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Plastics Recycling WORLD



5 News
News from the global plastics recycling industry

17 Wash cycle: equipment firms go with the flow
Developments in business, technology and regional markets are behind the progress of washing modules in plastics recycling. Mikell Knights reports on new trends

COVER PHOTO: SHUTTERSTOCK



25 Partners push ahead in chemical recycling
Projects to bring chemical recycling into production are focusing not just on polyolefins, but also PLA, PET, tyre rubber and carbon black, writes Chris Saunders



34 Conference Preview
Industry leaders will gather at AMI's Plastics Recycling World Expo in September to discuss plastics recycling progress

39 Expo Preview: Brussels hosts key players
Plastics Recycling World Expo provides a showcase for innovation from groups in Europe and beyond, as shown in this exhibitor preview



49 Expansion of e-waste and auto recycling
Sustainability and regulatory pressures are behind a surge of activity by industry groups aiming to improve recycling of used electronics and old cars. By Chris Saunders

58 Diary

COMING NEXT ISSUE

› Sorting Technology › Granulators › Rigid Polyolefins Recycling

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AMI

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

www.twitter.com/plasticsworld
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 Editor (UK): Jennifer Markarian
jma@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
maggieliu@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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US Plastics Pact issues new 2030 targets

The US Plastics Pact has released its latest strategic plan for sustainability in plastics in the US, at the same time pushing back targets by five years. It said Roadmap 2.0 builds on the lessons learned from its initial Roadmap to 2025 to help companies change how they design, use and reuse plastics in their packaging.

The Pact said the new version of the rodmap is an actionable plan focusing on practical steps to create a circular economy where plastic packaging is reused, recycled, composted, and kept within the economy instead of becoming waste. An important revision in the latest version delays key sustainability targets from 2025 to 2030 after initial progress fell short of anticipated targets. Roadmap 2.0 begins on 1 January 2026.



Jonathan Quinn has become the new CEO of the US Plastics Pact

"Roadmap 2.0 is not just a continuation; it's an evolution," said Emily Tipaldo, Executive Director of the US Plastics Pact. "Our initial targets were intentionally ambitious to spark rapid change. With Roadmap 2.0, we're taking what we have learned to the next level, focusing on innovative solutions, and addressing broader impacts. We are committed to working collaboratively with our Activators and stakeholders to make these targets a reality."

In July, the US Plastics Pact announced the appointment of Jonathan Quinn as the new CEO, effective immediately. Tipaldo, who served as first Executive Director, will act as strategic advisor to assist with the transition.

› **https://usplasticspact.org**

Lindner opens subsidiary in India

Austrian recycling machinery manufacturer Lindner is continuing its expansion with the foundation of a new subsidiary in India.

Known as Lindner Recyclingtech Bharat, the subsidiary will be headquartered in Delhi, adding to the group's existing subsidiaries in Germany, US, Singapore, and France, which provide services to local customers.

Chirag Verma, Co-owner of Lindner Bharat, said: "India is a densely populated country with huge volumes of waste. According to estimates, the mountain of rubbish will rise to more than 400m tonnes by 2050. There is a lot to do in recycling."

› **www.lindner.com**

PMMA recycler expands

Pekutherm Kunststoffe of Geisenheim, Germany, a specialist in recycling PMMA and PC, plans to accelerate its European expansion and has identified Italy, Spain, France, and the Baltic States, as key territories. The company said it also plans to build on its existing presence in Denmark and Finland.

According to Managing Partner Heiko Pfister, Europe generates approximately 30,000 tonnes/yr of PMMA waste. Of this, 5,000 tonnes/yr are recycled in Geisenheim for reuse, while the rest is processed elsewhere.

"A significant portion is collected in Europe and shipped to Asia, where the recycling rate is likely very low," Pfister said, adding that he hopes to double Pekutherm's PMMA recycling volume within the next three years.

Pekutherm recycles many types of PMMA glass, including coloured.

› **http://pekutherm.de**

Austria named best country for recycling

In a new study by Reloop and Eunomia Research, Austria has been named the world's best country for recycling.

