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Plastics Recycling WORLD



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LG Chem partners with Volkswagen in ETPs

LG Chem has signed a memorandum of understanding with the Volkswagen Group covering engineering plastics (ETPs) from virgin and recycled sources.

Under the agreement, the two companies will collaborate on developing next-generation plastics and composite materials, as well as on reducing vehicle weight and improving performance, using LG Chem's ABS and ETPs. These high-performance plastics typically have excellent impact strength, durability, and processability, and are widely used in car exterior components and automotive parts.

"We expect this to be a meaningful starting point for global automakers and materials companies to jointly drive innovation in future mobility materials," said Kim Sangmin, Senior Vice President and Head of LG Chem's Petrochemicals Company. "Based on our technological capabilities and competitiveness in the field of high-value-added, eco-friendly materials, we will work with our customers to set new milestones for sustainable growth."

LG Chem also intends to explore ways to expand the use of its post-consumer recycled materials in the interior and exterior components of the Volkswagen Group's major automotive brands.

LG Chem has a total ABS production capacity of 2.35m tonnes/yr domestically and internationally, and maintains a strong portfolio of ABS products that can be used in customer-specific applications such as side mirrors and radiator grilles.

› **www.lgchem.com**

IMAGE: LG CHEM



Kim Sangmin, Senior Vice President and Head of LG Chem's Petrochemicals Company (left) and Stefan Gramse, Executive Vice President and Head of the Exterior Materials Procurement Group at the Volkswagen Group

EPC Coalition is set up

The European Plastics Circularity (EPC) Coalition has been formed by 32 organisations from the plastics and packaging value chain. The industry-led initiative is advocating for policies that strengthen plastics circularity and investment in Europe.

Eastman, one of the industry members, said the EPC Coalition is calling for the mandatory recycled-content targets under Article 7 of the PPWR to be met with waste collected, sorted, and recycled in EU, the European Free Trade Association (EFTA), the UK, or in third countries that demonstrate genuine equivalence across their entire recycling system.

The group says these measures can provide the certainty needed to expand collection, sorting, and recycling infrastructure across Europe.

› **www.eastman.com**

Covestro opens pilot plant for PU recycling

Covestro has opened a new pilot plant for the chemical recycling of high-performance elastomers at its Leverkusen site in Germany, in a "double-digit million-euro" project.

"With this pilot plant, we are bringing innovative chemistry closer to industrial application and responding to our customers' growing demand for circular solutions," said Monique Buch, Chief Commercial Officer of Covestro.

Vulkollan is a high-performance polyurethane elastomer used in forklift wheels, railway buffer elements, automotive jounce bumpers, and vibration control components. Covestro's chemical recycling process enables more than 90% of the material by mass to be recycled.

› **www.covestro.com**



IMAGE: COVESTRO

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Borouge expands mechanical recycling plants in Europe

Borouge International, the company formed earlier this year when Borouge, Borealis, and Nova Chemicals merged, has announced significant investments to expand its mechanical recycling capacity at several European locations.

The expansions support customers in securing more reliable access to circular materials driven by brand preference, evolving regulatory requirements, and supply chain requirements.

"Circular materials are a strategic resource for Europe and around the world, not only to meet sustainability and regulatory requirements, but also to strengthen industrial competitiveness, brand differentiation, and supply resilience," said Dirk Langhammer, Senior Vice President Circular Solutions, Borouge International. "The investments in our European recycling platform give an even larger range of customers more reliable access to circular polyolefin solutions."



IMAGE: BOROUGE

At Borouge International Niedergebra in Germany, formerly MTM Plastics, the output of recycled mixed polyolefin (rPO) materials will increase by close to 9,000 tonnes/yr. At Borouge International Wildon in Austria, formerly Ecoplast, recycled polyethylene (rPE) output will increase by up to 5,000 tonnes/yr.

Borouge International Elin Pelin in Bulgaria, which produces more than 20,000 tonnes/yr, completes Borouge International's European mechanical recycling portfolio.

› **www.borougeinternational.com**

Sumika plans auto PP recycling

Sumika Polymer Compounds Europe said it will produce a range of recycled polypropylenes at a new recycling unit in France to meet the needs of the automotive sector in response to the EU's regulation on end-of-life vehicles.

The company is investing €13m in the plant in Saint-Martin-de-Crau which will have production capacity of more than 10,000 tonnes/yr of recycled PP.

Its waste feedstock will come from the automotive industry.

› **www.sumikaeurope.com**

France revises bottle DRS plans

On 4 September 2026, the French Ministry of Ecological Transition announced that it had officially dropped plans for a mandatory nationwide deposit-return system (DRS) for plastic bottles, opting instead to allow towns and cities to set up voluntary local schemes.

The decision follows a three-month consultation with towns and cities, bottle manufacturers, and recycling companies, said the ministry.

France has previously delayed other plastic-related measures. The government delayed the deadline for a ban on single-use plastic cups to 1 January 2030, having initially set a date of 1 January 2026 for the planned ban.

This decision was based on an in-depth technical analysis which concluded that no fully operational alternative currently allows for the industrial production of plastic-free cups under conditions that satisfy consumers, businesses, and health requirements.

› **www.ecologie.gouv.fr**

Alliance updates in progress report

The Alliance to End Plastic Waste has released its latest Progress Report, marking its first year of putting Strategy 2030, which aims to transition from smaller, standalone projects to larger-scale integrated Country and Thematic Programs, into practice.

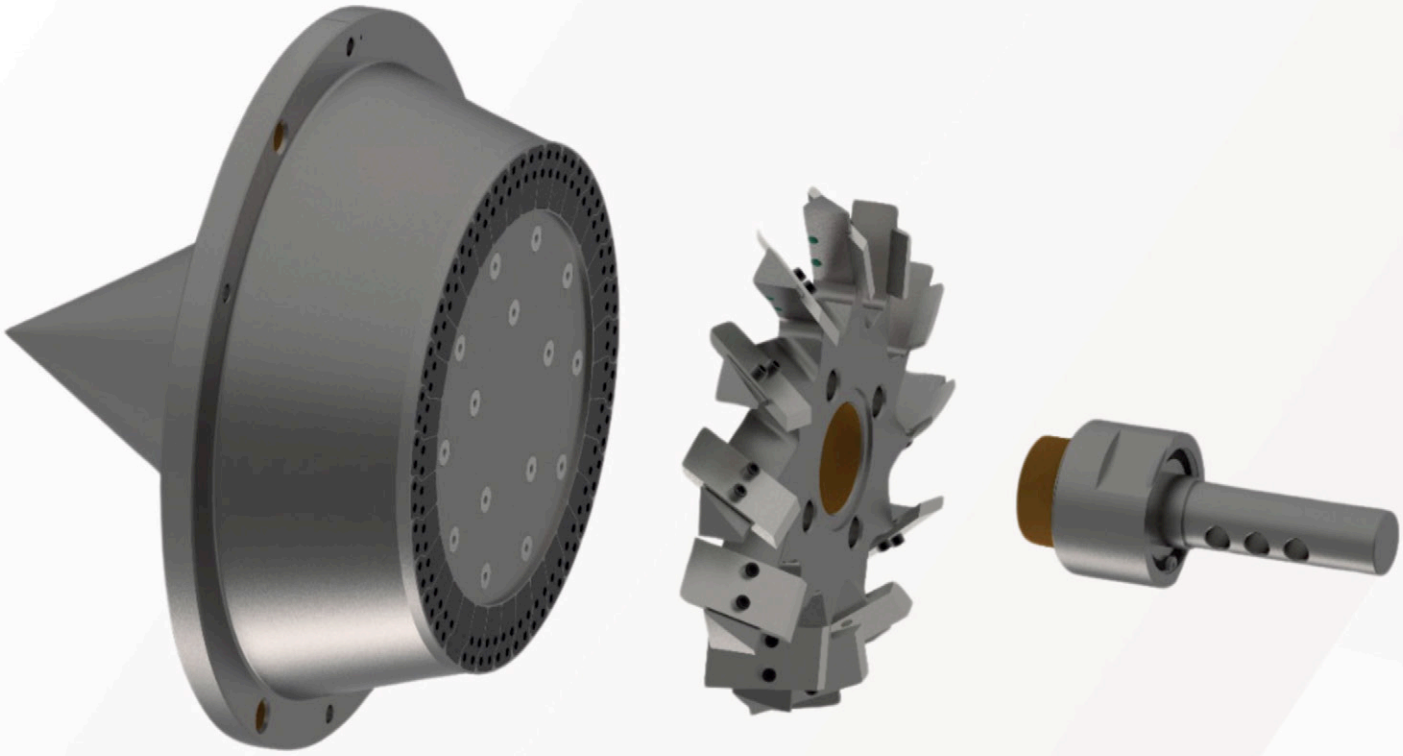
Last year, the Alliance engaged 559 organisations in its projects, reduced 138,162 tonnes of unmanaged plastic waste, and valorised 165,317 tonnes. Beyond tonnage, the Alliance has catalysed $641m in funding commitments from third parties and impact investors since 2019. The Alliance said that its education and behaviour-change initiatives have reached over 1.5m people since inception.

› **www.endplasticwaste.org**

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Politicians, officials and dignitaries at the project expansion event

New infrastructure for PET bottles in Indian city

The Government of Maharashtra, Thane Municipal Corporation (TMC), and Hindustan Coca-Cola Beverages (HCCB), have expanded the Maha recycled PET project in Thane, India, with the inauguration of the Thane PET Collection Centre.

The development comes amid a series of initiatives aimed at strengthening the collection and recycling of used PET bottles across the city.

"The Thane Collection Centre is an important step towards creating a more organised and traceable supply chain for recyclable materials, enabling segregation at source and the identification of food-grade PET for high-value recycling applications," said Avinash Kant Kumar, Head of Integrated Supply Chain, Hindustan Coca-Cola Beverages (HCCB). "This model demonstrates how industries can work alongside public systems to improve resource efficiency, support the availability of quality recycled material, and build resilient, sustainable supply chains."

The newly-inaugurated facility will serve as a dedicated aggregation and collection facility for used PET bottles recovered through the initiative. Dedicated collection bins will encourage residents to segregate used PET bottles at source, while retailers who actively contribute to the collection effort will be recognised.

The programme also showcased benches manufactured using recycled PET plastic collected through the initiative.

› **www.hccb.in**

New garments from waste

Carbios has successfully manufactured, on European industrial lines, high-quality recycled polyester t-shirts from complex textile and plastic waste, in partnership with the Fiber-to-Fiber Consortium: Patagonia, Puma, and Salomon.

"This achievement demonstrates that enzymatic recycling meets the highest requirements of the textile industry," said Benoît Grenot, Managing Director of Carbios. "By transforming complex waste into high-purity molecular building blocks for the production of recycled polyester, we prove that circularity is already an operational reality that can be concretely deployed on an industrial scale."

