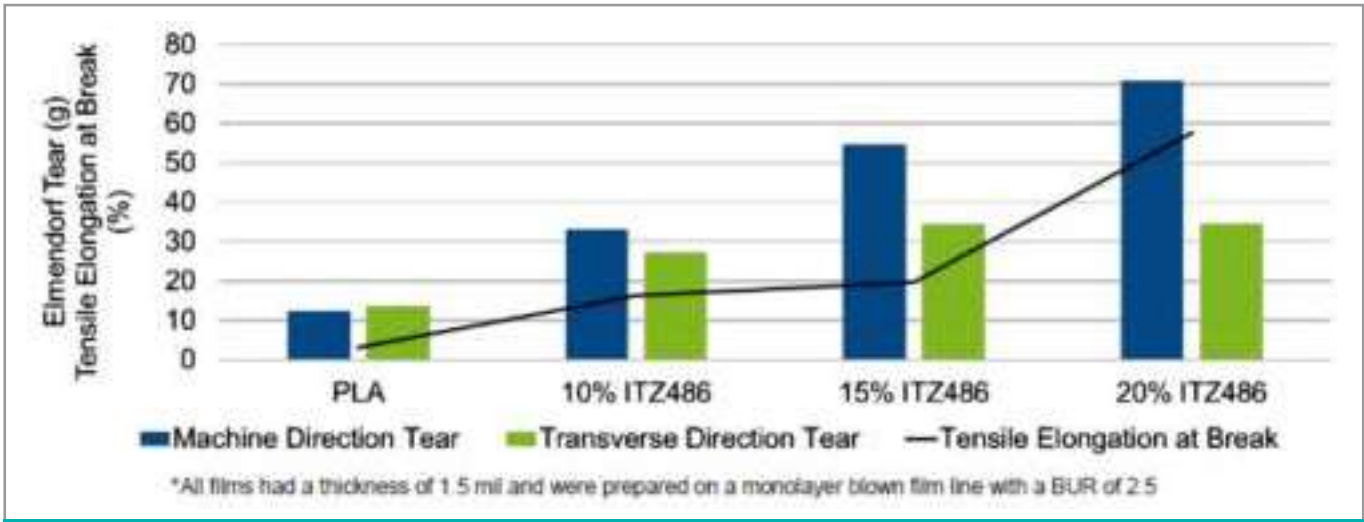
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Ingenia's new InBio ITZ486 toughening agent for PLA films

Source: Ingenia

A recent development from **P3N Technology**, **Addisperse**, and **AFAB Engineering** is micro hemp fibres and micro hurd fibres that can be used to improve physical properties of bio-based plastics. Addisperse says that flexural strength and heat deflection temperature are improved in PLA.

One of the challenges that sometimes arises with unfilled bioplastics as well as with natural fillers is unwanted odour from volatile organic compounds. Albee says that the company's Addisperse odour-eliminating additives bind with the odour compounds to neutralise the odours. The company has a development product for neutralising odours in bio-based polymers, such as PLA, and in compounds with natural fillers, such as hemp.

The latest from Addisperse Technology for PLA and PLA/PHA blends is the HP30-BP nucleating agent masterbatch, a modified grade of Applied Minerals' Dragonite halloysite, an aluminosilicate clay with a tubular morphology. Using 2% of the additive maximises crystallinity, which improves dimensional stability, reduces part warpage, and

reduces cycle time during injection moulding. The additive acts as a reinforcing agent in unfilled compounds as well as enhancing compounds with natural fibre reinforcements, said Paul Albee, consultant with P3N Technology, which collaborates with Addisperse.

Addisperse also introduced the Bio 500 impact modifier designed for unfilled or filled PLA, PHA, and PBS. The additive does not affect clarity and is bio-based and biodegradable. It improves impact, flexibility, and tear-resistance. It also improves compostability of PLA-based compounds.

Ingenia's new InBio ITZ486 is a toughening agent for PLA films that improves tear and tensile elongation without compromising the high clarity of PLA.

Best practices

Bio-based polymers and the natural fillers that are sometimes added to these materials tend to be more temperature- and shear-sensitive than conventional formulations. Some are also sensitive to hydrolytic degradation and require drying before and after compounding. Different types of equipment can be used for compounding. Continuous mixers, such as those from **TPEI** and from **Farrel Pomini**, are being used for compounding bioplastics and natural fillers. Co-rotating twin-screw extruders (TSE) are also being used.

Heat, shear, pressure and hydrolysis can cause degradation when compounding bioplastics. To control these in a TSE, it is crucial to manage the screw design, residence time, peak and average shear rate, shear stress, and feed location, among other aspects, said Charlie Martin, President of **Leistritz Extrusion**, in a presentation at AMI's Bioplastics event. It is also important to monitor pressure, setpoint and melt temperatures, motor



Micro hemp (left) and micro hurd fibres (right) are sourced from industrial hemp grown in the US

Source: Addisperse Technology

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load, feed rate, and screw RPM. Devolatilisation is key; multiple vents can be used in a TSE to reduce hydrolysis risk when compounding bioplastics. Bioplastic compounds can exhibit variation and a narrower processing window, but tools are available to help with this challenge, Martin noted. For example, on-line measurement of variables such as viscosity can be helpful for addressing variation. For successful compounding, the whole process, from upstream feeder design to downstream pelletising, should be taken into consideration, he said at the conference.

End-of-life

There are many issues around the end-of-life for biodegradable bioplastics, whether composting or recycling. Challenges can vary by region, as the infrastructures and systems as well as regulations and incentives differ. In the EU, a new project called ReBioCycle started in October to demonstrate recycling technologies for bio-based biodegradable plastics, such as PLA, PHA and composites that are used in durable goods and multi-use packaging.

“Bio-based biodegradable plastics can be kept

in the material cycle for as long as possible through innovative recycling technologies, thus demonstrating that end-of-life bio-based biodegradable plastics can be used in the circular bioeconomy,” said Kevin O’Connor, Professor at University College Dublin in Ireland, coordinator of the project and Director of Ireland’s **BiOrbic Bioeconomy SFI Research Centre**.

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The transition to circularity in major PVC-using industries is being maintained through recycling programmes, partnerships and innovation. Mikell Knights provides an update



Commitment to recycling continues in PVC sector

PVC recycling seeks to be a more indispensable sustainability and circularity solution in a wider range of market sectors. Windows and profiles, building and construction, flooring and medical sectors are industry sectors seeing interest increase for schemes that can reduce carbon footprint and energy by recovering and reprocessing waste materials into high quality flexible and rigid products.

Research and innovation in PVC recycling and compounding, the continued improvement and establishment of collection and recycling schemes, startup of new technical projects, and greater support and execution of initiatives and programmes are being supported or established to increase the rates of recycling of PVC from post-industrial and post-consumer applications.

Participants in PVC recycling are testing various approaches to increase collection rates or raise the quality of the recyclate. Efforts to establish closed- or controlled-loop systems that ensure high quality

recyclate are in development, and devices are being evaluated that can detect banned additives in waste PVC to keep them out of the recycling stream to increase feedstock purity.

VinylPlus, the European PVC industry's voluntary commitment to sustainably produce, use and recycle PVC, said in its 2024 Progress Report that 737,645 tonnes of PVC waste were recycled within the EU-27 plus Norway, Switzerland and the UK in 2023. This was down by 9.3% from the 813,266 tonnes recycled in 2022.

Converters in the VinylPlus framework that registered how much recycled PVC has been used in new products reported the volume at 469,916 tonnes in 2023, down 16.4% from the 561,795 tonnes reported for 2022. VinylPlus is committed to recycling at least 900,000 tonnes/yr of PVC into new products by 2025 and 1m tonnes/yr by 2030.

Karl-Martin Schellerer, Chairman of VinylPlus, said: "2023 was a very demanding year for Vinyl-

Main image:
Vinyl flooring recycling is the focus of collaborative projects in Italy and Germany

IMAGE: VEKA



Above: Waste collection is a key part of industry efforts to increase PVC window profile recycling

Plus, as the PVC industry continued to face unprecedented regulatory and macroeconomic challenges. However, even in a year characterised by extreme uncertainty, our commitment did not waver - as it never has. Our industry can tackle demanding challenges thanks to hard work and close co-operation among our founding members and partner companies, as well as among PVC sectoral and national associations.”