Wales was second on the list with both countries achieving a recycling rate of 59%, ahead of Taiwan, Germany, and Belgium.

The Global Recycling League - Phase One Report examined the recycling performance of 48 countries in total, including those that report the highest recycling rates and many of the world's largest economies, as well as lower income countries, to highlight global disparities.

Tove Andersen, President and CEO of Tomra which partly funded the project, said the lack of standardisation on what should be measured at which point in the recycling process made cross-country comparisons "notoriously difficult". But highlighting nations that are performing well allows for dissemination of best practices and increased recycling rates.

› **www.reloopplatform.org**

› **www.tomra.com**

AMI launches Textiles Recycling Expo in Europe next year

The Textiles Recycling Expo is making its debut on 4-5 June 2025 in Brussels, Belgium. Organised by *Plastics Recycling World* publisher AMI, this groundbreaking exhibition is the first of its kind, focusing specifically on solving the pressing issue of textile waste, including the recycling of fabrics, clothing, footwear, fibres and non-wovens.

Designed to foster collaboration and spark innovation, the Textiles Recycling Expo and its conference theatre are free to attend. This decision is aimed at attracting a large international audience from across the complete supply chain, including leading recyclers, waste managers, textile manufacturers, clothing suppliers, retailers, and other stakeholders.

"New EU regulations and growing consumer pressures are driving the need for cross-industry collaboration to develop viable solutions to divert textile waste away from landfills," said Andy Beevers, Events Director at AMI. "This new exhibition and conference provide a unique opportunity for the whole supply chain to get together to explore the recycling strategies and technologies that can meet these demands, and plan their investments accordingly".

The exhibition is an international showcase for innovative developments aimed at solving the issue of textile waste, including the latest sorting, shredding and recycling technologies. Exhibitors also include textile recyclers plus fibre and fabric manufacturers using reclaimed materials. Companies that have already booked their stands at the event include: Aimplas, Carbios, Closeoop (DBT Fibre), MagnoLab, List Technology, New Retex, Pellenc ST, Picvisa, Reverse Resources, Stadler and Tomra.

The high-level two-day conference running alongside the exhibition provides a forum for industry leaders, innovators and stakeholders to shape a sustainable future for the textiles industry. It is designed to deliver valuable insights and perspectives on the textile recycling industry, as well as opportunities for discussion and knowledge sharing.

The Textiles Recycling Expo is supported by leading industry organisations, including EuRIC, Fedustria, ReHubs and Textiles Recycling Assn.

For more information on the event, visit **www.textilesrecyclingexpo.com**

New plant innovates sorting

Recycling machinery manufacturer Bollegraaf is building a new LDPE sorting plant for Broeckx in Esbeek, Netherlands. Planned capacity is 13.5 tonnes/hr.

To recycle LDPE more efficiently, the new plant will use a sorting method based on chemical properties.

With this new installation, it is hoped the percentage of LDPE that can be reused will increase from 10% to as much as 80%.

› **www.bollegraaf.com**

White House: new strategy to tackle plastic waste in US

The White House has issued a new government-wide strategy to tackle plastic pollution in the US.

Entitled Mobilising Federal Action on Plastic Pollution: Progress, Principles, and Priorities, it presses home the need for a "full lifecycle approach," and was accompanied by a post on the White House website alluding to a new goal of phasing out single-use plastics from operations, events, and packaging by 2027, and from all federal operations by 2035.

The strategy was met with approval from some organisations like the Association of Plastic Recyclers (APR) which issued a statement saying: "The report represents the first comprehensive, government-wide strategy to target plastic pollution [and] identifies several key actions that are long-standing APR priorities. Specifically, the report emphasises the importance of both the supply of high-quality recyclable plastic packaging with design standards and specifications and the demand for material with minimum post-consumer recycled content requirements."

However, the Plastics Industry Association, claims the strategy is inadequate. "Instead of targeting plastics, we support investing in improving our country's recycling infrastructure," said Matt Seaholm, President and CEO. "New innovations, like advanced recycling, must not be stifled. Furthermore, we support well-crafted extended producer responsibility policies and reasonable nationally recognised recycled content requirements."