Monomers were repolymerized by Selenis in Portugal, the PET was spun into yarn by Antex in Spain, then knitted into fabric by Henitex in France.

› **www.carbios.com**

Consortium formed to deal with waste banners

SK Chemicals has formed the Waste Banner Resource Circulation Consortium in South Korea with several partners including MOA, Daehan Media, and Upcloth, and is launching a full-scale collaboration to build a regional circular economy model for waste banners.

A representative of SK Chemicals said: "Waste banners are a waste issue that most local communities are grappling with, but each region's circumstances and approaches differ to some extent. Through collaboration with the participating organisations, we will broaden the scope to the metropolitan and provincial level to build waste banner circulation systems, and create real success stories of turning waste banners back into banners."

Because banners are typically used only once for events, elections, and similar purposes, most are discarded after a short period.

According to the South Korean Ministry of Climate, Energy and Environment, approximately 6,000 tonnes of waste banners are generated in Korea each year, and about 70% of them end up being landfilled or incinerated.

› **www.skchemicals.com**

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Japanese protocol for deinking

The Artience Group, through its subsidiary Toyo Ink, and DIC Corporation, have developed the first common industry protocol to standardise test procedures, evaluation criteria, and reporting formats, for deinking and debonding in the recycling of flexible film in the Japanese market.

This protocol establishes a unified environment where stakeholders across the supply chain, including converters, brand owners, and recyclers, can evaluate and compare recyclability based on shared standards.

By pooling expertise in printing inks, laminating adhesives, and recycling technologies, the companies involved have established a blueprint consisting of three core elements, Test Procedures, Evaluation Criteria, and Reporting Format.

› **www.artiencegroup.com**
› **www.dic-global.com**

Sorema to set up rPP line in Romania

Recycling technology group Sorema has been selected by Total Recycling to install a new polypropylene (PP) recycling line in Timișoara, Romania.

With a capacity of 2 tonnes/hr, the new line will process PP material sourced from both local collection streams and other EU countries.

The plant will cover the recycling process from sorting to washing, including a batch hot-washing stage, with the aim of achieving the high material quality required for demanding PP applications.

Romania is an important market for Sorema, but this will be the first line it has installed in Romania specifically dedicated to the production of high-quality recycled PP.

For all involved, the new Timișoara plant represents a forward-looking investment in the development of high-quality PP recycling in Europe. For Sorema, it also adds another important reference to its European installed base, the company said, confirming the value of a technological approach built around quality, reliability, and long-term performance.

The new line is scheduled to start up in mid-2027.

› **https://sorema.it**
› **www.totalrecycling.ro**

HDPE recycling research project

The Fraunhofer Institute for Structural Durability and System Reliability (LBF) and the German Federal Institute for Materials Research and Testing (BAM) have launched the MultiCycCon research project to investigate how repeated recycling affects stress cracking resistance of high-density polyethylene (HDPE) in hazardous materials containers.

The project will simulate real-world usage and recycling cycles in a laboratory setting with the goal of enabling manufacturers, processors, and recyclers, to evaluate material quality and use recycled materials more safely and economically.

Specifically, three HDPE materials will undergo up to ten extrusion steps, with additional samples aged through thermo-oxidative processes or UV radiation and then reprocessed. After defined process steps, Fraunhofer LBF will analyse mechanical properties, molecular weight distribution, melt behaviour, and chemical changes, while BAM will examine crystallinity, oxidation stability, and stress crack resistance.

The project results are expected to help recyclers to identify unsuitable batches early on, and thereby avoid production defects.

› **www.lbf.fraunhofer.de**

Thai firm scales up PET recycling project

PET bottle manufacturer HaadThip, which distributes Coca-Cola beverages across 14 provinces in Southern Thailand, is scaling up its Southern Recycling Alliance. To this end it has signed a Memorandum of Understanding with Oxytech and Royce Universal to transition the scheme from pilot initiative to ongoing operations.

"During the second quarter of this year, the PET market experienced volatility resulting from the situation in the Middle East," said Major General Patchara Rattakul, Chief Executive Officer, HaadThip. "This drove up virgin PET prices and raised concerns about supply continuity."

Under the reverse logistics model, Oxytech purchased post-consumer PET bottles from collectors and buyers then sorted, cleaned, and processed them into PET flakes in accordance with HaadThip's specifications. HaadThip transported the PET flakes to Royce Universal's facility in Nakhon Pathom province to produce food-grade rPET pellets, which were used to produce new beverage bottles.

During discussions to develop the expanded collaboration, HaadThip initially ordered more than 1,000 tonnes of rPET pellets from Royce Universal.

› **www.haadthip.com**

Making advances with recycling lines

Technology groups are focusing on all process stages to enhance efficiency and quality for recyclers, writes Chris Saunders in this round-up of new machinery developments

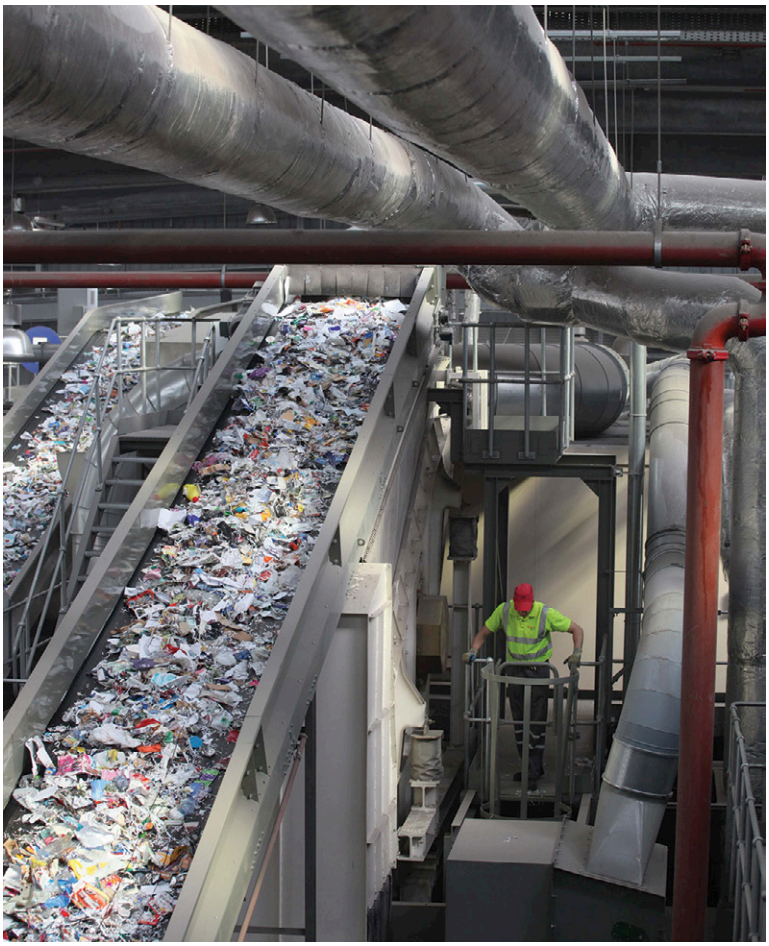


IMAGE: VEOLIA

Main image: With regulation bearing down on them, plastics recyclers must ensure their machinery delivers high quality and other benefits

The boundaries between plastics compounding and recycling are becoming increasingly blurred. As recyclers are asked to produce materials with tighter specifications, and compounders face growing demand for higher recycled content, equipment manufacturers are developing lines that combine feeding, extrusion, filtration, devolatilisation, compounding, and pelletising, into increasingly integrated production systems. At the same time, the emphasis is shifting from simply processing more volume to processing difficult feedstocks more efficiently while still delivering material quality. New systems increasingly seek to optimise material flow, an approach particularly important for post-consumer recycled (PCR) plastics where contamination, moisture, variable bulk density, and inconsistent polymer composition, can make consistent extrusion difficult.

In response to rapidly growing demand for high-capacity polyolefin recycling systems, at K2025 **Nordson BKG**, part of Nordson Corporation's Polymer Processing Systems division, and **Fimic**, announced a strategic collaboration to deliver fully integrated solutions capable of processing up to 6 tonnes/hr of PCR plastics. The partners say these solutions address key industry challenges, including material variability, filtration limitations, and costly downtime. By integrating Nordson's advanced gear pumps, valves, and underwater pelletising systems with Fimic's high-performance filtration units, the systems ensure consistent pressure, superior filtration, and pellet homogeneity, even at high throughputs.

To meet the diverse demands of high-capacity polyolefin recycling, the companies engineered a modular system architecture offering exceptional operational flexibility in three configurations, DO (Discontinuous Operation), CO (Continuous Operation), and CFO (Continuous Flexible Operation), each tailored to specific production environments. Key features include: seamless integration from twin-screw adaptor flange to underwater pelletiser; intelligent pump control, modular system design; and minimal operator involvement; which combine to maximise performance and lower Total Cost of Ownership. Meanwhile, the fully automated, intelligent venting process ensures consistent product quality and innovative design strategies, including mobile components and thermal elongation adaptors.

In June, **Erema** held its Edvanced Recycling Days event at its headquarters in Ansfelden, Austria, bringing together industry players from



IMAGE: EREMA

Right: Visitors at Erema's Edvanced Recycling Days in Ansfelden, Austria, in June

across the plastics value chain. Group CEO Manfred Hackl emphasised that increasing recycled content is not just about volume, but about reliability. Stable quality, clearly specified material properties and a consistent supply of recyclates are essential to achieve this, he said.

Clemens Kitzberger, Business Development Manager Post Consumer Recycling, focused on technologies that help closed-loop recycling. PCR material needs to meet clearly defined and increasingly demanding quality standards. He indicated the EU Packaging and Packaging Waste Regulation (PPWR) can be seen not just as a regulatory framework, but also as an opportunity to drive quality and open new application fields.

Live technology demonstrations at the Erema event included: supermarket film recycling with Intarema TVEplus DuaFil Compact; HDPE regrind recycling with Volex high-performance degassing; PP regrind recycling and compounding with Corema technology; processing highly contaminated input material as a feedstock for chemical recycling using Agglorema.

Adding to capacity

Finnish recycling company **Syklo** is expanding capacity at its new Circular Economy Hub in Hyvinkää with three new extrusion lines supplied by **Leistritz** capable of processing mixed PCR plastics. The Nuremberg-based compounding technology specialist is supplying three cascade extrusion lines that significantly increase the efficiency of recycling HDPE, LDPE and PP from PCR waste streams, boosting Syklo's recycling capacity in Finland by up to 50%. At the heart of each line is the Leistritz ZSE twin-screw extruder with Maxx technology in combination with **NGR's** C-Gran cutter-compacter-extruder solution, which enables the recycled material to be melted and homogenized before being compounded.