Recovinyl, a platform of European recyclers and converters created in 2003 by VinylPlus to facilitate PVC waste collection and recycling by monitoring, verifying and reporting on European PVC recycling and the use of recycled PVC in Europe, played a leading role in the 2021 founding of PolyREC, an organisation that brings together major players across the value chain as a multi-polymer data collection platform to monitor, verify and report on plastics recycling and uptake data in Europe.

PolyREC utilises the RecoTrace common data collection system originally developed for PVC, which has now been extended for use with all main polymers. PolyREC looks to help the European plastics industry fulfil its commitment to use 10m tonnes of recycled plastics in new products by 2025.

Window to the world

The **EPPA** (European Trade Association of PVC Window System Suppliers) continued its efforts to boost the recycling of post-consumer window profiles. Its European recycling strategy is implemented in a five-year action plan entitled “vision for 2025”, which has a primary goal to recycle 420,000 tonnes of PVC from windows by end of next year, by improving the collection of old windows and establishing a controlled loop for PVC profiles, in which rPVC is used in construction applications, or in a closed loop, where recycled PVC windows are incorporated into new PVC windows.

The association said old double-glazed and triple-glazed PVC windows can be fully recycled by

re-introducing the rPVC into the core of new PVC windows. “Today, the [European] PVC uses around 50% of its own recyclate,” EPPA said. According to the VinylPlus Progress Report 391,093 tonnes of PVC profiles were recycled in 2023 with 182,672 tonnes rPVC used in new windows and profiles.

The EPPA’s activities eye the markets of France and Germany as a focus with continuing efforts in Poland and the UK. In France, the EPPA has partnered with that country’s **UFME** association of doors and windows manufacturers to actively promote recycling in the window sector. UFME developed the FERVAM label and brand which highlights a value chain company’s use of best practices in the recycling of windows. More than one hundred companies are signatories to UFME’s FERVAM label, UFME said.

UFME’s commitment in Valobat, a collective initiative in the construction products and materials sector in France, is a way the association supports the doors and windows sector in waste management, with rPVC volumes generated and used there reported by all FERVAM signatories using EPPA’s RecoTrace system.

Also in France, an Extended Producer Responsibility (EPR) scheme for building and construction project which began 1 January 2022 advanced in 2023 following the implementation of the French EPR by two national associations in charge of flexible PVC (Kaléi) and rigid PVC (SNEP) in building applications.

The French EPR scheme, actively followed by VinylPlus France, aims to organise the collection, sorting, reuse and recycling of building and construction products at a national scale under the umbrella of Producer Responsibility Organisation (PROs), which Kaléi and SNEP have joined.

In Germany, **Rewindo Window Recycling Service**, the recycling initiative for PVC window profiles, roller shutters and related products in the country, reported that 136,000 tonnes of PVC was recycled in 2023, of which 43,000 tonnes were derived from post-consumer sources and 93,000 tonnes from pre-consumer production and manufacturing processes of the PVC-U window industry and window makers. The recycled volume amounts to a recycling rate of 86%, according to Michael Vetter, Managing Director.

Use of the 136,000 tonnes of recycled PVC instead of new PVC equates to almost 2 million MWh energy savings potential and approximately 272,000 tonnes in CO₂ savings, Vetter said.

The figure for recycled PVC in Germany was down slightly from the 44,000 tonnes reported in 2022 using RecoVinyl’s RecoTrace database system,

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Right: Lead-containing recyclates are subject to EU restrictions on their use in PVC pipes

which is a respectable result given Germany's weak economic performance, especially in the construction sector, impacted by high energy costs, rising costs and a decline in demand and production of window profiles, said Vetter. "In 2023, over two million used plastic windows were placed in the Rewindo nationwide collection and recycling system and did not end up as mixed construction waste," he said.

In Poland, the EPPA continued to develop a PVC recycling system with the launch in 2023 of the Oknorec PVC window collection and recycling project, which aims to enhance collection processes for PVC profiles, ensure their proper recycling and minimise waste.

In the pipeline

TEPPFA - the European Plastic Pipes and Fittings Association - said the restriction on the use of lead and its compounds in PVC, which entered into force in May 2023, will ban the use of lead-containing recyclates from waste PVC profiles in the production of PVC pipes, following a 36-month transition period that ends on 29 May 2026. The regulation, adopted by the European Commission member



states and the European Parliament, prohibits PVC articles containing lead from being placed on the market if the concentration of lead is equal to or greater than 0.1% by weight of the PVC material.

A ten-year derogation until 29 May 2033 has been granted to rigid PVC products such as profiles and pipes. Following a 36-month transition period lead-containing recyclates with a concentration of lead lower than 1.5% from rigid PVC profiles

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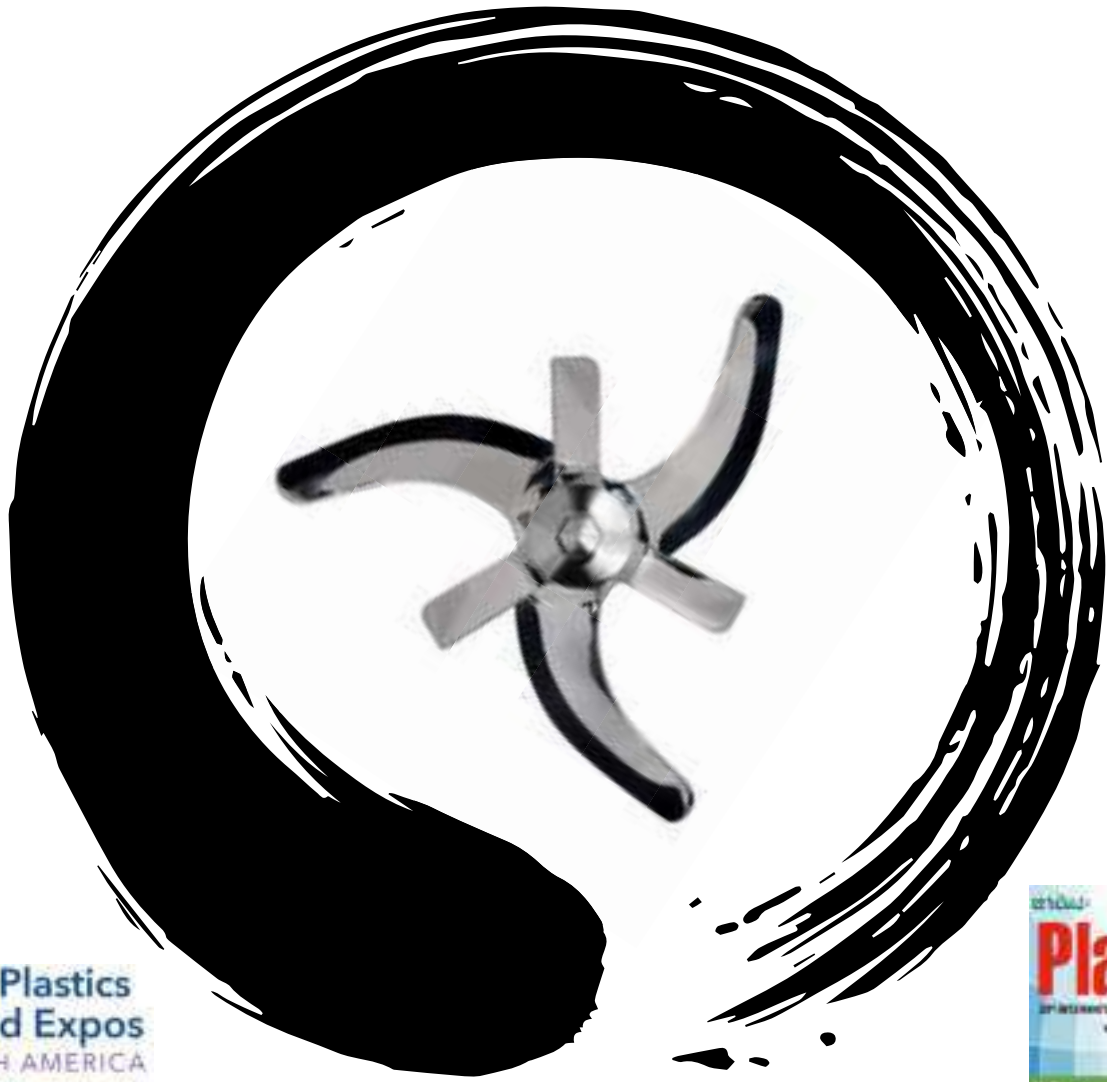
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The PVC processing challenge

US compounding systems group **Farrel Pomini** says processing PVC can be a challenge as it is heat sensitive by nature, its processing temperature window is narrower than many polyolefins, and if exposed to extended residence time or overheated will degrade quickly and release hydrochloride acid, which is toxic and highly corrosive to the processing equipment. "The degradation will affect the colour and mechanical properties of the product," the company says. Processing recycled PVC is an even bigger challenge because of its unknown thermal history and the contaminant invariably carried by the recycled material.