› **www.whitehouse.gov**

› **www.plasticsindustry.org**

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www.herbold.com www.coperion.com

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Borealis to install recycled PO compounding line in Belgium


IMAGE: BOREALIS

Borealis is installing a semi-commercial demonstration recyclate-based polyolefins (rPO) compounding line in Beringen, Belgium.

The new line will use Borealis' proprietary Borcycle M technology to transform mechanically recycled post-consumer waste into high-quality rigid PP and PE materials, and will be capable of processing a broad range of recyclate flakes from both PP and HDPE waste sources. Set for construction this year, the plant is expected to be fully operational in the first half of 2025.

Mirjam Mayer, Borealis Vice President Circular Economy Solutions, said: "This represents another step in Borealis' ambition to deepen our expertise in giving plastic waste a new life in high-value applications."

The investment will expand Borealis' overall recyclate processing and compounding capacity as well as provide valuable operational experience and technological insight into recyclate processing that will help the company scale up the technology in future, it said.

› **www.borealisgroup.com**

Dow to acquire Circulus

Dow has signed an agreement to acquire recycler Circulus in the US. This transaction includes two facilities, one in Ardmore, Oklahoma, and another in Arab, Alabama, with a total capacity of 50,000 tonnes/yr.

Dow's expertise in materials science and high-performance resins combined with Circulus' mechanical film recycling capability will allow Dow to enhance its offerings in a range of applications such as stretch film, liners and select food packaging and help it reach its 2030 Transform the Waste goal. The transaction is expected to close in the third quarter of 2024.

› **www.dow.com**
› **https://circulus.com**

Erema remains cautious despite strong sales

IMAGE: EREMA



Erema has opened a new R&D centre at its HQ in Ansfelden, Austria

Austria-based Erema Group – which has eight subsidiaries: Erema, Pure Loop, Plasmac, Keycycle, Lindner Washtech, UMAC, Plasticpreneur and 3S – has closed the 2023/24 fiscal year with total revenues of €380m. The group manufactured 290 extruders for recycling plastic in the past fiscal year, supplemented by over 100 add-on components such as filter systems.

"With our machines and components, we have now reached a recycling volume of more than 25 million tonnes per year worldwide, which makes a significant contribution to the development of a circular economy for plastics," said Manfred Hackl, CEO of the group.

Despite the success, Hackl urged caution: "The plastics recycling industry is having a tough time competing with the low prices for virgin material, particularly in Europe, with companies still facing high energy and production costs. We are using this time to further optimise our processes and invest more in research and development. Our aim is to continuously increase the added value for our customers and be ready for the next phase of growth."

In recent times, the group has invested in developing machines for specific tasks, applications, and infrastructure, and opened a new R&D centre in Ansfelden, Austria.

› **https://erema-group.com**

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RecyClass updates packaging design for recycling guidance

Following intensive independent testing, the European cross-industry initiative RecyClass has released an updated version of its Design for Recycling Guidelines for plastics packaging, with restructured sections on decoration to bring them in line with recent legislative developments at European level.

Notable additions to the guidelines include a more precise definition of adhesives for labels on HDPE, PP and PS rigid packaging, and updated recommendations for polyolefin foamed liners. A technical review of HDPE tube size sorting will also be available following the results shared by US research group Stina.

For PE films, EVOH/metallisation and laminating adhesive combinations can now be directly certified without testing, provided they follow recommendations.

Additionally, PP-based plastomers are now recognised as fully compatible with the PE packaging recycling stream if they represent up to 15% of the total weight of the packaging. Also, recommendations around PET bottles have been refined with better definitions for clear, light blue, and coloured transparent PET bottles, together with additional guidance on closures.

"Considering the recent legislative developments at the European level, RecyClass is more committed than ever to provide the industry with the most up-to-date recommendations for improving circularity of plastic packaging," said Paolo Glerean, Chairman of RecyClass.

The recommendations have been integrated into the RecyClass Online Tool and the RecyClass Recyclability Certification Schemes.