Below: Unipack modernised its polyester strapping tape production line with a Gneuss Omni extrusion system



IMAGE: GNEUSS

"With the EU Packaging and Packaging Waste Regulation coming into force, the requirements for plastic packaging are rising significantly, from mandatory recycled content to extended producer responsibility and stricter material specifications," said Teemu Koskela, CEO of Syklo. "For us, this means that recycling must become more efficient, more precise and even more sustainable. At the same time, recycled products must meet substantially higher quality demands. Thanks to Leistritz's innovative twin-screw technology and decades of expertise, we can now reliably meet these challenges."

Another company that made pre-emptive plans for the new PPWR regulations is Hungarian thermoforming specialist **Kurucsai Plastic**, which has been producing food-grade rPET on a **Gneuss** MRS extrusion line since the beginning of 2025. The company initially produced thermoformed packaging for its own fruit and vegetable products, but today it supplies customers throughout the food industry. As production capacities continued to expand the company gradually converted its sheet production from PP to PET, the transition driven by increasing requirements for recyclable packaging and the growing use of recycled content. At the same time, the company aims to become less dependent on raw material availability by being able to process a wider range of PET feedstocks.

Making a switch

The switch, however, introduced a major processing challenge. PET is hygroscopic and readily absorbs moisture from the surrounding environment. In conventional extrusion processes, it must therefore be dried before processing to ensure consistently high sheet quality, particularly when recycled material is being used. The company therefore looked for an extrusion solution capable

of processing different PET feedstocks without upstream material drying while maintaining maximum energy efficiency, finally settling on a Gneuss MRS 110 extruder with a throughput of up to 600 kg/h.

At the heart of the Gneuss system is the patented Multi Rotation System (MRS) technology. Multiple satellite screws significantly increase the melt surface area, enabling highly efficient devolatilisation and decontamination of the melt. As a result, virgin resin, bottle flakes, and in-house production regrind, can all be processed without the need for energy-intensive pre-drying. A gravimetric dosing system allows different material streams to be blended while a Gneuss RSFgenius rotary filtration system continuously removes solid contaminants from the melt, ensuring consistently high sheet quality.

Czech packaging specialist **Unipack** has recently modernised its polyester strapping tape production line by replacing an older, existing extruder with a Gneuss Omni extrusion system. The new system has been operating successfully since the beginning of 2026, delivering higher production output, significantly more stable processes, and noticeable energy savings. Unipack, which produces PP and PO strapping tape, has continuously expanded its production capacities in recent years and installed the setup – consisting of a four-component dosing system, an MRS 90 extruder, a 25 mbar vacuum unit, an RSFgenius melt filtration system, a VIS online viscometer, melt pump, and strapping die – as part of a modernisation project. As feedstock, the company mainly processes coloured PET bottle flakes that are typically not suitable for bottle-to-bottle recycling.

"With the new Gneuss technology, we do not need expensive material preparation. With a residence time of 5-6 hours, we are able to monitor the viscosity of the material online and, most importantly, thanks to excellent filtration, we have stable production without unnecessary interruptions," said Project Manager Dušan Rejthar. "Our productivity has increased and the amount of waste has decreased from 7% to 3%."

Pakistan development

PET producer **Novatex** has invested in a new **Starlinger** bottle-to-bottle recycling system, able to produce up to 24,000 tonnes/yr. Novatex sources

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IMAGE: STARLINGER



Above: Starlinger RecoStar bottle-to-bottle PET recycling system

the PCR PET bottles mostly from municipal kerbside collection across Pakistan, and the rPET chips it produces are used in the company's own PET preform production or sold on the local and international market.

"By producing bottle-grade recycled PET we want to support our partners PepsiCo, Coca-Cola, and others, to meet their circularity targets," said Rizwan Diwan, CEO at Novatex. "The produced rPET has all the necessary food-contact certifications and is being used by all major brands. In addition, the government of Pakistan is pushing hard to eliminate single-use plastics and plastic waste."

Pakistan does not yet have a national mandatory recycled content quota for plastic packaging comparable to the EU's PPWR, despite studies estimating that Pakistan generates around 3.12m tonnes of plastic waste annually, of which only 4% to 9% is currently recycled. The country's efforts to tackle plastic waste, however, are evolving. In the last year, it has moved from plastic bans and pilot initiatives in individual provinces toward a more coordinated national approach, but implementation remains uneven. In April 2025, the government of Pakistan, together with the United Nations Development Programme and the World Economic Forum, launched the National Plastic Action Partnership Roadmap, which has been described as the most important framework for plastics waste management on a national level.

Paths to market

Coperion has received a Letter of No Objection (LNO) from the US Food and Drug Administration (FDA) for its HDPE and PP recycling technology, confirming that the combination of Coperion twin screw extruders and EcoFresh silo degassing used in the manufacture of rHDPE and rPP fulfils the requirements for direct contact with food. Coperion says it is the first provider of complete decontamination systems featuring twin screw extruders and EcoFresh silo degassing to offer the market a highly efficient solution for the production of food-grade recyclates, covering capacities from small throughputs up to 6,000 kg/h.

The company says this opens up a range of new possibilities in the recycling of food packaging. For example, food-grade regranulate can be produced from HDPE milk jugs or fruit juice bottles, and then reused to manufacture similar bottles or related products. Raw material for the food-safe rHDPE recyclate process generally consists of used HDPE beverage bottles or their caps, while the material stream for rPP compounds consists of vegetable trays, packaging, yogurt containers, and the like. The material is fed into the extruder via Coperion K-Tron gravimetric feeders, where it is first melted, intensively mixed, homogenised and degassed.

Coperion says it benefits from many years of experience in melt and solid devolatilisation when designing process parameters, and has designed both the process and the screw configuration to optimally meet the requirements of the respective recycling application. The material is purified of solid foreign materials via a melt filter and then pelletised before undergoing a second decontamination step in the EcoFresh silo degassing unit. "The basis for the suitability of our HDPE and PP recycling solutions for manufacturing food-contact materials lies in our integrated approach as a system provider," said Stefan Lachenmayer, Global Commercial Director Recycling at Coperion. "We look at the entire process and apply our decon-



IMAGE: COPERION

Right: Coperion's EcoFresh silo devolatilisation solutions ensure residual odours are removed from the compounds

tamination technologies at specific points in the process chain. It is their optimal interplay that makes the achievement of the necessary level of decontamination possible."

In May, **BlueAlp**, a chemical recycling company in the Netherlands, announced a partnership with **KraussMaffei Extrusion** focusing on its ZE BluePower technology. Co-rotating twin-screw extruders designed for demanding recycling applications and high energy efficiency were installed at the BlueAlp plant in Italy, as well as at its plant in Oostende, Belgium. The extruder ensures efficient, stable, and reliable conditioning of materials, claims that have been supported through testing at the KraussMaffei Technology Centre in Laatzen, Germany.

"The BlueAlp project is a prime example of how our extrusion technology can make a decisive contribution to scaling up chemical recycling processes," said Ralf Benack, Managing Director of KraussMaffei Extrusion.

Together with KraussMaffei, **BASF**, **Rampf**, and **Remondis**, have developed an industrial polyurethane recycling process which enables chemical recovery even with heavily contaminated regrind. Until now, PU foam from old refrigerators has often been incinerated, but it is likely that the thermal recycling of plastics will be more restricted in the future. KraussMaffei is therefore in the process of industrialising a process for the continuous chemical recycling of PU.

This continuous extrusion method can efficiently handle PU regrind with contamination levels of up to 30%. In order to achieve depolymerisation using a glycolysis process modified by Rampf, the PU regrind is mixed with depolymerisation agents and other additives in the extruder. The result is an intermediate product from which a high proportion of foreign substances can be filtered out directly in-line. The polyol with recycled content obtained in the process can be used by BASF as a component of PU systems for the production of rigid foams.

New feeder

At the Fakuma exhibition in October, KraussMaffei presented the new ZSA UltraCycle, a side-feed system for twin-screw extruders developed specifically for recycling. It features integrated compaction which allows multiple process steps to be combined.

The ZSA UltraCycle is specifically designed for fluffy recycled materials that pose challenges for conventional feeding systems due to their low bulk density of 10 kg/m³ or more and their high volume. These include, for example, thin-walled flakes, film scraps, or plastic fibres from consumer waste, as well as fibres from textile recycling. Typical materials include PET, LDPE, and PP flakes, as well as fibres and fabrics made of PA and polyester.



The new ZSA UltraCycle side feeder from KraussMaffei Extrusion is specifically designed for fluffy recycled materials that pose challenges for conventional feeding systems

IMAGE: KRAUSSMAFFEI

The side-feeding system features two screws, designed to ensure efficient compaction of the material. This allows large quantities of light recycled materials with a low bulk density to be reliably conveyed into the feed zone of KraussMaffei Extrusion's ZE BluePower twin-screw extruder without compromising gravimetric dosing accuracy. The result is consistent throughput, high recipe accuracy, and stable process control, said the company.

In trials conducted at the KraussMaffei Extrusion Technology Centre in Laatzen, Germany, ZSA UltraCycle was operated at an exemplary throughput of 1,000 kg/h, which leads to potential electricity savings of up to 400,000 kWh annually, according to the company.

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IMAGE: SHUTTERSTOCK



Research into improved solutions for both detection and reduction of odours and emissions aims to support the growing use of PCR, reports Jennifer Markarian

Ways to solve the odour problem with recyclate

Malodours can be a tricky problem in plastics applications. One challenge is that what is considered an unpleasant smell can vary by culture and even by person. Another challenge is that while the human nose can be very sensitive to what is repellent, detecting these components and identifying their source is another matter. As the plastics industry moves ahead with using more mechanically recycled post-consumer recycled (PCR) content, the problem becomes even more pressing, as odours can remain from previous uses or result from degradation or other reactions.

New technologies aim for improved detection of volatile and semi-volatile organic compounds (VOCs and SVOCs) that cause malodours. Additives can be used to mask or neutralise odours, and both additive and processing technologies work to remove culprit compounds.

In ABS and PC/ABS applications, mandates for recycled content are pushing more PCR and post-industrial recycled ABS into blends, but the resulting odour can be a challenge for meeting specifications, especially for interior automotive parts where specifications are increasingly tighter, said Torey McCleskey, COO at **CAI Performance Additives**. Blends with higher recycled content may pass mechanical tests but fail on VOC or odour levels, he explained.

The company's solution is LDV8010, a VOC removal masterbatch in an ABS carrier that removes odour sources during the compounding process. The additive masterbatch creates a foam in the melt of the extruder; VOCs bind to the foam and are vented from the extruder during devolatilisation. Typical dosage is 1-2%. Tests of 2% of the masterbatch in a 60/40 PC/ABS blend showed odour level improved from 4.6 down to 3.5 without affecting mechanical properties, McCleskey reported. Similarly, total VOCs were reduced with 2% of the masterbatch in a 50/50 PC/ABS blend.