Temperature control

Farrel Pomini says its Compact Processor (CP) II series is designed with the Farrel Continuous Mixer (FCM) technology that maintains precise temperature control which results in lower temperature mixing and a wide processing window for

both rigid and flexible PVC. The precise temperature control also provides higher production rates and lower costs due to a reduced need for heat stabilisers.

Its CP series, offered in six models and able to provide PVC compounding at nominal production rates from 170 to 3,000 kg/hr for rigid PVC, and rates from 250 to 4,700 kg/hr for flexible PVC, feature multiple temperature control zones and rotor cooling which allows for processing of PVC within its ideal temperature range and with less reliance on heat stabilisers. The units also feature energy-efficient atmospheric venting for removing air, volatiles, and moisture from the mixer.

The FCM utilises a twin rotor design that compounds materials in a single step rather than a melt, add, mix, convey, repeat technology associated with twin-screw extruder technology, says the company.

Mixing is achieved by repeated passage of the compound through

the controlled shear region formed by the rotor tip and the inner housing walls, as well as the continuous splitting and recombination of the compound between the two rotors.

Good dispersion

Large rotor tip to wall clearances and non-intermeshing rotors allow for processing of abrasive materials and contaminants without excessive wear to major machine components. The unit's #15/7 rotor combination provides good dispersive mixing with excellent distributive mixing and yields decreased melt temperature with increased production rates.

Farrel Pomini has presented several case studies in which various recycled PVC materials in the form of a clear film, Luxury Vinyl Tiles, window frame, vinyl siding or shredded carpet tile backing, and containing a high percentage of solids/fillers or mixed durometer materials could be processed into a homogenous compound.

➤ www.farrel-pomini.com

and sheet have to be used in a closed loop. As a result it means that from 29 May 2026 onwards, only lead-containing recyclate from rigid PVC pipes can be used for the production of new pipes.

No derogation was granted to lead-containing recyclate from soft PVC applications.

Manufacturers using rigid lead-containing PVC recyclates in new products must comply with a mandatory certification of origin of the rPVC used as well as a mandatory product marking.

The new regulation does not cover the use of lead-free recyclates from profiles and pipes. For more than a decade, profiles and pipes use a calcium zinc-based stabiliser. Lead-free recyclate from profiles and pipes can be used for new non-pressure rigid PVC pipes without any restriction, but subject to product standard specifications.

TEPPFA members already set-up end-of-life rPVC pipe collection schemes more than 30 years ago in some EU Member States such as the Netherlands, Belgium, Austria and Denmark. Due to the useful life time of the rPVC pipes from 50 up to 100 years, the volumes collected were mainly limited to installation waste.

TEPPFA's activities to support an increase in rPVC collection as the restriction comes into force include a project to open up non-pressure product standards for an increased use of recycled content without compromising on quality, performance, and longevity. It also concluded a mass flow analysis with German association member KRV to find out the potential non-collected volume, which can help to set the baseline for future pilot collection, sorting, and recycling projects for end-of-life plastic pipes at national levels from 2025 onwards.

Vinyl flooring

The **European Resilient Flooring Manufacturer' Institute** (ERFMI) is advancing projects relating to the recycling of PVC flooring and PVC from bulky urban waste. With the support of VinylPlus Italia, the group commissioned Phoenix RTO, a Padua, Italy-based optical instrument, and systems maker to design and build an industrial technology capable of separating PVC from other plastics in post-consumer waste.

Phoenix RTO developed a handheld device that employs near-infrared (NIR) hyperspectral technol-

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ogy that reduced the percentage of impurities in the collected PVC from an average of 3% to less than 1%. In 2023, it was asked to conduct further studies on PVC recycling based on scanning equipment already used to manage electric and electronic waste. In one study, Phoenix RTO is developing a handheld scanner that detects the presence of lead in PVC cables. In another study it is looking to detect legacy additives that are banned. Through testing, it found the NIR technology was most promising in detecting and sorting PVC waste containing legacy additives like LMW orthophthalates while X-ray fluorescence spectroscopy (XRF) was most promising to detect and sort waste PVC containing lead.

The study showed that an industrial in-line pilot system able to select and recognise PVC with the presence of lead should be pursued based on the results of its testing. VinylPlus will finance the design of a pilot plant to be installed at a partner company of VinylPlus Italia to detect the additives and traces of other substances not allowed under EU regulation, such as Di 2-ethylhexyl phthalate (DEHP) and medium-chain chlorinated paraffins (MCCP).

ERFMI in Germany launched a pilot project within the Revinylfloor initiative in 2022 seeking to increase the collection of PVC floor coverings from scraps and end-of-life products. Two German wholesale companies involved in the project, Lotter + Liebherr and Laminat Depot set up collection centres, capturing 65 tonnes of post-consumer flooring by the end of 2023. Lotter + Liebherr is extending the service to additional locations in Germany, while ERMFI's has broadened its objective to gather additional insights, perform a comprehensive cost analysis and evaluate the branch infrastructure of the current wholesalers.

Compatriot PVC flooring recycling company **Aktion PVC-Recycling** processed the collected materials into a fine grind at its recycling plant in

Troisdorf. Aktion PVC formed the **Association for the Recycling of PVC Floor Coverings (AgPR)** as an initiative with several major PVC flooring makers, with the rPVC processed into powder and used in the production of new PVC construction products, where suitable.

AktionPVC says its recycling process first sorts the post-consumer floor coverings, which are then mechanically size-reduced into chips no larger than 30mm. A magnet removes metals while a hammer mill and a sieving machine separates concrete and glue residues from the chips. A final grinding process occurs and the PVC material is cooled by liquid nitrogen to -40C, where the material becomes temporarily brittle, at which time it is further downsized into particles no larger than 0.4mm by a fine grinding mill. The material is shipped in big bags to PVC converters for the production of new PVC building products, said Jochen Zimmermann, Managing Director.

ERFMI also commissioned additional tests in 2023 to sort flooring containing legacy low-molecular weight plasticisers from flooring without it, using NIR sensor sorting technology from Steinert. Preliminary tests showed a near zero concentration of orthophthalate content after sorting. Further tests are planned this year to confirm the results.

Recofloor, said to be the leading takeback scheme in the UK, reported 475 tonnes of commercial waste vinyl flooring was collected in 2023, saving 557 tonnes in carbon emissions compared to the processing of virgin material, said scheme manager Carla Eslava.

Since the inception of Recofloor in 2009, the scheme has collected 7,060 tonnes of vinyl flooring that has been recycled back into new flooring and traffic management products. The total, which Recofloor said is a milestone, generated 8,282 tonnes of carbon savings, the equivalent of 2,161 cars being taken off the road for a year, and equal to 2,353,000 m² of vinyl flooring being recycled, said Eslava.

Larger volumes of recycled material from contractors, helped by the deployment of the scheme on more major projects along with increased engagement with main contractors, helped push the scheme to collection and recycling volume highs. In 2023, Recofloor was deployed on nine substantial projects, with six of those continuing their collections in 2024.

Collecting acceptable commercial vinyl flooring also saves up to 70% on waste disposal costs, such as skip hire and gate fees, as well as landfill tax.

A new pilot programme to collect and recycle post-patient PVC medical devices by establishing a

Below: As part of the Revinylfloor initiative, Aktion PVC-Recycling processed post-consumer flooring materials at its recycling plant in Troisdorf, Germany



IMAGE: AGPR

dedicated collection system was launched in the US in October by **Westlake Global Compounds**, a global flexible and rigid PVC compounder and subsidiary of Houston-based Westlake Corp.

The new Choose Pink pilot program, created in collaboration with Houston Methodist hospital at its flagship Texas Medical Center location, will collect single-use healthcare items such as nasal cannulas and masks, oxygen tubing and saline bags from the hospital's Outpatient Center.