The initiative said ongoing testing campaigns will soon be finished which is expected to further enhance the RecyClass Design for Recycling Guidelines on TPS, adhesives, inks and PVOH, among others.

› **https://recyclass.eu**



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Circular flooring group confirms breakthrough

It is possible to produce plasticiser-free PVC recyclates from flexible floor coverings using a solvent-based process jointly developed by Fraunhofer IVV and CreaCycle, according to the Circular Flooring consortium following lengthy research.

The recovered PVC complies with EU Reach legislation and can therefore be used to produce new PVC flooring, supporting the EU objective of establishing a European circular economy. In addition, the consortium said it has has demonstrated the technical feasibility of the process on a pilot scale, paving the way for a shift to commercial dimensions. The Fraunhofer Institute for Processing Engineering and Packaging (IVV) in Freising, Germany, carried out the project together with ten companies and research facilities from five European countries.

IMAGE: SHUTTERSTOCK / 8TH CREATOR



A solvent-based process has been shown to be successful in recycling PVC flooring while separating plasticiser content

Due to product requirements which were not covered by the project, the recyclate is not used in the top layer of flooring but can replace up to 100% of virgin PVC in non-visible layers. Furthermore, the critical legacy plasticisers that are removed during the process can be converted into uncritical Reach-compliant substances.

"The quality of the PVC recyclate produced on a pilot scale is very good, conforming to EU standards and permitting reuse in new PVC products," said Fraunhofer IVV's Dr Martin Schlummer, who coordinated the project. "Transforming the separated plasticisers into Reach-compliant products proved more chemically complex than we had at first imagined. Nevertheless, we were ultimately successful."

› **www.circular-flooring.eu**
› **www.ivv.fraunhofer.de**
› **www.creasolv.de**

IN BRIEF...

Krones has spun off its recycling expertise in an independent subsidiary, Krones Recycling, which takes over all activities relating to plastics recycling, and continues to utilise Krones' global production, sales, and service network (also see Washing feature on p17).
www.krones.com

Silon has acquired Czech recycling company PESL. Located approximately 100 km northeast of Prague, PESL has a 30-year history and is transitioning to Silon with all its assets, employees, and technology.
https://silon.eu

Amut has appointed Altech as its new sales agent for its recycling plants in Japan. This new partnership will improve the level of service provided to clients, while strengthening Amut's presence in the region.
https://amut.it/en/

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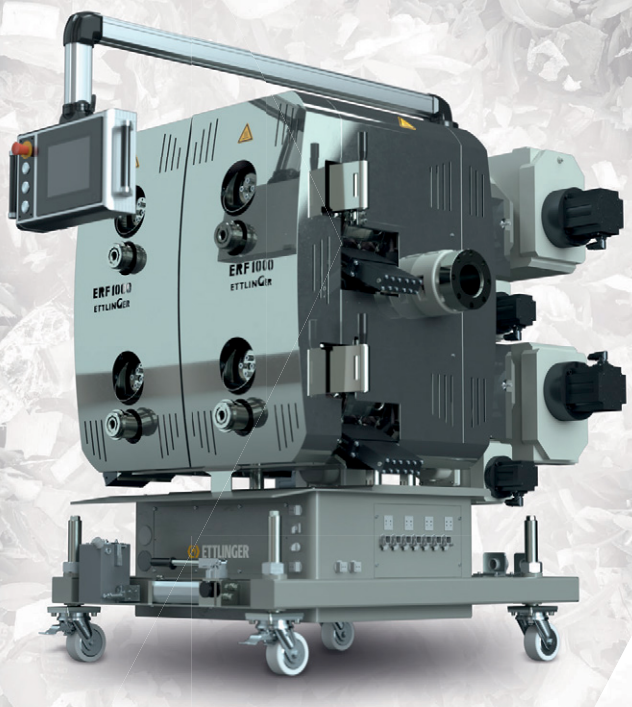

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An Introduction to Recycling of Engineering Polymers Europe

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By evaluating the operating environment, identifying key trends, and providing up-to-date databases on mechanical and chemical recyclers, this study offers visibility into the current and future status of the market. It highlights areas where investments and improvements are needed, paving the way for a more sustainable and efficient recycling industry.