In foamed applications that use azodicarbonamide (ADC or azo) foaming agents, a bad smell can result from decomposition of the ADC. CAI's ST-BA13MB is an endothermic foaming agent

Main image: New technologies aim for improved detection of volatile organic compounds that cause malodours

IMAGES: FRAUNHOFER CCPE



Above: Sandwich specimen with a core of recyclate (brown) and a skin material without odour barrier additives during sensory evaluations. Right: This was compared to a specimen with an odor barrier skin

masterbatch for extrusion, injection, and blow moulding in HDPE, PP, and other olefins is an azo-free and formamide-free technology that avoids this problem, said McCleskey.

"Furniture and durable-goods moulders evaluating foaming often cite decomposition odour from conventional azo systems as an EHS [environmental health and safety] and shop-floor issue. We're in active trial discussions with a major US furniture moulder on HDPE blow moulding," he said.

HPF The Mineral Engineers, a division of **Quarzwerke** group, said that its Rescofil functional mineral odour absorbers use a combination of physical and chemical adsorption mechanisms to reduce odour-causing substances. In recent trials with recycled PP, the mineral filler was found to successfully reduce odour levels to an acceptable level according to the VDA 270 German automotive industry standard for odour.

Concentrate producer **Chroma Color Corporation** introduced its ChromaFresh product line, which incorporates scent additives in colour concentrates. The company said that the scent can be used to counteract unpleasant odours, including any lingering odours from PCR. The concentrates are intended for applications such as packaging, toys, household goods and personal care items.

Analytical improvement

SepSolve Analytical and Markes International, now part of the Velaris family of lab-automation brands, have developed advanced methods for characterising the volatile compounds responsible for odours, supporting vehicle interior air quality (VIAQ) testing and analysis of emissions from materials. The companies presented a new approach that builds on conventional gas chromatography coupled with mass spectrometry (GC–MS) by incorporating thermal desorption (TD) with two-dimensional gas chromatography and time-of-flight MS (GCxGC–TOF MS).

This enhanced technique delivers substantially greater sensitivity and chromatographic resolution, allowing trace odourants to be separated from more abundant matrix components, such as aliphatics, which can obscure their detection in traditional one-dimensional GC methods, said Laura McGregor, Senior Product Marketing Manager, Separation Technologies, at SepSolve.

To accelerate data interpretation, the companies also demonstrated the Smart Subtract tool within ChromCompare+ software, which automatically highlights chemical differences between "good" and "bad" samples, allowing analysts to quickly identify problematic odour-causing compounds and other chemical markers associated with sample failures. Furthermore, the comparative data can also be used to develop predictive classification models for screening and classifying future samples, supporting more efficient odour evaluation and quality control workflows, she reported.

Odour barrier

The **Fraunhofer Cluster of Excellence Circular Plastics Economy** (CCPE) brings together multiple Fraunhofer Institutes in Germany to conduct research in processes and products focusing on the lifecycle of plastic products to help the industry transform from a linear to a circular economy. This work includes developing concepts to minimise odours and emissions from plastic recyclates.

In a project called SIMBA, for Demonstration of the Barrier Layer in Materials and Components, the researchers investigated odour-barrier technology for recycled plastics in furniture applications. Using a patented multilayer concept, odour scavengers based on modified zeolites are concentrated in a dedicated barrier layer instead of being directly added to the bulk, which has proven significantly more effective, reported Michael Großhauser, part of the CCPE team and deputy head of the department Additivation and Durability at the Fraunhofer Institute for Structural Durability and System Reliability LBF.

"Previous work confirmed strong odour reduction in rPP, rPS and HDPElignin systems under accelerated ageing. In SIMBA, these formulations are further optimised, characterised (mechanics, VOC, longterm odour) and transferred into thickwalled injection moulded demonstrators such as chair feet or armrests," said Großhauser.

He said that CCPE is currently establishing collaborations with furniture associations and are actively seeking compounders, recyclers, additive suppliers and furniture component manufacturers interested in developing and testing odouroptimised PCR materials for office and publicspace furniture.

In an earlier project called GINA - Odour Control Additives for Industrial Applications, researchers considered addition of odour scavenger additives into bulk materials and investigation their interaction with other additives. Odour property tests included both human sensory tests and online emission measurements to analyse VOCs.

Processing variables

The **Institute for Plastics Processing (IKV)** at RWTH Aachen University has been leading a consortium in a project called Smellstop that aims to reduce odour in post-consumer PE from packaging by optimising the mechanical recycling and compounding process. The project is funded by the German Federal Ministry of Education and Research in an initiative called Resource Efficient Circular Economy – Plastics Recycling Technologies (KuRT). The goal is to increase recycling rates and reduce downcycling so that rPE can be re-used in packaging films.

IKV researchers are conducting processing tests and analysis of odour-causing substances. As described in the project announcement, other partners were Kreyenborg, which performed thermal pretreatment of the shredded PCR film pieces in an infrared rotary kiln; Coperion, which performed regranulation; Reifenhäuser Cast Sheet Coating, which produced cast films; and RKW, which produced blown films on an industrial scale. Siegwerk Druckfarben provided printing inks and adhesives as odour-causing "contaminants" and 3S provided technology for inline detection and quantification of odours.

Deodourisation during the regranulation step was investigated, and the researchers looked at various compounding parameters and devolatilising strategies. ›



IMAGE: LUXUS



Above: UK compounder Luxus has developed odour-extraction technology

"We found that lower temperatures, higher rpm, and a double vacuum plus water injection yielded recyclates of the lowest odour in our experiments," reported the IKV researchers. "We further investigated Kreyenborg's IR-heat treatment in comparison to traditional heat storage with the aim of reducing the amount of VOC with high molecular weight. In film extrusion, we aimed again for lower temperatures and added yet another degassing step. Currently, we are analysing the deodourisation and film extrusion samples."

Auto interior VOCs

Aimplas, the Plastics Technology Centre in Spain, has been leading an initiative called H_2Odor to reduce odours in polyolefin PCR for use in vehicle interiors. The project is using water-based decontamination and deodourisation technologies from **Fych Technologies** to minimise VOCs.

"The automotive industry is one of the most demanding sectors, but also one of the most strategic for applying advanced recycling solutions," said Juan Alfonso Naranjo, researcher in Sustainable and Future Mobility at Aimplas, in a post on the organisation's website. "With this project, we want to offer a sustainable and viable alternative that contributes to the fulfilment of the new European objectives."

The project is funded by the Valencian Institute of Competitiveness and Innovation (IVACE+i) and European Regional Development Funds.

UK-based technical plastics recycling and compounding company **Luxus** supplies the global auto industry, including recycled grades for auto interior trims. The company recently tackled the problem of odour in post-consumer waste under a grant funded by the Industrial Energy Efficiency Accelerator, in partnership with the UK's University of Lincoln. The Odour Control Accelerator project wrapped up in 2024 and resulted in an odour-extraction technology that can be integrated into the extrusion process for recycled PP.

"One of the main aims for this project was to develop a system that can target as many of the identified critical odour species as possible," said Natalie Stones, Laboratory and Technical Manager at Luxus. "Odour in recycled polymers, especially those with high post-consumer waste content, is often due to the presence of VOCs, contaminants, and residuals from prior use (eg, food, chemicals, or packaging materials). These odours can make the recycled polymers less desirable for high-value applications. Common sources of VOCs in recycled plastics include alkanes, ketones, aldehydes, and carboxylic acids, often originating from degradation during use or improper disposal, residual additives, or other contaminants from packaging or consumer goods."

One challenge for solving odour problems is that odour perception is subjective. A well-rounded assessment combines instrumental, quantitative analysis with sensory measurements from human panellists, Stones said. Another challenge is that many of the VOCs and SVOCs that cause odour can be present in low concentrations.

"Isolated compounds can have a large contribution to the overall odour but may be below their limit of detection threshold when analysed, so remain unidentified," she explained. "Synergistic effects of VOCs also add to the complexity of the analysis of odour causing compounds, as they may produce a stronger or characteristically different odour when combined."

The Luxus proprietary technology uses high pressure and dispersion to remove VOCs during compounding. The company designed a specialised barrel section and extruder configuration to maximise melt surface area, said Stones. A post-conditioning deodourising unit was also installed downstream of the extruder. The polymer compound is pneumatically conveyed to the top of this conditioning column, and a counter-current airflow draws air through the descending polymer. "A high residence time allows for the circulating air to encapsulate any airborne VOCs to migrate from the polymer into the airstream. Sensors and controls ensure the process remains consistent and so all material is uniform," she said.

"The Luxus project demonstrated that effective odour reduction in recycled polypropylene requires an approach that goes beyond conventional odour scavengers. By combining in-line VOC extraction during extrusion with post-conditioning deodourisation, the technology significantly reduced odour intensity and improved material

perception," concluded Stones. "This enables recycled polymers to be used in more demanding applications, helping to overcome one of the key barriers to circular plastics and supporting the wider adoption of high-quality recycled materials."

Process steps

A solution from **Coperion** for removing VOCs and unpleasant odours from PCR is the company's EcoFresh dual-silo system for degassing. In this system, pellets go through a deodourising silo for heating and purging and then through a downstream cooling silo. It is designed to be used following compounding and devolitalisation in a Coperion ZSK twin screw extruder.

"In the extruder, the recycle is first melted, intensively mixed, homogenised, and degassed. With the help of stripping agents, up to 75% of the volatile components are reliably removed in this process step. EcoFresh then performs the thermal post-treatment and removes the remaining VOCs," said Jochen Schofer, Head of Sales, Business Unit Recycling, at Coperion. While various types of stripping agents can be used, water is most commonly used, he said.