The collected material will be sent to Westlake Dimex, a Marietta, Ohio, facility and subsidiary of the Westlake group that compounds recycled polymers, said Andy Antil, General Manager at Westlake Dimex. The materials will be reprocessed into durable consumer and industrial products such as commercial and retail runner matting, exercise equipment matting, dock edging for marine applications and cord protection products for electrical and cable management applications, which will reduce the hospital's carbon footprint, Antil said.

Medical PVC

According to Westlake Global Compounds, other PVC medical device recycling programmes have been launched in the US cities of Atlanta, Chicago and Rochester, New York. The company is also a key partner of the **PVCmed Alliance**, which is the **European Council of Vinyl Manufacturers'** (ECVM) value chain platform to raise awareness and promote best practices on the use of PVC in healthcare. ECVM is a founding member of VinylPlus and a division of the PlasticsEurope trade association representing plastics manufacturers in Europe. Westlake says advances in medical PVC circularity is not limited to medical devices. VinylPlus currently has a PharmPack project that aims to enhance the recyclability of PVC-based pharmaceutical blister packaging.

VinylPlus Med is the Belgium-based pilot collections and recycling partnership launched in 2022 by VinylPlus to demonstrate that PVC waste from medical devices could be turned into REACH compliant recyclates of high quality then reused by PVC converters to make durable products for healthcare settings. The project, which has been extended, initially involved Brussels-based hospital group Europe Hospitals to collect and sort single-use, non-contaminated PVC medical devices that do not contain classified phthalates from its operating rooms, intensive care unit and service care unit at two hospital sites. These streams are collected by waste management company Renewi for recycling by Belgian plastics recycler Raff Plastics.

Evelyn Vass, Operational Director at Europe

Hospitals, said involvement in the initiative helps the hospitals to significantly reduce their environmental impact and operating costs. "We realised that our hospital, like other hospitals in Belgium, is a major polluter. Before, everything used to be incinerated," Vass said. Since 2022, the VinylPlus Med scheme has expanded to 22 hospital sites, collecting a total volume equivalent to nearly 830,000 face masks. Currently, 400 bins are in place across these hospitals, with 60 pallet containers transporting waste to recyclers. To support this growth, Renewi has added two additional storage facilities in Belgium, while VinylPlus Med has also begun working with social economy partners to dismantle non-PVC components.

The success of the VinylPlus Med scheme in Belgium has led to plans to expand the pilot program to France in 2024 involving Terra, a France consulting expert for the circular economy, and Medtronic, a healthcare technology company. The French pilot scheme will also include the recycling of rigid PVC medical devices such as disposable laryngoscope blades.

VinylPlus Med said a handheld NIR device to detect the presence of orthophthalates in PVC waste has been developed and is being adopted by the British Plastics Federation, which will use it as part of a relaunch of its RecoMed takeback scheme in the UK.

VinylPlus is also involved in the Select4Care project, which aims to increase the recycling volumes of medical PVC in Belgium by improving device design for recycling and enhancing the collection and sorting logistics for medical plastic waste - from hospitals to recyclers and converters.

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Above: Westlake Dimex, which produces recycled compounds at its facility in Marietta, Ohio, is taking part in a project to recycle single-use healthcare items



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Looking for answers in black and white

Pigment suppliers are addressing recyclability and carbon footprint issues, allowing masterbatch companies to widen their portfolios. Jennifer Markarian reports

Many thermoplastic applications rely on black colorants. Properties such as opacity, tint strength, hue, and dispersability are important. Another property increasingly being considered is the ability to be sorted in material recycling facilities using near infrared (NIR) detection. Many carbon black-based pigments are not able to be detected in NIR sortation, but a variety of other types of blacks, including complex inorganic coloured pigments (CICPs), manganese ferrites and some new bio-based blacks, can be detected by NIR.

Bioregion Technology (BRT), located in Oregon in the US, has launched TruBlack TPA Infrared (IR), a bio-based NIR-reflective black pigment that is capable of being sorted using NIR sorting equipment. The bio-derived black additive is created from lignocellulosic biomass from agricultural waste. BRT partnered with **Nagase** to sell and distribute the additive globally.

"Through a novel carbonisation process, we're able to turn this abundantly produced and tightly controlled biomass input into a high quality bio-derived carbon," said Brendon Bohnert, Senior Manager for Emerging Technologies at Nagase. A patent-pending technology controls the surface morphology.

"TruBlack has gone through the USDA's BioPreferred certification process and has 100% biobased carbon content. In addition, the biomass input is OMRI certified organic," said Bohnert. The com-

pany is working on US food contact substance notification, which would allow it to expand into food-contact applications.

BRT's aim was to develop a cost-effective IR-reflective black masterbatch that would colour similarly to carbon black and provide good dispersibility with no impact on final part functionality, said Bohnert. He said the masterbatch is approximately 50% pigment loaded and will be used at 1.5 to 2 wt% for typical applications. "TruBlack also has advantages versus other NIR pigments as its colour is very close to what industry partners expect when using traditional carbon black," said Bohnert. He said that the powder form of TruBlack is cleaner and easier to handle than carbon black. In addition, it has low to no magnetic properties.

BRT worked with packaging supplier PakTech to optimise a masterbatch for the company's black packaging handles. The parts were successfully sorted on four different sorting technologies in Australia and received the Australian Packaging Covenant Organisation (APCO) certificate for sortability.

BRT has built a pilot plant that is capable of producing 1.2m lbs/year of bio-derived carbon, which will be available for both pigment and industrial uses. The company aims to scale up its process and expand into conductive applications.

UPM Biochemicals (part of Finland-headquartered forestry company UPM) is constructing a

Main image: Carbon black is the tried and trusted pigment for black plastics, but alternative sources are being developed



IMAGE: ORION

biorefinery in Leuna, Germany that will produce wood-based biochemicals, such as renewable glycols, industrial sugars, and lignin. Start of production is expected by the end of 2024. Lignin is

used to make UPM BioMotion Renewable Functional Fillers (RFF). In addition to use as a functional filler in thermoplastics, RFF can be used as a black pigment as an alternative to carbon black. RFF achieves black colouring with a slightly reddish and yellowish tone.

The company says that in general, a loading of 3-5 wt% gives the best colour properties. At all loading levels, RFF is detectable in NIR sortation equipment in recycling facilities. The product has been tested as

100% bio-based carbon content by ASTM D6866 and also awarded the highest level certification of "bio-based>85%" from the third-party certifier DIN Certco. The company says it meets EU standards for biodegradability and compostability.

Biomass basis

Colorado-based **Living Ink Technologies** is deriving black pigments using biomass inputs to its proprietary pyrolysis process. The company is currently using algae biomass that is waste from a nutritional supplement manufacturing process, and is investigating other bio-based waste streams, such as those from local beer fermentation processes. The pigments are being used commercially in inks and also in a paint application, said Devon Murrie, Director of Partnerships at Living Ink Technologies.

At the lab-scale, the company has created a black masterbatch in pellet form that can be used in plastics. One application in development is solution-dyed, recycled PET yarn for clothing. The masterbatch has been used in the lab for injection moulded caps. A life cycle assessment (LCA) of the algae-based black pigments, calculated in January 2023, found that the pigments have a negative global warming potential (GWP) (ie, remove more greenhouse gases from the atmosphere than emitted for pigment production) for the current scenario in which waste biomass is used as a feedstock.

Ampacet says its new Natura Shades Collection is a series of bamboo-based colorants that are an alternative to conventional carbon-black-based pigments. The colorants are suitable for injection moulded polyolefins in applications such as furniture and housewares.

Birla Carbon is making progress with its plan to obtain International Sustainability & Carbon Certification (ISCC Plus) certification for its manufacturing plants. The ISCC Plus certification can identify biomass, non-biological renewables and recycled carbon materials. Birla makes its carbon-black alternative, Continua Sustainable Carbonaceous Materials (SCM), from end-of-life (EOL) tyres. The company notes, however, that the SCM products, launched in 2021, are not the same material as carbon black.

ISCC Plus recognises SCM as a circular material, and certification verifies that it can be traced through the supply chain. In July, the company announced that plants in the US, Canada, and Spain had received certification, following certification of facilities in Brazil, Hungary, the US, South Korea, Egypt and three units in India earlier in 2024 and Italy in 2023. The company says its remaining three plants are expected to be certified by the end of 2024.

Avient's latest is OnColor REC Polymer Colorants, which are made with pigments derived from recycled content, including EOL tyres. The company says that compared to carbon black, the pigments can perform comparably and reduce product carbon footprint. The new products are available in the US and Canada for a range of resins and applications, including wire and cable, building and construction, automotive, and electrical and electronics.

Cabot launched the company's first carbon blacks with certified recycled content with ISCC Plus certification in late 2023. The masterbatches are part of Cabot's Evolve Sustainable Solutions technology platform for offering sustainable content at industrial scale.

Replasblak rePE5475 100% circular black masterbatch contains 100% ISCC Plus mass balance certified material made from reclaimed



IMAGE: BRT

Above: BRT supplied NIR-detectable masterbatch to PakTech to optimise for its black packaging handles

Right: Living Ink Technologies is using algae biomass to create black masterbatch



IMAGE: LIVING INK

carbons from EOL tyre pyrolysis and mechanically recycled polyethylene. Cabot reports the masterbatch reduces greenhouse gas (GHG) emissions more than a 60% in comparison to a standard black masterbatch. The product has a medium tint strength is suitable for a range of applications that require higher circular content.

Replasblak rePE5265 70% circular black masterbatch contains 70% ISCC Plus mass balance certified material made from mechanically recycled PE and reduces GHG emissions by nearly 50% in comparison to a standard black masterbatch. It produces high gloss and jet pigmentation in thermoplastics, making it suitable for compounding, recycling, injection moulding and sheet extrusion applications relevant to the automotive segment, the company claims.

Replasblak rePE5250 60% circular black masterbatch contains 60% ISCC Plus mass balance certified material made from mechanically recycled PE. It reduces GHG emissions by nearly 50% in comparison to a standard black masterbatch and has high tint strength. All three products adhere to the ISCC Plus voluntary add-on GHG emissions requirements.

The latest from Cabot are its Replasblak universal



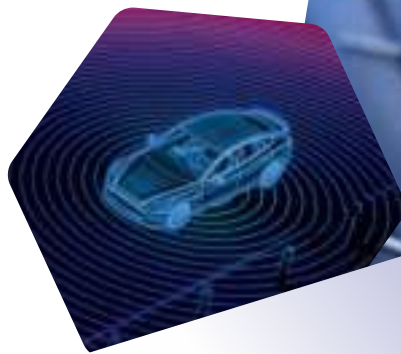
IMAGE: AVIENT / ISTOCK

circular black masterbatches with ISCC Plus certification. Replasblak reUN5285, designed for compounding applications in the automotive industry, contains 45% material from mechanically recycled polymer, and Replasblak reUN5290 contains 20% material from mechanically recycled polymer. The company says that both grades provide colour performance and mechanical properties similar to standard universal black masterbatches. A universal solution provides versatility for using a single

Above:
Avient's new OnColor REC Polymer Colorants are derived from recycled content such as end-of-life tyres



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IMAGE: ORION

Above: Orion's facility in the city of Huaibei in Anhui province, China, will produce carbon black for a variety of applications, including coatings, printing inks, rubber, polymers, fibre and rubber

masterbatch for a range of polymers.

Carbon black supplier **Orion** offers ISCC Plus certification for multiple grades made from different feedstocks at five different plants. Three facilities – in Texas, Ohio, and Poland – were recertified in 2023, and the Cologne, Germany and Ravenna, Italy facilities were certified for producing circular and bio-circular raw materials. "ISCC Plus verifies the transparency and traceability of sustainable raw materials in our value chain," said Orion CEO Corning Painter in the press release.

Renewable

The company notes that it developed and commercialised carbon black from renewable feedstocks, such as vegetable oils, oils derived from waste, and residues from agriculture or forestry, a decade ago. The company is also a partner in the European BlackCycle consortium, which has developed sustainable carbon black using oil from an EOL tyre pyrolysis process. In June, Orion announced that it was installing multiple tyre pyrolysis oil tanks at its plant in Poland to increase production of circular carbon black, which is used in multiple applications.

At NPE 2024, the company introduced two new specialty carbon black grades made from EOL tyre pyrolysis oil. The products, Printex kappa 100 Beads and Printex kappa 100 acetylene conductive additive, provide both pigmentation and conductivity for wire and cable as well as pipe, film, fibre, packaging, and automotive applications.

Orion's latest for thermoplastics is Printex chroma 500 Beads, a high-jetness carbon black designed for engineered plastics that balances high jetness and dispersibility. "This is a product our customers have been demanding for a long time. It's ideal for injection moulded automotive parts, household appliances, electronics and other applications with a shiny, glossy finish," said Tilo Lindner, Vice President of Global Marketing for Specialty at Orion, in the June press release. The

product is available with ISCC Plus certification.

Compounding equipment manufacturer **Farrel Pomini** is working with WF Recycle-Tech on a new, patented technology to use Farrel Pomini's continuous mixer for pyrolysis of EOL tyres. The output is 50% tyre-derived oil, 10% syngas (which is used to generate electricity for the process) and 40% recovered carbon black, the company reports. A benefit of this equipment for this application is its modularity, which makes it suitable for the smaller, regional nature of EOL tyre processing, said Paul Lloyd, Farrel Pomini President. A typical size handles 10,000 tonnes/year of tyre scrap. Farrel Pomini has produced its own 40-55% black masterbatch in a research and development environment as samples.

White pigments

Titanium dioxide (TiO₂) is broadly used for white pigmentation in plastics and other applications. The **Titanium Dioxide Manufacturers Association** (TDMA), representing European manufacturers, recently announced an updated LCA measuring the climate change impact (ie, a carbon footprint measure) for TiO₂. The LCA used data from members across 33 production sites.

Tronox has new products in development that are targeted for very specific thermoplastic applications, said Steve Forrest, Director of Global Marketing at Tronox. "Working with customers and understanding the specific polymers and intended applications allows new, specialised TiO₂ offerings to be developed to enable performance," said Forrest. He added there is a drive to provide TiO₂ products that are more sustainable, and suggested that Tronox can do this effectively because it is vertically integrated and controls 85% of its own feedstock as well as the TiO₂ pigment factory, so that the company has direct control over almost two-thirds of the total carbon footprint. "We can take direct and achievable action with current technology to reduce our footprint in the short term, while also mapping out longer term and developing technology options for future reductions," said Forrest.

US Silica launched EverWhite Pigment, an engineered high-white pigment for various applications, including plastics, in 2023. The pigment can be used to partially replace or complement other inorganic white pigments, such as TiO₂, the company says. For US customers, it is a domestically sourced product, for cost savings and access, the company added. In mid-2024, the company was acquired by Apollo Funds.

Finland-based **FP-Pigments** produces opacity pigment masterbatches for thermoplastics that are composites of TiO₂ and calcium carbonate. These

pigments can replace a portion (typically 10-20%) of the TiO₂ in a formulation. The company's latest version, FP-545, is based on a particle treated with stearic acid, rather than the trimethylol propane organic surface treatment used in the FP-540 grade that was introduced in 2021 along with the untreated FP-440 grade.

The FP-440/540/545 series uses less TiO₂ than the company's earlier versions, to produce a similar optical effect with less expense and lower carbon footprint.

"Our control of the calcium carbonate precipitation process has allowed us to entrap some additional air in the particle, thereby increasing the effective light scatter in a modified way and subsequently allowing for the formulation of an FP-Pigment particle containing even less TiO₂ but delivering similar optics," said Andy White, Business Unit Director Paints and Plastics at FP-Pigments.

Food packaging

FP-440, with no extra organic coating, is designed for compounds. FP-540 and FP-545 are designed high pigment-concentration masterbatches, where the extra surface treatment is needed to aid dispersion, White explained. The masterbatches can be used in food packaging.

Tosaf, a supplier of white and additive masterbatches, recently announced that its production facilities have achieved ISO certification regarding food safety, in addition to previously obtained ISO quality certifications.

"Tosaf places great importance on supplying the food industry with high-quality raw materials that meet the strictest requirements," said Dina Khom-

chuk, Q&A Manager for Tosaf's Additives Business Unit. "As part of the new ISO 22000 certification including ISO 22002 Part 4, which is specifically tailored to food packaging, we have comprehensively adapted our processes to this area of application and optimised them even further. We have developed a multi-year plan that includes measurable goals in the areas of quality, food safety, and environmental quality. We allocate resources and train the entire organisation in food safety. On this expanded basis, Tosaf is looking forward to growing in the market for masterbatches for food packaging."