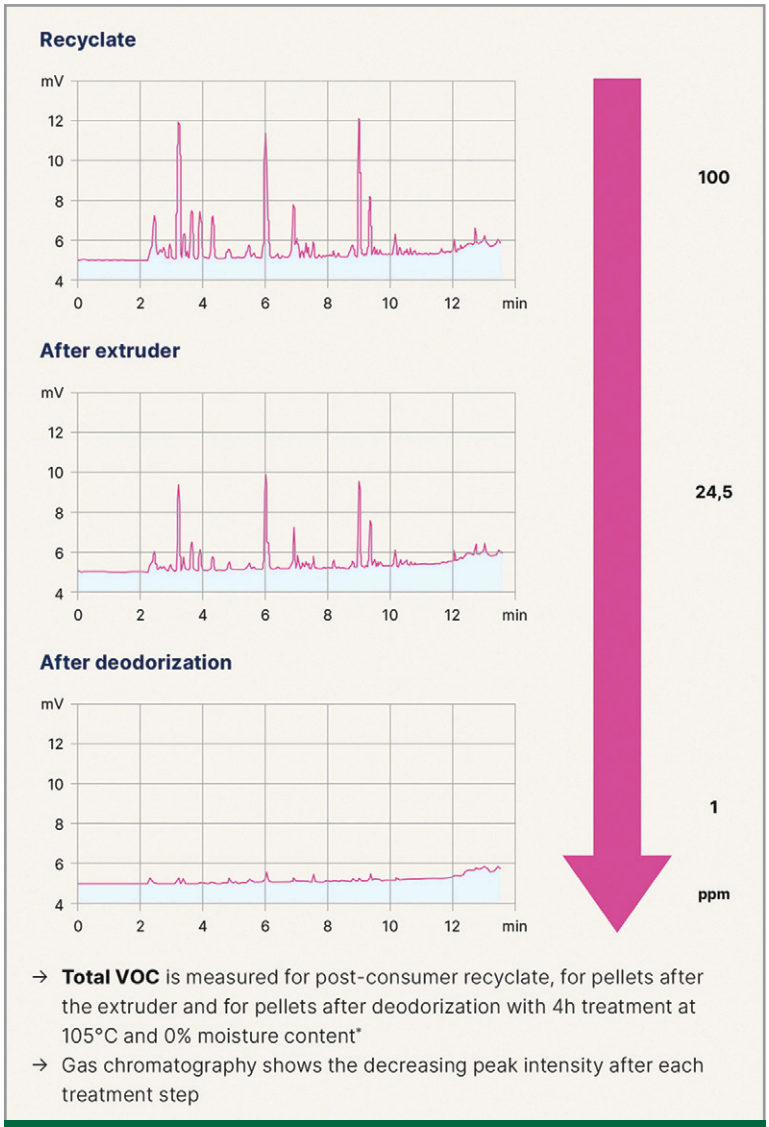
As shown in the chart, total VOCs are significantly reduced after the extruder and further reduced after the EcoFresh deodourisation step.

Schofer reported that the system can be designed for small or large scales, with good performance in both. "Thanks to consistent process parameters, the product quality achieved in systems with low throughput can be easily scaled-up to systems with high throughput capacities," he explained.

Twin-screw extruders and the EcoFresh system are available for testing in Coperion's Recycling Innovation Centre.

Erema launched Volex degassing technology for its Intarema TVEplus technology at K2025. The company reported that the new system, which uses water stripping, achieves up to 40% lower VOCs compared to standard degassing; compared to the input material, VOCs are 75% lower. The company said that the Intarema TVEplus uses a Plus-Zone after filtration, before the degassing section, which provides homogeneous mixing of the water into the plastic melt and results in a highly efficient stripping effect.

"The open-pored melt created by the evaporation of the water multiplies the exposed surface area of the melt a thousand-fold, shortening the diffusion paths to a minimum, and allowing VOCs and condensable substances such as limonene to escape efficiently," the company explained. The company said that use of the Volex technology allows use of higher proportions of PCR in new products.



VOC reduction with Coperion extruder and EcoFresh system
Source: Coperion

Another K2025 exhibitor, **Zeppelin Systems** highlighted its Fresh-Tec equipment for deodourisation at the show. The system uses air flushing to remove VOCs.

CLICK ON THE LINKS FOR MORE INFORMATION:

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- **https://chromacolors.com**
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- **www.luxus.co.uk**
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IMAGE: AMI

Polymer recycling events return to Cleveland

The Recycling World Expo taking place in the USA's compounding heartland in November is playing host to key technology and additive exhibitors

This year's Plastics World Expos 2026 – held on 11-12 November in Cleveland, Ohio – will once again feature both an exhibition and conference.

The free event, which takes place at the Huntington Convention Center, is North America's largest plastics industry gathering of the year.

It brings together four focused expos: Compounding World Expo, Plastics Recycling World Expo, Plastics Extrusion World Expo, and Polymer Testing World Expo. Each includes a range of international suppliers, plus a dedicated conference theatre with full two-day programmes of technology talks, business debates and keynote presentations. The event welcomed nearly 5,500 attendees and 352 exhibitors in 2025.

This year's exhibitor lineup boasts many leading industry players including Ampacet, Cabot, Cargill, Clariant, Coperion, CPM, Davis-Standard, Erema, Farrel Pomini, Galata, IMCD, JSW, KraussMaffei, KW Plastics, Lanxess, Maag, Milliken, Netzsch, NGR, Omya, PTi, Struktol, Thermo Fisher and Westlake.

This year, the show is focusing on the theme of Powering Plastics: Skills, People and the Future. This will be reflected across the exhibition and conference sessions, highlighting the importance of workforce skills, talent development and knowledge transfer.

"The expos are designed to make it easy for industry professionals to meet the right suppliers, compare solutions and stay informed," said Kelly DeFino, exhibition sales team manager at AMI.

Exhibitor slots are still available. For more information on exhibiting, visit the **website**.

The expos will showcase manufacturers of compounding, recycling, extrusion and testing equipment, plus suppliers of polymers, additives, software and industry services.

The event will also host around 100 expert speakers in its four conference theatres. They will explore key themes including materials innovations, process optimisation, recycling technologies, market trends, regulatory developments and the increasingly vital role of AI.

Details on exhibitors of most relevance to companies in the plastics recycling sector can be found on the following pages.

Main image: Last year's event hosted more than 350 exhibitors from across the plastics supply chain

Aaron Industries is a leader in recycled polymer innovation, offering custom compounding and toll compounding services for polyolefins, manufacturing FDA-approved food contact materials from 100% recycled content.
› **www.aaroninc.com**

ADG Solutions engineers and sells systems for plastic recycling for post-consumer and industrial plastics, including extruders, filters, shredders, grinders, material handling systems, and waste-to-energy solutions.
› **https://adgs.net**

AEC / Cumberland / Sterling: Cumberland is a leader in size reduction equipment, including granulators and shredders. AEC provides solutions in material handling, process cooling and size reduction. Sterling is a leader in chillers and process cooling, materials handling and granulators.
› **www.acscorporate.com**

Amandus Kahl, a family-owned company, focuses on recycling and processing equipment, specialising in transforming hard-to-recycle materials.
› **www.akahl.com**

American Cutting Edge is a leading supplier of machine knives and industrial razor blades, committed to making cutting effortless for their clients.
› **https://americancuttingedge.com**

Ampacet showcases AI automation for colour correction in extrusion and moulding processes with LIAD Smart technology.
› **www.ampacet.com**

ArcLABS is Agilyx's analytical laboratory and data intelligence business which provides commercial feedstock characterization, polymer identification, and quality assurance services.
› **www.agilyx.com**

Below: ArcLABS provides services including characterization and identification of plastic streams



IMAGE: ARCLABS

Attwell Plastics is a privately owned company founded in 1980, producing LDPE and HDPE repro resin.
› **www.attwellplastics.com**

Avian USA Machinery offers a wide variety of machines: low, medium, and high speed granulators, as well as shredders and pulverisers.
› **https://avianusa.com**

Bano Recycling develops and manufactures advanced plants and shredding solutions for plastic waste, including the Premac single-shaft shredder and twin-shaft Rhino.
› **www.shredder-bano.com**

Bunting Magnetics designs magnetic separation, metal detection, and conveying systems to help recyclers remove metal contamination, improve material quality, and keep lines running at high throughput.
› **www.buntingmagnetics.com**

BUSSLIST is the original manufacturer of the reciprocating Kneader technology, designed for heat- or shear-critical applications in the plastics, aluminium, chemical and food industries.
› **www.busscorp.com**

C4 Polymers provides services to compounders and recyclers for their plastic scrap, hard-to-recycle materials, excess regrind, and obsolete resin.
› **www.c4poly.com**

Cable Management manufactures equipment to help recycle cable/wire and other parts.
› **https://cablemanagementusa.com**

Cargill is a leading global supplier of specialty additives for the plastics industry, including slip, anti-block and anti-scratch additives.
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Carolina Filters offers technical cleaning services and solutions for metallic filtration challenges.
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CieTrade Systems offers software solutions for trading and recycling industries, managing inventory, logistics, and finance to optimise operations.
› **www.cietrade.com**

CMG Granulators designs and produces solutions for the recycling industry, represented by granulators, shredders, integral feed conveyors, regrind evacuation and conveying systems and powder separation executions.
› **www.cmg-granulators.com**

Cresswood Shredding Machinery provides size reduction equipment to the recycling industries.
› **www.cresswood.com**

CST Industries says it is the largest dome and storage tank manufacturer in the world.
› **www.cstindustries.com**

Cutmetall North America provides industrial knives and wear parts for shredders and granulators.
› **www.cutmetall.com**

EBM Manufacturing's Gentle Roll Plastic Screener is a non-vibrating screener that efficiently sorts plastic materials by size to ensure precise separation and optimal processing. The technology uses gravity and mild centrifugal force.
› **https://gentleroll.com**



IMAGE: EBM

Above: EBM Manufacturing's Gentle Roll Plastic Screener

EFS Plastics is a post-consumer mechanical recycler that focuses on creating high-quality recycled plastic products.
› **www.efs-plastics.ca**

Ely Enterprises' product offerings include new and used balers, compactors, shredders, conveyors, and other recycling equipment.
› **www.elyrecyclingequipment.com**

Ensign Equipment offers bulk material handling equipment worldwide for a wide range of applications.
› **https://ensigneq.com**





IMAGE: HOSOKAWA

Above: Granulators are among the products made by Hosokawa Micron Powder Systems

Erema technologies process in-house waste, post-consumer plastics, and bottle-to-bottle recycling, producing high-quality recycled pellets.
› **www.erema.com**

Excel Baler manufactures high-quality baling equipment for the recycling industry.
› **www.excelbalermfg.com**

Fimic offers five models of melt filters, providing filtration solutions for post-industrial and post-consumer plastics.
› **www.fimic.it**

Firefly North America manufactures fire prevention solutions engineered for demanding industrial environments.
› **www.fireflynorthamerica.com**

Gamma Maccanica specializes in manufacturing high-performance lines for the recycling of plastic materials.
› **www.gamma-meccanica.it**

Gem City Plastic Machinery is a representative for six industry-leading companies.
› **www.gemcity1.com**

The **Gneuss** MRS extrusion technology enables the efficient devolatilization of PET, PS, nylon or polyolefins.
› **www.gneuss.com**

HammerTek Corp makes the Smart Elbow deflection elbow for preventing issues caused by sweep, lined, and plugged tee elbows in pneumatic conveying systems.
› **https://hammertek.com**

Hosokawa Micron Powder Systems produces granulators, dedusting systems, separation systems, and multi-stage recycling plants for film, cable, post-consumer materials, and other general plastic recycling applications.
› **www.hmicronpowder.com**