The company says its white masterbatches withstand demanding processing conditions and offer high dispersion quality and colour strength. They can be designed for specific application requirements as well, such as organoleptic properties for milk packaging.

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Inside TaipeiPLAS 2024: Taiwan's plastics showcase



IMAGE: TAITRA

Sustainability and digitalisation were major themes for TaipeiPLAS 2024 exhibitors in compounding, extrusion, recycling and moulding machinery. Chris Saunders reports from the event

The Asia-Pacific region continues to loom large in the global plastics market, holding a revenue share of over 22% in 2023, according to Grand View Research. Significantly, Taiwan was recently named in a study by Reloop and Eunomia Research and Consulting as the world's third best country for recycling and leads the way in sustainable solutions through initiatives like the Taiwan Excellence Awards, annual honours given out by the Ministry of Economic Affairs (MOEA) and The Taiwan External Trade Development Council (TAITRA) to encourage Taiwanese companies to incorporate more innovation and value into their products. Taiwan is now the sixth largest rubber and plastics machinery exporter in the world, and has become a major influence on other Asian markets.

The Taipei International Plastics and Rubber Industry Show (TaipeiPLAS) - the latest edition of

which was held at Nangang Exhibition Centre on 24-28 September in conjunction with ShoeTech Taipei - is indicative of Taiwan's ascendancy. According to TAITRA, the organiser of TaipeiPLAS, this year the newly-expanded five-day event featured a total of nearly 500 exhibitors across more than 1,800 booths, reflecting a 40% increase from the last edition in 2022. The event in September attracted over 16,000 visitors from 98 countries and regions, including delegations from India, Myanmar, Vietnam, Malaysia, Algeria, and Egypt. Attendees were able to view every facet of plastics manufacturing up close, catch a first glimpse of cutting-edge technology, meet industry professionals, and check out a vast array of processing machinery, materials and finished products.

To make it even more of an immersive experience, the event was accompanied by various

**Main image:
Exhibitors and
visitors from all
over the world
mixed at
TaipeiPLAS
2024**

IMAGE: TAITRA



Above: The opening ceremony at TaipeiPLAS 2024, co-located with ShoeTech 2024

seminars, workshops, conferences, product launches, and award shows. One notable session was dubbed 'Visionary and Sustainable Development Summit for the Plastic and Rubber Industry,' and included contributions by experts from BASF, Arburg, Wittmann, and other companies, who came together to discuss industry advancements. Throughout the show, established industry heavyweights such as these rubbed shoulders with new and emerging companies, mainly based in Taiwan but also in other parts of Asia, all with international aspirations and keen to showcase the products and services they offer.

A TAITRA representative said: "TaipeiPLAS serves as an industry hub, highlighting the dynamics of the Asian plastics and rubber industry. At TaipeiPLAS, visitors can explore the full ecosystem of the industry, including materials, processing machines, recycling solutions, and application across various sectors."

Expanded event

As part of the expansion, this year the organisers introduced a new Composite Materials Zone. Composite materials are increasingly in demand due to their lightweight properties, insulation performance, corrosion resistance, plasticity, and recyclability, and according to MarketsandMarkets, the global market is expected to grow from \$74bn in 2020 to \$113bn by 2025. In addition, TaipeiPLAS 2024 featured zones dedicated to Bio, Recycled Plastics & Green Products, and Adhesives & Glues. The main pavilion housed a range of processing machinery from the likes of JSW, Everplast, and Fong Kee, along with a smaller selection of recycling machinery and auxiliary equipment and robotics, while the upper level was dedicated to more niche aspects of the industry such as packaging and printing, moulds, and additive manufacturing.

From comments made at the opening ceremony

by dignitaries representing various organisations, two key themes were prevalent: the global transition towards Net Zero, and the rise to prominence of artificial intelligence (AI). One good example of the latter among the exhibitors was provided by Taiwanese company **Moldex3D** which produces injection moulding simulation software. Its latest innovation is Moldiverse, a cloud ecosystem offering a centralised source for polymer material data, smart moulding solutions, and even education via its online courses and tutorials. Among the companies integrating the software are Fanuc, Engel, and Sumitomo.

Forwell develops quick mould change systems which automate the mould changing process and provide increased speed, efficiency, and productivity, not only reducing mould change time but also promoting small batch production runs and streamlining production. The company displayed its new, upgraded die clamps which are fitted with sensors and feature non-leak valves which help maintain hydraulic pressure even if the hoses are leaking.

Chuan Lih Fah (CLF), which has been supplying injection moulding machines since 1966, is another company embracing the benefits of AI and has incorporated several digital solutions into the way it works. It said: "Precision is paramount in injection moulding, especially when producing complex or high-tolerance parts. Digital technologies enable real-time monitoring and control systems, which adjust parameters on the fly to maintain optimal conditions."

The company is further increasing efficiency by offering customers tailored installation plans and says its 600TPIIR two-platen machine - which was on display alongside a 180 all-electric and a 250TWII toggle type machine - is consistently one of its most popular machines as it saves at least 20% of floor space and is fully customisable.

Another injection moulding machinery manufac-

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turer, **FCS**, which celebrates its 50th anniversary this year, displayed both a CTE-180E and a SA-160, its newly released outward toggle hydraulic servo energy-saving machine which was used to produce four-cavity PC safety goggles with a cycle time of 35 s, showcasing the MuCell microcellular foaming system which routinely achieves an overall weight reduction of 8-10%. This machine was the recipient of a prestigious Gold award at the event.

Everplast, founded in 1993, provides customised extrusion lines based on market demand and the characteristics of the resin being used. On display at TaipeiPLAS 2024 was a WPC compounding line and a machine especially configured to produce fruit netting. The company says to date it has turned out more than 21,000 lines to customers in over 100 countries.

Digital

By integrating digitalisation into its machinery, extrusion machine producer **Plasco** says it has made significant strides in accelerating energy-saving functions and improving operational efficiency, all geared toward helping manufacturers transition from linear production methods to more sustainable, closed-loop systems. Its machinery is designed with advanced energy regeneration capabilities, achieving up to 35% of energy savings by converting heat generated during the extrusion process into electricity which can then be reused to power other parts of the production line.

Blown film machinery group **Han King** is a true success story, the company having rented premises for 30 years before purchasing land and building its own factory in Chiayi County, Taiwan, in 2019. At the exhibition it displayed a mono-layer HDPE blown film machine with an output of up to 230 kg/hr.

Yei Yi Machinery is an extruder specialist with over 60 years of experience in recycling and film blowing. The compact 3-in-1 machine on show at TaipeiPLAS 2024 was a combination of shredder, extruder, and pelletiser, fitted with a twin hydraulic cylinder-type screen changer that allows screen changing without machine shut-down.

One of the main players in the Taiwanese extrusion industry is **Fong Kee International Machinery** (FKI), which was established in 1953 and has now achieved global sales of more than a million units in over 100 countries. The TaipeiPLAS regular is best known for its award-winning I Blow Intelligent Full Electric Blow Moulding Machine and its subsequent upgrade the E Blow.

Also exhibiting was **Genius Machinery**, which specialises in comprehensive recycling plant planning and has over 40 years of experience in

designing and manufacturing recycling equipment. It supplies washing lines, recycling machines, pelletisers, dryers, crushers, shredders, and other equipment, providing a valuable one-stop service. On display was its energy-efficient ShredMax, a shredder integrated recycling machine which simultaneously shreds various types of plastic waste and feeds it into an extruder. Another notable feature is its space-saving potential.

Polystar chose not to display any machinery, but instead gave visitors an insight into its high-efficiency, one step Repro-Flex technology, designed for the reprocessing of both printed and non-printed polyethylene (HDPE, LDPE, LLDPE) and polypropylene (PP). The cutter-integrated pelletising system eliminates the need for pre-cutting and requires less space and energy than many of its competitors, making it a popular choice in today's cost-conscious market.

Chang Woen, a specialist in recycling and shredding technology, displayed a scale model of one of its expansive turnkey solutions used for recycling PET bottles, where the waste is passed through several complex, multi-stage procedures. The company also gave a glimpse of its new bale de-wiring machine, set to go on sale later this year.

Outlook

So what of the future? TAITRA says: "Our goal is to establish TaipeiPLAS as a dedicated international platform, a pathway for enterprises interested in entering the Asian market. Simultaneously, Asian and Taiwan companies can leverage TaipeiPLAS as a springboard to expand their global business opportunities. In the future, we plan to attract an even more diverse range of exhibitors, making it an all-in-one show that showcases the latest developments in the global plastics and rubber industry, from materials and manufacturing to finished products, as well as circular economy solutions."

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Moving ahead in mixing

New developments in mixing technology provide compounders with more precise control of the process. Chris Saunders reports

The need for a mixing process in some compounding applications requires understanding the specific requirements of the material type, production scale, and desired product properties, in order to select the appropriate equipment. The latest mixing technology developments focus on reducing energy consumption, more efficient motors, and close control of process parameters. As demand for specialised or customised plastics grows, there is a trend toward more flexible, modular mixing systems that allow for rapid changeovers between different materials and formulations.

Earlier this year, **Ross Mixers**, a US-based manufacturer of industrial mixing equipment, introduced the FDA-50 fixed tank dual shaft mixer. Built to handle a wide range of formulations and viscosities, it is designed for processes that require meticulous control over mixing, temperature, and pressure contained within a compact and portable module. Equipped with two agitators, the high speed disperser features two 6-inch sawtooth blades, one fixed at the bottom and an adjustable one placed along the shaft. It is driven by a 5 HP explosion-proof motor up to 1,760 rpm, creating a vortex into which dry ingredients can be delivered for fast wetting.

The disperser is belt-driven with a removable drive motor, belt, and guard. The two-wing anchor agitator is direct-driven by a 5 HP explosion-proof removable gearmotor up to 45 rpm, designed with a heavy-duty triangular cross-section and removable Teflon sidewall scrapers. The anchor feeds product towards the high speed disperser blades and ensures that the batch contents are never stagnant in any one area.

Another new piece of equipment from Ross to make its way to market recently is the Ross CDA-



IMAGE: ROSS MIXERS

300 dual shaft mixer, fitted with a disperser that has an open disc blade capable of traveling roughly 5,000 feet/minute to induce vigorous flow. This creates a vortex into which dry ingredients can be added for fast wetting and the change can design features an air/oil hydraulic lift that allows the use of multiple temperature-controlled mix cans. Easy discharge is enabled by a 3 inch manually operated stainless-steel flush bottom ball valve with tri-clamp connection. The mixer is designed to produce air-free products with highly repeatable density, viscosity, composition, and dispersion quality, while the NEMA 12 control panel features a colour touch screen for user-friendly operation and provides independent agitator speed controls, load display, cycle timer, and other functions.

A specific challenge machinery makers have been keen to address in recent times is the proper dispersion of pigments, small-particle fillers, and other fine solids. Achieving uniform distribution, preventing agglomeration, minimising dust generation, and maintaining operational efficiency, are just a few of the processing issues that compounders must navigate. Strategies for solid-liquid

Main image:
The Inline High Shear Mixer from Ross Mixers fitted with SLIM technology, which is also available for batch mixers

Right: The new FDA-50 fixed tank dual shaft mixer from Ross Mixers

mixing consider various factors including viscosity profile, solids loading, and shear requirement, among others. Ross Mixers says it developed its Solids/Liquid Injection Manifold (SLIM) system to address the complexities of inducting powders into a low-viscosity liquid. The SLIM technology is available for both batch and inline high shear mixers, as well as in Ross multi shaft mixers.

“Batch to batch consistency is key to ensuring quality and highly repeatable end products,” the company said. “By using Ross SLIM technology, manufacturers can complete complex formulations in a fraction of the time compared to using traditional mixers such as sawtooth dispersers, axial flow impellers, and conventional rotor/stator devices. The SLIM introduces raw powders into the liquid phase right in the shear zone, creating the ideal environment for instant wet-out. It utilises a specially engineered rotor/stator design to generate a powerful vacuum without the need for external pumps or eductors. The intense negative pressure pulls powders into the liquid stream for the inline configuration or sub-surface for the batch configuration. In conventional mixing methods, undispersed agglomerates are a very common issue associated with fine particle dispersions, forcing operators to deliberately slow down powder addition or run the mixer for longer durations. In comparison, rotor/stator mixers equipped with the SLIM technology can quickly disperse these solids without the risk of forming agglomerates or fisheyes, saving production time and manpower.”

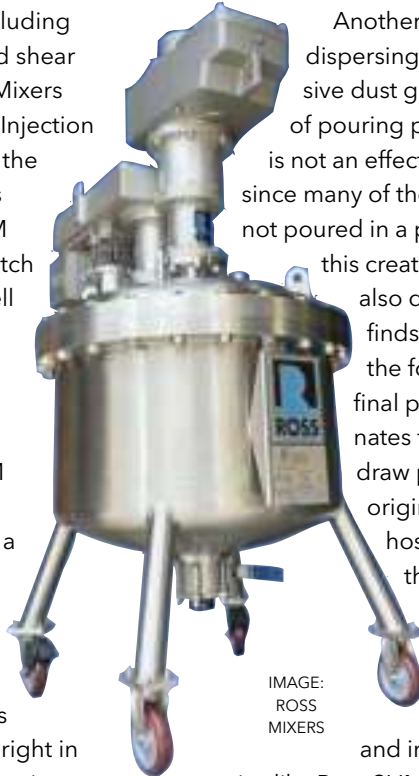


IMAGE: ROSS MIXERS

Another familiar issue associated with dispersing pigments into liquids is excessive dust generation. The traditional method of pouring pigments into an open-top vessel is not an effective way to maximise efficiency, since many of these powders become airborne if not poured in a precise manner. Not only does this create a health and safety risk, but it also dilutes the amount of powder that finds its way into the mixer, impacting the formulation and ultimately the final product. SLIM technology eliminates this issue since operators can draw powders straight from the original containers using a flexible hose and wand and deliver them to the batch without the opportunity for dust generation.

“As the compounding industry continues to seek ways to optimise process efficiency and improve product quality, technologies like Ross SLIM are vital components,” the company said. “The ability to rapidly and efficiently introduce solids into liquids often reduces mixing times from hours to minutes, resulting in a competitive advantage. By changing the way pigments and other fine solids are introduced and dispersed, this advanced system is setting new standards for efficiency and quality.”

The Centrifugal Inline Mixer (CIM) from Switzerland-based **Dec Group** is designed to work in tandem with Dec’s Powderflex system to ensure precise dosing of powders in small to medium quantities. The unique CIM inline mixing design concept, which allows for easy integration with existing tanks or vessels, uses centrifugal force to subject powder and liquid streams to intense agitation and turbulence ensuring powder particles are completely homogenised and efficiently mixing powders into liquids while maintaining a consistent ratio.

The CIM offers numerous advantages over batch mixing in tanks and other traditional methods, according to the company, including continuous operation, faster mixing times, lower energy consumption, improved product consistency, and simplified maintenance thanks to its compact and user-friendly design. To address dust generation, the CIM offers a pre-mix option in which powdery substances are fully mixed with liquid before entering the vessel thus preventing material loss through sticking and clogging of the walls. Further advantages include reduced need for cleaning, and high suitability for process automation.

Right: Ross Mixers developed its SLIM system to address the complexities of inducting powders into a low-viscosity liquid



IMAGE: ROSS MIXERS

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IMAGE: DEC GROUP



Above: The Centrifugal Inline Mixer (CIM) from Dec Group ensures precise dosing of powders in small to medium quantities

At the Compounding World Expo Europe, which took place in Brussels, Belgium in September, one of the exhibitors from the mixing technology sector was **Mixaco**. Guido Brand, Sales and Marketing Manager at the company, spoke in a conference session on how to make the most of advances in batch mixing technology. His presentation covered technology improvements in terms of flexibility, reliability, scalability and efficiency. Brand also gave a future outlook for mixing technology that took in developments in digitalisation (through connection to ERP software and also automation) and Industry 4.0 (including digital twins that can find the “golden batch”).

Compounding PVC

Rigid PVC is commonly used in construction materials such as decking, rails, window frames, and pipe fittings. Unlike flexible or semi-rigid PVC, it does not contain plasticisers, making it more challenging to process. A common method involves mixing with batch or continuous compounding equipment, finishing with a two-roll mill followed by water bath and a dicer. Key features of continuous mixing technology include adjustable mixing intensity, which is achieved by changing rotor speed and orifice position, as well as excellent temperature control throughout the mixing chamber, rotors, and extruder barrel. The standard six L/D rotor provides a short residence time and low heat history for the polymer, which is especially important for processing temperature-sensitive PVC.