IMS Company is a supplier of components, auxiliary machinery and equipment which help customers increase efficiency and ramp up productivity.
› **https://imscompany.com**

Industrial Magnetics specialises in designing and manufacturing magnetic equipment, including permanent and electromagnets, for a wide range of applications.
› **www.magnetics.com**

Industrial Recyclers is a full-service recycling, resin, and logistics company helping manufacturers reduce waste, improve sustainability, and streamline their supply chains.
› **www.industrial-recyclers.com**

Innovative Recycling Solutions provides equipment for reclaim extrusion, melt filtration, and plastic waste recycling.
› **https://irecyclingsolutions.com**

InResST focuses on the recycling of marine discarded fishing gear in the fields of textiles, home furnishings, automobiles and packaging.
› **www.inresst.com**

Kice Industries manufactures bulk handling equipment, specialising in separating dust and other contaminants from regrind plastics.
› **www.kice.com**

Kongskilde Industries offers custom-engineered conveying solutions that optimize efficiency, reuse process waste and convey materials or finished components.
› **https://kongskilde-industries.com**

KraussMaffei is a leading manufacturer of machines and systems for plastic and rubber production, with a wide range of technologies in injection moulding and extrusion.
› **www.kraussmaffei.com**

KW Plastics is a leading recycler of HDPE and PP materials, buying post-consumer and post-industrial scrap from over 600 vendors across North America, Mexico, and the Caribbean.
› **www.kwplastics.com**

Laidig is a leader in bulk storage and reclaim systems.
› **www.laidig.com**

Ludeca is a leading provider of predictive and proactive maintenance solutions.
› **https://ludeca.com**

Lutz Blades manufactures blades and knives for industrial applications including plastic granulation

and film production throughout the American market.
› **https://lutz-blades.us**

Main Tech produces machines dedicated to complete material-handling systems, as well as systems for storage, material drying, dosing, and recycling, for both granules and powder materials.
› **www.maintechamerica.com**

MAS Maschinen- und Anlagenbau Schulz provides advanced extrusion solutions, specialising in twin-screw extruders for plastic recycling. It also offers high-performance melt-filtration systems and waterless cleaning technology for efficient recycling of plastic film flakes.
› **https://mas-austria.com**

Mesutronic is a specialist in metal detection and x-ray equipment for plastics and other industries.
› **www.mesutronic.us**

MoistTech says its near-infrared technology enables precise and continuous moisture analysis across a wide range of products and raw materials.
› **www.moisttech.com**

Nexam Chemical's Reactive Recycling technology helps restore the properties of recycled polyester and polyolefin feedstocks, ensuring efficient processing and higher recycled content in moulded products.
› **www.nexamchemical.com**

NFM Welding Engineers offers full turnkey extrusion systems, featuring custom integrated controls for all auxiliary equipment. NFM also offers global field service and full rebuilding of any extruder OEM's equipment including barrels, feed screws, feed sections, power feed roll and door assemblies, and gearboxes.
› **www.nfm.net**

NGR's recycling technology includes patented shredder-feeder-extruder systems that reduce energy consumption and optimise production, and the LSP process for PET recycling which ensures food-grade materials through rapid decontamination.
s› **www.ngr-world.com**

Omya is a leading producer of industrial minerals, such as calcium carbonate, dolomite, and perlite, and a distributor of specialty chemicals.
› **www.omya.com**

Pierret Industries is a leader in feeding and cutting equipment for the textile and plastics industries.
› **www.pierret.com**

Pioneer Systems designs and builds bulk material handling equipment and fully integrated systems for plastics processors and manufacturers.
› **www.pioneersystemsllc.com**

Piovan UnaDyn has an extensive product range, including systems for material handling, drying, conveying, feeding, blending, size reduction, and software.
› **www.piovan.com/unadyn**



IMAGE: MESUTRONIC

Left: Mesutronic Quicktron 03 R metal separator

Plastic Recyclers Southeast is a post-industrial plastics recycling and compounding company founded in 1991 in Decatur, Alabama.
› **www.prsei.com**

Plastics Machinery Group buys and sells plastics equipment including thermoforming, blow moulding, injection moulding, extrusion, grinders/shredders and more.
› **www.plasticsmg.com**

PlastiWin Capital Equipment specialises in buying and selling used plastics processing equipment worldwide.
› **https://plastiwin.com**

Polykemi is a producer of customised compounds including products based on high-quality, recycled raw materials.
› **www.polykemi.se**

Process Control Corporation's product portfolio includes blenders, scrap recycling systems and grinders.
› **www.process-control.com**

Pure Loop, part of the Erema Group, offers innovative shredder-extruder technology for recycling clean production waste into high-quality pellets.
› **www.pureloop.com**



IMAGE: REVOLUTION

Right: PCR LLDPE produced by Revolution

Recycling Equipment recently acquired Midwest Recycling Equipment and will now be operating out of four locations: Newton, NC, Fort Worth, TX, Souderton, PA and La Porte, IN.
› **www.gogreenrei.com**

ReNew Plastics a family-operated business in Northeastern Ohio which recycles PET.
› **www.renewplasticsrecycling.com**

Revalyu has commercialized an advanced recycling process for post-consumer PET bottles, using mono-ethylene glycol in a low temperature glycolysis process.
› **www.revalyu.com**

Revamp Polymers performs comprehensive on-site waste audits to maximize the value of generated scrap, directing it to export markets or local processing facilities in Canada based on the feedstock and its location.
› **https://revamppolymers.com**

Revolution produces flexible packaging products using recycled plastics for sectors including agriculture, retail, construction and transportation.
› **www.revolutioncompany.com**

RoyTech Environ is a plastics recycling and pelletizing company located in Grant, Alabama.
› **https://roytech-us.com**

Sasol Chemicals (USA) provides polymer processing additives, plasticisers, waxes, and alcohols used in plastics and rubber manufacturing.
› **www.sasol.com**

Schwing Technologies is a leader in thermal cleaning technologies, specialising in removing polymers and organic contaminants from metal tools and machine parts.
› **www.schwing.tech**

Shini USA, Division of Budzar Industries, offers a wide range of plastic processing and recycling equipment, such as heating and cooling systems and granulators, serving the injection moulding and extrusion sectors.
› **www.shiniusa.com**

Sigma Recycling, which is part of part of Sigma International FZC, has operation in Georgia, US, and Ontario, Canada.
› **https://srinc.us.com**

Soleno designs, manufactures and distributes high-quality products, mainly in HDPE, for the sustainable control and management of water.
› **www.soleno.com**

Solid Equipment Company is a US-nationwide industrial recycling equipment supplier.
› **https://solidequip.com**

Stadler America is a specialist in the design, production and assembly of automated sorting systems and machines for the recycling industry.
› **https://w-stadler.com**

Star Plastics supplies high-quality thermoplastic materials and custom formulations, specialising in PC, ABS, nylon, and UL-validated recycled content materials.
› **www.starplastics.com**

Supreme Plastic Recycling produces and distributes recyclable plastics to both domestic recycling facilities and international markets.
› **https://supremeplasticinc.com**

Below: Polykemi's facility in Gastonia, North Carolina



IMAGE: POLYKEMI



Left: Weima WLK 1000 shredder

Syncro Group provides advanced auxiliary equipment and machinery for industries, focusing on minimising energy consumption and waste.
› **https://syncro-group.com**

Trecora is a leader in high-purity specialty hydrocarbons, specialty waxes, lubricant additives, and custom chemical processing solutions.
› **https://trecora.com**

Van Dyk Recycling Solutions consults and sells equipment to help recyclers and waste processors maximise profits.
› **https://vdrs.com**

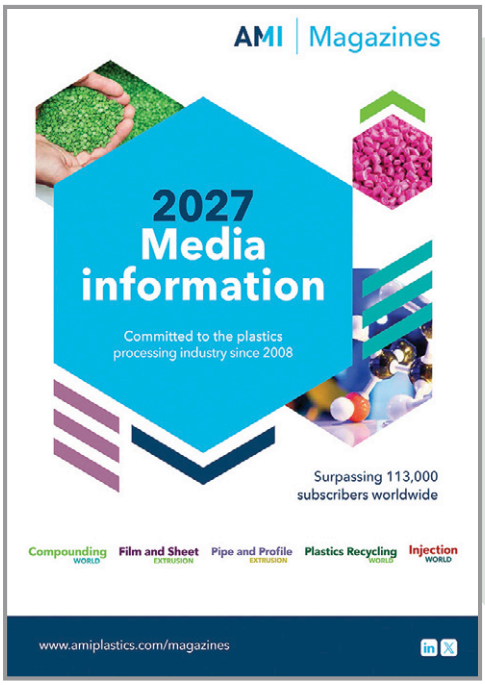
Vartega produces recycled carbon fibre as a cost-effective alternative to virgin fibre, serving automotive and industrial sectors.
› **www.vartega.com**

Vecoplan is a leading supplier of size reduction technologies, including shredders and granulators.
› **www.vecoplanllc.com**

Weima manufactures robust shredding technology, including single-shaft shredders and four-shaft shredders, for processing waste in industries like plastics, wood, and metal.
› **https://weima.com**

Zerma is a leading supplier of recycling equipment, offering shredders and granulators for various materials, alongside accessories for enhanced operations.
› **https://zerma-america.com**

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Adding to the mix: PCR-based materials



IMAGE: SHUTTERSTOCK

Stabilisers, compatibilisers and other additives counteract problems associated with increasing levels of post-consumer recyclate. Jennifer Markarian reports on new products

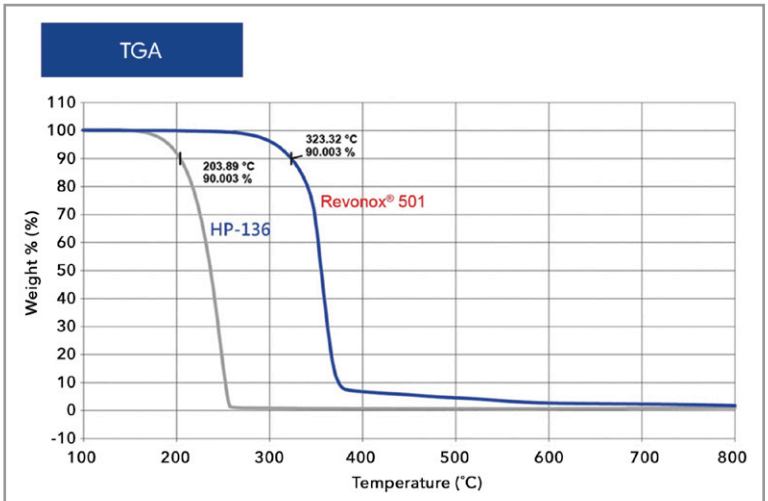
Companies want to increase recycled content in their products without sacrificing quality or performance. Yet recycled content from post-consumer recyclate (PCR) is notorious for higher variability in viscosity, colour and other properties as well as increased risk of degradation in the polymer, contamination, gels and other issues. One of the ways to handle these challenges is increased sorting and quality control of incoming material. As well as this, a wide range of additives, including stabilisers, compatibilisers, processing aids, viscosity modifiers and reinforcing fillers can also be used to remedy problems and boost properties to counteract the effects of increasing PCR content. The goal is to allow greater use of PCR while maintaining processability and meeting performance specifications for the end-use.