Farrel Pomini’s rigid PVC solution involves compounding the PVC using its Farrel Continuous Mixer (FCM) to a hot feed single screw extruder for pelletising. The compound cools as it processes through the extruder while the newly designed Farrel Pomini Dry Face Pelletiser (DFP)

minimises the die pressure, any potential temperature increases, and efficiently cuts the pellet. After pelletising, an air transfer system completes the cooling process along with pellet classifying and dust and fine removal. The DFP has a compact and robust design, is easy to operate, and can be fully integrated into the Farrel Pomini Synergy Control System. The entire line can be completely automated with minimal operator involvement. This concept is currently commercially available for producing rigid PVC, providing a safe, cost-effective, and space-efficient solution. (Read more about Farrel Pomini’s technology in the PVC Recycling feature on page 23 in this issue.)

In the summer, **Plantech CST**, a member of the Syncro group and a specialist in turnkey plant engineering and manufacturing for storage, conveying, mixing, and dosing, successfully completed the installation of a PVC dryblend production plant at Laborplast. Roberto Pariani, CEO of Laborplast, said: “This new plant represents significant progress for Laborplast, not only in terms of production capacity, but also in the quality and innovation of the solutions we are able to offer our customers. Our collaboration with Plantech-CST has enabled us to adopt a cutting-edge technology that allows us to meet more efficiently our customers’ needs and pursue our ambitious environmental sustainability goals.”

The plant, based on Plantech CST’s Turbo Mix technology (hot and cold mixer) from the CACCIA-MYX series, includes a combo mixer with turbo and cooling mixer (RCC+RCH), a high vacuum pump system for the turbo mixer, big bag emptying stations for PVC powder, calcium carbonate and micronised recycled PVC, weighed cyclone filters (WHL) for vacuum feeding of turbo and cooling mixers. There is an automated control system for the mixer and feeding system, managed via PLC with customised supervision software

Right: The Farrel Pomini FCM with a single screw extruder

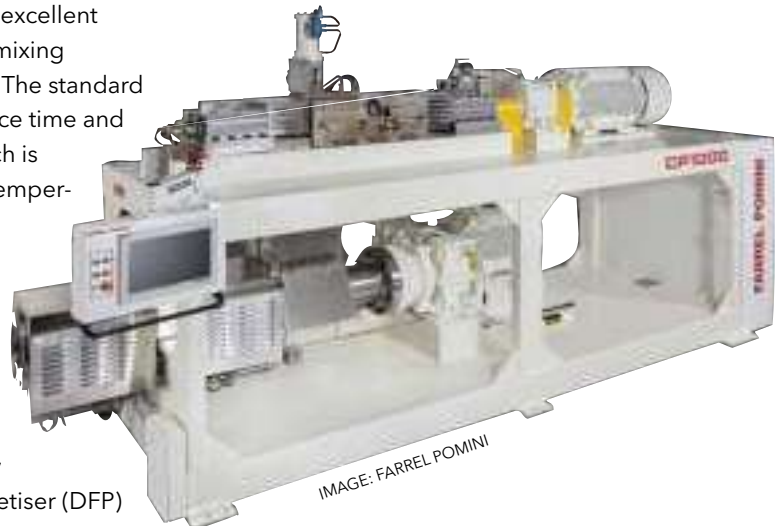


IMAGE: FARREL POMINI

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IMAGE: MARION



Above:
A Marion Horizontal Mixer featuring its new paddle design

Late last year, **Marion Process Solutions** introduced an improved agitator design for its 30-inch diameter and smaller horizontal mixers. The new plated paddle agitators are manufactured with the paddle and arm sections cut from a single piece of stainless steel, reducing welding requirements and offering operators low-maintenance and enhanced cleanability. Due to the integrated placement hole design additional arms can be attached, which means the length of the paddles is shortened to facilitate improved mixing efficiency. **Nan Yun** is a Taiwan-based designer and

producer of high performance mixing screws and barrels. At the TaipeiPlast 2024 exhibition in Taiwan in September, Project Manager Clare Yang said: "Our engineers conduct thorough analysis according to the customer's machine model, required production capacity, and resin properties, before the design even takes place," said Yang. "All the factors that may affect screw performance are considered and the final product designed to accommodate them. During manufacture we apply various design theories and technical knowledge such as screw type, length/diameter ratio, flight depth, flight density, helix angle, etc. This attention to detail ensures our customers are as efficient and productive as can be. If we give them good quality, our customers can make good machines and products, making it a win-win situation."

CLICK ON THE LINKS FOR MORE INFORMATION:

- > www.mixers.com (Ross)
- > www.dec-group.net
- > www.farrel-pomini.com
- > <https://syncro-group.com/plantech-cst>
- > www.marionsolutions.com
- > www.nyi.com.tw



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The October 2024 issue of Compounding World explores the world of graphene and carbon nanotubes, reports on new additives for recycling and looks at developments in alternative compounding technology.

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The September 2024 issue of Compounding World magazine has features on sustainability in colour pigments, demanding applications for antioxidants and UV stabilisers, and the latest compounds for thermal conductivity and high-temperature environments.

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**Injection World
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The September-October edition of Injection World includes a cover feature on advances in injection moulded packaging, plus articles covering developments in TPEs and granulator technology. There is also a preview of Fakuma 2024 in Germany.

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**Plastics Recycling World
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Plastics Recycling World's October edition has a review of plastics recycling line developments, plus features on additives for recyclate and the latest technology and materials for odour reduction, and a preview of the Plastics Recycling World Expo in Cleveland in November.

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**Pipe and Profile
Autumn 2024**
Pipe and Profile Extrusion's Autumn edition has features that explore applications for pressure pipe, recent developments in recycling and granulation, and new extruder technology. Plus a preview of the Plastics Extrusion World Expo in Cleveland in November.

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**Film and Sheet
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Film & Sheet Extrusion's October edition has features covering technology for granulation and recycling, developments in extruder systems, biaxially-oriented film market and technology, and mineral additives.

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GLOBAL EXHIBITION GUIDE

Year	Event Dates	Event Name & Location	Website
2024	13-14 November	Compounding World Expo US, Cleveland, OH, USA	https://na.compoundingworldexpo.com/
	4-7 December	PlastEurasia, Istanbul, Turkey	https://plasteurasia.com/en
	11-14 March	Plastimagen, Mexico City	www.plastimagen.com.mx
	18-20 March	Plastics & Rubber Vietnam, Ho Chi Minh City, Vietnam	https://plasticsvietnam.com
2025	24-28 March	Plástico Brasil, São Paulo, Brazil	www.plasticobrasil.com.br
	15-18 April	Chinaplas, Shenzhen, China	www.chinaplasonline.com
	6-9 May	Moulding Expo, Stuttgart, Germany	https://www.messe-stuttgart.de/moulding-expo
	7-8 May	PlastTeknik Nordic, Malmö, Sweden	www.plasttekniknordic.com
	8-10 May	RePlast Eurasia, Istanbul, Turkey	www.replasteurasia.com
	14-15 May	Compounding World Expo India, Mumbai	www.compoundingexpoindia.com
	27-30 May	GreenPlast, Milan, Italy	www.greenplast.org
	3-5 June	UTech Las Americas, Mexico City	www.utechlasamericas.com
	4-5 June	Textiles Recycling Expo, Brussels, Belgium	www.textilesrecyclingexpo.com
	8-15 October	K2025, Dusseldorf, Germany	www.k-online.com
	4-7 December	PlastEurasia, Istanbul, Turkey	https://plasteurasia.com


AMI CONFERENCES

12 November 2024	Performance Polyamides, Cleveland, OH, USA
18-20 November 2024	Fire Resistance in Plastics, Cologne, Germany
20-21 November 2024	PVC Formulation Asia Bangkok, Thailand
2-4 December 2024	Stretch and Shrink Film North America, Charleston, SC, USA
3-4 December 2024	Polymer Engineering for Energy, London, UK
5-6 December 2024	Polymers in Hydrogen and CCUS Infrastructure, London, UK
10-11 December 2024	Recycling Flexible Packaging, Vienna, Austria
10-11 December 2024	Multilayer Flexible Packaging, Vienna, Austria

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