New stabilisation systems go beyond the conventional antioxidant packages to do more than prevent oxidation, said James Gacek, Executive Vice President and Managing Director for the Americas at **Chitec Technology**.

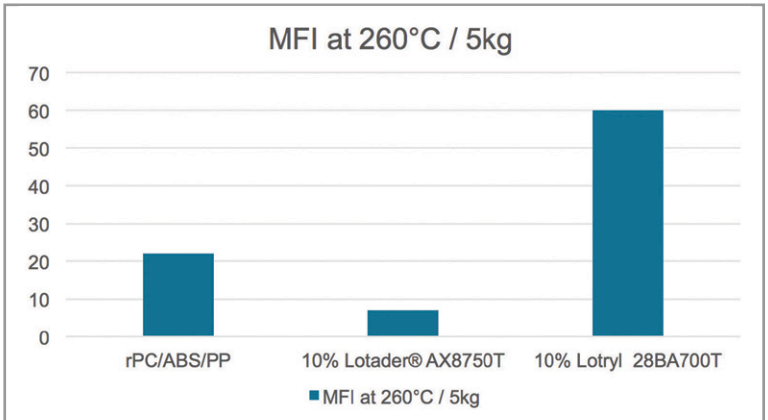
"Conventional antioxidant systems typically rely on combinations of primary phenolic and secondary phosphite antioxidants to minimise thermo-oxidative degradation during extrusion. While effective, these systems may still allow chain scission, molecular weight loss, additive depletion, and deterioration of melt flow properties during demanding processing conditions. Today's formulations require additives that protect polymer molecular weight, preserve processing stability, and improve overall manufacturing efficiency," Gacek explained.

New from Chitec is Revonox 501, a multifunc-

Main image: problems caused by recycled material can be addressed with additives



Revonox 501, a multifunctional processing stabiliser based on a redesigned benzofuranone molecular architecture, exhibits higher thermal stability than conventional benzofuranone technology. TGA results show virtually no weight loss below 300 C
Source: Chitec Technology



SKFP additives can be used to adjust the viscosity of recycled PC/ABS, including blends that contain PP. Lotader AX8750T increases viscosity (lowers MFI) and Lotryl 28BA700T lowers viscosity (raises MFI)
Source: SK Functional Polymers.

tional processing stabiliser based on a redesigned benzofuranone molecular architecture. Gacek said that the additive combines efficient carbon-centered radical scavenging with thermal stability in a single molecule. It is particularly beneficial for recycled materials, where multiple thermal histories accelerate degradation.

"Compared with earlier benzofuranone technologies, Revonox 501 exhibits significantly higher thermal stability, making it particularly well suited for today's higher-temperature extrusion, compounding, and engineering plastic applications," he added. The additive prevents polymer degradation, helps preserve polymer molecular weight and helps maintain consistent processing performance.

Revonox 501 has also been found to improve the efficiency of conventional antioxidant packages. It can be used to replace a small portion of traditional primary and secondary antioxidants, which improves melt flow stability and reduces overall additive demand, Gacek said. In addition, because less oxidative degradation occurs during processing, the additive also helps preserve the effectiveness of HALS, allowing light stabilisers to deliver improved long-term weatherability in the finished part.

The additive has US FDA food-contact clearances for use in HDPE, PP and PET.

Compatibilisers and coupling agents provide significant benefits for formulations with recycled content, because they act to bring together dissimilar materials. In mechanical recycling, a stream of one polymer may have a small amount of a different polymer remaining in it. This "contaminant" can degrade properties. A compatibiliser counteracts this effect by acting at the interface of the different materials to improve strength properties.

As discussed in *Compounding World's* May 2026 issue, a growing area for compatibilisers is in rHIPS, rABS, rPC, and rPC/ABS blends, to improve properties of materials collected under the EU's waste electrical and electronic equipment (EEE) and end-of-life vehicles directives.

For example, Elvaloy AC 1330 from **Dow** is a copolymer of ethylene and methyl acrylate that can be used as an additive in virgin and recycled ABS to improve processability, impact performance and optical properties, particularly in rABS, the company said. The additive recently received **RecyClass** automotive and EEE technology approval after it was evaluated under RecyClass protocols and found to be compatible with recycling processes.

Engineering compounds

The latest from **SK Functional Polymers** is Lotader AX8900T, a reactive ethylene terpolymer that can be used in virgin or recycled engineering plastics compounds. Lotader AX8900T has a higher melting point than the similar Lotader AX8900, and either additive can be used as a compatibiliser, impact modifier, viscosity enhancer, or for hydrolysis protection. The two additives are produced in two different production sites to ensure strong supply robustness, noted Nico Esselin, Mechanical Recycling Market Development manager at SK Functional Polymers.

Other additives from the company for recycled polymers include Lotader AX8750T, Lotryl 29MA03T and Lotryl 40MA05T. The additives act to compatibilise different components in recycled styrenic blends, such as rPC/ABS, even in the presence of 2% PP contamination, as indicated by an improvement in elongation at break (see chart). The two Lotryl

additives significantly improve impact resistance, particularly at room temperature, said Esselin. Lotader AX8900 benefits impact at room temperature and also at low temperatures, down to -30°C.

The additives are being increasingly used as viscosity modifiers in rPC/ABS, said Esselin. Lotader AX8900 or AX8750T can be used to raise viscosity and Lotryl 28BA700T to lower viscosity, which allows accurate adjustments of the material flow properties to facilitate processing and optimise final part performance, he explained.

A new polyolefin compatibiliser from **Avient**, Cesa Unify A4R, is part of the Additive for Recycling (A4R) product line and can be used in applications with nonpolar polymers, such as PP and PE. The company is also developing formulations for polar–nonpolar polymer combinations.

"Cesa Unify A4R is Avient's latest additive solution developed to compatibilise mixed polymer streams by generating a homogeneous polymer phase and restoring mechanical properties to a level comparable to virgin materials," said Jan Sültemeyer, Global Sustainability and Innovation Manager at Avient.

Beyond packaging applications, Cesa Unify A4R can be used to improve mechanical properties in cable applications with PCR content. Strategies are needed to compensate for the reduced and more variable mechanical properties associated with using PCR while maintaining quality requirements in this area, said Mirco Groeseling, Market Development Manager for Packaging & Sustainability at Avient.

"Major cable manufacturers increasingly view PCR content as an opportunity to reduce the carbon footprint of their products and, consequently, to support the achievement of ambitious sustainability targets," he said.

The latest A4R additive for cable applications from Avient is Cesa Tough A4R, which improves environmental stress crack resistance (ESCR) in rHDPE while maintaining material recyclability. The company reported that ESCR improved by more than 100% in bent strip tests and processability increased by 20%. Flexibility, as measured by strain at break, increased by 35%. Durability, as measured by impact strength, increased 140% with use of the additive in rHDPE.

The additive was developed by Avient's team from its CycleWorks Innovation Centre for Plastic Recycling in collaboration with the Italian cable manufacturer Tratos. It was designed for cable jackets, which need long-term protection against environmental stressors like moisture, soil chemicals, and mechanical strain, the company said. ESCR requirements can restrict how much PCR content a cable jacket can use with conventional formulations, but the new additive technology modifies polymer rheology and strengthens the polymer to protect against degradation, so higher levels of PCR can be used.

Reactive recycling

Nexam Chemical sees expanding commercial use of its Reactive Recycling technology. A US-based customer that had been using Nexam's additives within the Reactive Recycling product family since early 2025 for rigid food packaging expanded use to additional product lines. Additionally, two customers recently moved from evaluation to commercial use of Nexam's technology. One is a Canadian manufacturer of rigid food packaging

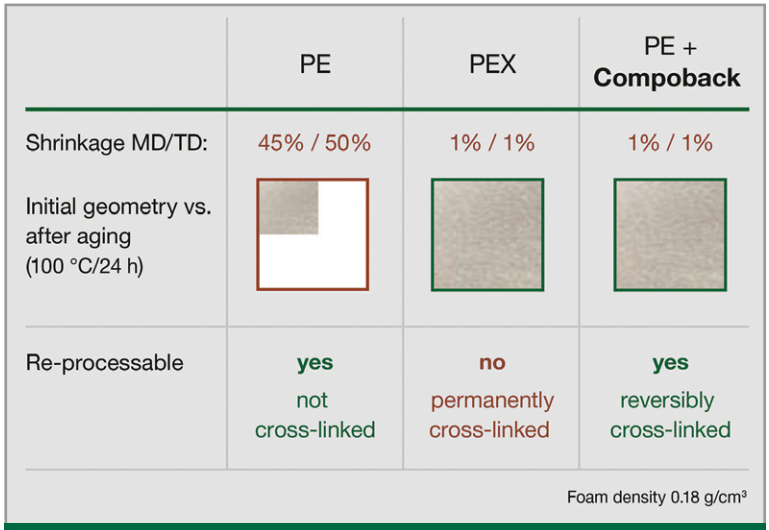


based on recycled PET (rPET). During industrial trials, Reactive Recycling enabled reduction in the number of defective products by more than 90%, Nexam reported. The technology also allowed normal production speeds and a high proportion of internal regrind without affecting product performance. Similarly, a European customer concluded successful testing and moved to commercial use. Nexam reported a more than 80% increase in the number of samples shipped for evaluation by prospective customers in June and July compared with the same period last year, excluding additional samples distributed through Palmer Holland.

"The geographic reach of the interest in our solutions is clearly broadening," said Ronnie Törnqvist, CEO of Nexam Chemical. Enquiries have come from a broad range of geographic markets, including Europe, North America, South America, Asia and Africa. The company added distribution agreements this year with Vanoplast in France and another distributor in Turkey, adding to its distributors in North America and Asia.

Also this year, an independent study tested 1% of Nexamite R201 additive in a 50/50 blend of rPP and virgin material which was injection moulded into a chair. The test found that the additive maintained mechanical properties and improved flexural strength and stiffness, as well as provided a controlled reduction of melt flow rate to an optimal level for injection moulding. The company said that the study validates the additive's capability in injection moulding, in addition to existing applications in extrusion and in blown film.

Techmer PM collaborated with graphene producer **NanoXplore** to launch GrapheneBlack xGnP masterbatch to significantly boost properties in film applications, as discussed in another article in this issue. The product combines Techmer PM's film expertise and Techsperse advanced dispersion technology with NanoXplore's proprietary high-surface-area xGnP graphene technology. The graphene-enhanced solution has the potential to significantly increase the amount of recycled content that can be incorporated into film formulations without sacrificing performance, the companies suggested. They noted that this would benefit packaging manufacturers who are seeking to meet challenging sustainability mandates and circular economy targets.



Brüggemann's Compoback additive: shrinkage of rectangular foam profiles after 24 hours ageing at 100°C
Source: Brüggemann

Recycling innovations

At K2025, **Brüggemann** introduced Bruggolen R8897, a thermostabiliser developed specifically to improve the properties of PP-EPDM recyclates from vehicle front-end applications. The additive helps retain mechanical properties during long-term heat ageing, as demonstrated by laboratory tests that show an improved level of residual Charpy impact after ageing.

Another innovation from the company that improves recyclability is Compoback, which is an additive for polyolefin foams, HFFR compounds, cables and TPEs that is an alternative to crosslinking. The additive allows thermoset-like performance while maintaining the ability of thermoplastics to be reprocessed. As shown in the diagram (left) of square cross-sections of physically foamed PE profiles, the samples without stabilisation shrank by approximately 75% after 24 hours of storage at 100° C. When compounded with Compoback, however, the shrinkage was negligible and similar to conventional, permanent crosslinking.

Processing aids are critical additives for extrusion applications and are even more important when formulations contain higher levels of PCR. Processors are seeking formulations that comply with current and potential regulatory requirements. Conventional fluoropolymer-based processing aids are under pressure due to restrictions on per- and polyfluoroalkyl substances (PFAS), such as the restriction in the EU's Packaging and Packaging Waste Regulation (PPWR) on PFAS in food-contact packaging.

Multiple non-fluorinated processing aids have been introduced as an alternative to address the need for reducing melt fracture and die buildup in extrusion processes, as discussed in the April issue of *Compounding World*. Most recently, **Gabriel-Chemie** introduced Maxithen PFAS-free PPA masterbatches, which the company described as PFAS- and silicone-free processing aids based on hydrocarbon technology. The company said that the new masterbatches

demonstrated comparable process stability and product quality to conventional processing aids in large-scale industrial production trials.

New from **Ampacet** is a slip control masterbatch, Ampacet Slip Scavenger 1540, which is part of the company's R3 Sustainable Solutions portfolio. The additive enables consistent coefficient of friction in flexible films with high PCR content, which enables higher levels of recycled content to be used without machinability issues. The company explained that variable PCR sources may contain high slip levels that can make films too slippery, which is a particular problem in stack stability. The new masterbatch captures migrating slip additive molecules during pelletising or when blending high slip rPE into new films.

Holland Colours announced last year that two of its additive technologies, CircStab and LightGuard, had successfully passed the RecyClass Recyclability Evaluation Protocol for PET bottles, demonstrating compatibility with PET bottle recycling processes. HolcoPET CircStab, which uses SI Group's EverCycle technology, stabilises PET during recycling by preventing yellowing while preserving brightness and viscosity, the company said. LightGuard 400 blocks UV light to protect light-sensitive contents of transparent PET bottles from photodegradation.

For recycled white opaque PET (rPETo) packaging, challenges include consistent colour and light protection. Since both mono and multi-layer opaque PET bottles are in the recycle stream, the output can appear greyish, the company said. In addition, rPETo can lose brightness and light protection. Holland Colours' Holcopearl ReWhite restores both whiteness and light protection, enabling rPETo to meet strict requirements. Holcopearl ReWhite is added during preform injection moulding and ISBM bottle manufacturing and enables closed-loop recycling for white PET dairy bottles.

Markers or taggants in plastic compounds have been used for traceability and anti-counterfeiting efforts and can also be used to enhance efficient and accurate sortation of recycled materials. For example, the Tracer-Based-Sorting solution from **Polysecure** can be used as an option with the company's Sort4Circle single-step, multi-sensor sorting process. Food-contact approved fluorescent marker particles can be added to the plastic compound and then later detected by sensors in the sorting equipment, allowing closed-loop recycling.



Ampacet Slip Scavenger 1540 is engineered specifically for flexible packaging using post-consumer recycled polyethylene

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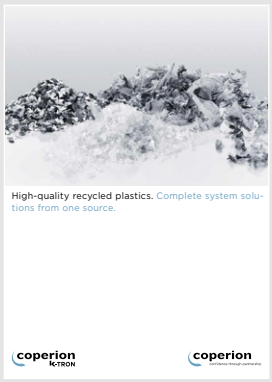
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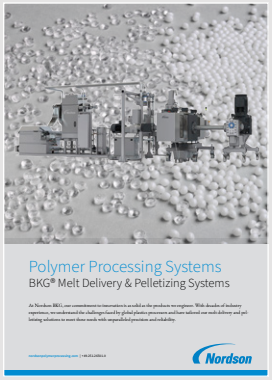
BB ENGINEERING: RECYCLING SYSTEMS



BB Engineering explains in this brochure how its technologies recycle PET into fibre and pellets, covering its VacuFil recycling systems, Visco+ vacuum filter, VarioFil R/R + compact spinning lines, extruders and more.

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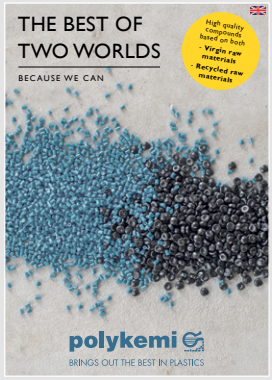
NORDSON BKG: MELT DELIVERY



The technology portfolio of Nordson BKG, part of Nordson Polymer Processing Systems, includes a full range of melt filtration systems, melt pumps, polymer valves and jet cleaners plus pelletising systems, all detailed in this brochure.

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POLYKEMI: COMPOUNDS



Polykemi's engineering compounds based on virgin and recycled materials can be used in applications ranging from housings and panels to vehicle carriers and grilles, as shown in case studies in this brochure.

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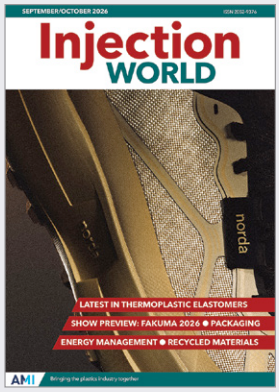
Plastics Recycling World September 2026
The Compounding & Recycling Expo in Frankfurt is previewed in the September edition of Plastics Recycling World. Recycling of food-grade polyolefins is explored in an opinion article and a feature, while sorting and granulating technologies are also covered.

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Plastics Recycling World July/August 2026
In its cover feature, Plastics Recycling World's July-August edition looks at technology for the critical role of washing in a recycling line. The other features in this edition explore polyurethane and chemical recycling.

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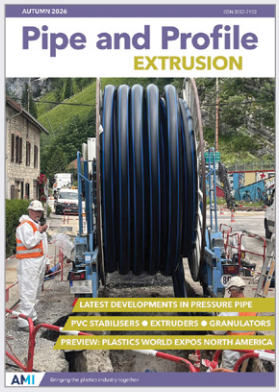
Injection World September/October 2026
Plastics sustainability is a key topic in the new issue of Injection World magazine, covered in features on energy efficiency and recycled materials. Plus: Fakuma 2026 is previewed and TPEs and packaging moulding are explored.

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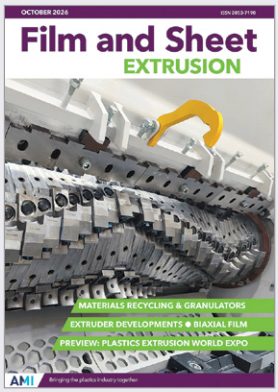
Compounding World October 2026
In the October edition of Compounding World discover how the latest nanoscale additives can support compound development, and read about exhibitors at the Compounding World Expo in Cleveland, plus alternative technologies for compounding.

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Pipe and Profile Autumn 2026
The cover feature of Pipe and Profile Extrusion's Autumn edition looks at pressure pipe companies winning praise for their work. The issue also contains features on the latest in extruder and recycling technologies, plus PVC stabilisers.

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Film and Sheet October 2026
Film & Sheet Extrusion's October edition has features which explore new technology in film recycling, the latest extruder developments and the outlook for biaxially oriented film. There's also a preview of the Plastics Extrusion World Expo in the USA.

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Compounding WORLD
Film and Sheet EXTRUSION
Pipe and Profile EXTRUSION
Injection WORLD
Plastics Recycling WORLD

GLOBAL EXHIBITION GUIDE

2026	**3-5 November**	PU China, Shanghai, China	www.puchina.eu
	3-6 November	Ecomondo, Rimini, Italy	www.ecomondo.com
	10-13 November	Plastimagen, Mexico	www.plastimagen.com
	11-12 November	Plastics Recycling World Expo, Cleveland, US	www.na.plasticsrecyclingworldexpo.com
	1-5 December	IPF Japan, Chiba	www.ipfjapan.jp
	2-5 December	Plasteurasia, Istanbul, Turkey	https://plasteurasia.com
	14-16 December	RACE, Mumbai, India	www.raceexpos.com
2027	**2-4 March**	JEC World, Paris, France	www.jec-world.events
	7-8 April	Textiles Recycling Expo, Charlotte, NC, USA	www.textilesrecyclingexpo.com/usa
	13-16 April	Chinaplas, Shenzhen, China	www.chinaplasonline.com
	20-22 April	UTech Europe, Maastricht, Netherlands	www.utecheurope.eu
	27-29 April	Plast-Alger, Algiers, Algeria	www.plastalger.com
	3-7 May	NPE 2027	www.npe.org
	11-12 May	Moulding Expo, Stuttgart, Germany	www.moulding-expo.de
	16-17 June 2027	Textile Recycling Expo, Brussels, Belgium	www.textilesrecyclingexpo.com

AMI CONFERENCES

3-4 November 2026	Fire Resistance in Plastics, Düsseldorf, Germany
24-25 November 2026	Flexible Pack Recycling, Vienna, Austria
1-2 December 2026	Polymer Engineering for Energy, London, UK
8-10 December 2026	Wind Turbine Blades, Düsseldorf, Germany
8-9 December 2026	Stretch and Shrink Film North America
24-25 February 2027	PVC Formulation, Charlotte, NC, USA
2-4 March 2027	Cables Europe, Düsseldorf, Germany
20-22 April 2027	Stretch and Shrink Film, Málaga, Spain
1-3 June 2027	Global FilmTech Forum, Savannah, GA, USA
23-24 June 2027	Fire Retardants and Cables, Pittsburgh, PA, USA

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

www.amiplastics.com

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