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- An evaluation of current commodity polymer capacity and recyclate production including an indication of utilisation.
- A review of the end-use applications for recyclate, with an examination of potential future absorption.
- Data is provided for the years 2021, 2022, and 2023, and forecasts for 2035 and 2030.

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Both reports include an interactive dataset, allowing for fast and convenient data retrieval.



IMAGE: SHUTTERSTOCK

Developments in business, technology and regional markets are behind the progress of washing modules in plastics recycling. Mikell Knights reports on new trends

Wash cycle: equipment firms go with global flow

Improving the quality of recycled plastics is driving advancements in the efficiency and accuracy of washing equipment. Technology suppliers say their latest designs pursue higher purity fractions coupled with economic consumption of energy, water and detergents.

German bottling machinery and equipment maker Krones has created **Krones Recycling**, an independent subsidiary company that will take over all activities related to plastics recycling, including its washing technology. The new company, which commenced business operations on 1 July, has been formed in response to the growing significance of the recycling sector, increasing demand worldwide for recycled plastics and the role Krones says the new company will play in achieving its sustainability goals.

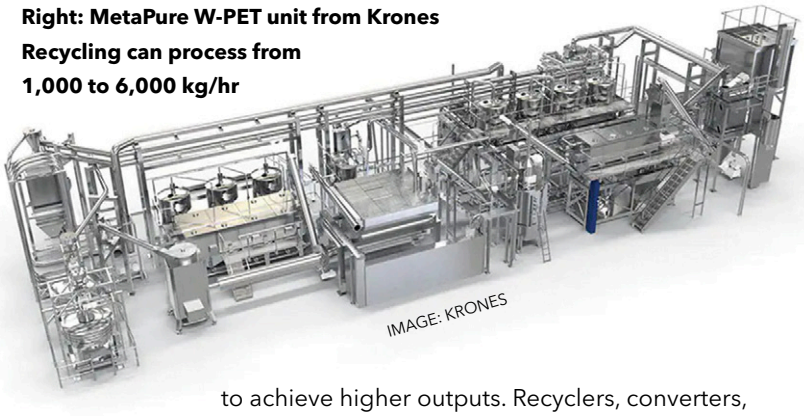
Krones Recycling will continue to conduct intensive research into new innovations at its in-house Recycling Technology Centre, where tests on the recyclability of various plastics, including adhesives and colours can be carried out under real conditions on behalf of customers.

Krones Recycling will offer the company's MetaPure W series of washing modules in configurations for PET or polyolefin washing, which can help in the processing of recycled material into food-grade material, avoiding downcycling.

Features of the MetaPure W-PET washing module for waste PET include gentle treatment of the material as the unit operates with slow rotation, reliable removal of dirt, organic residues and adhesives using a caustic washer, and a multi-stage post washer. A design and automatic waste management system of the unit results in less cleaning and more safety for line operators, the company said. The automatic dosing equipment ensures a constant concentration and low consumption of caustic material, additives and defoamers. A float-sink separation system and sifter offer reliable removal of caps and labels.

Krones Recycling said the MetaPure W-PET unit can process from 1,000 to 6,000 kg/hr. Several modules can be combined with each other in order

Main image: The washing stage is a vital part of a PCR plastics recycling line



Right: MetaPure W-PET unit from Krones Recycling can process from 1,000 to 6,000 kg/hr

IMAGE: KRONES

to achieve higher outputs. Recyclers, converters, private label bottlers and brand bottlers are likely users of the washing system, Krones said. Many parts of the unit are constructed in stainless steel for robustness.

The company also offers the KIC Krones Col-clean series of detergents and disinfectants that optimise the PET washing process to ensure the operating materials for the process and processing fit together for the most efficient operation.

Krones Recycling also produces the MetaPure W in a configuration adapted to washing polyolefins. Its MetaPure W-PO keeps the process-related attributes of the Krones washing technology unchanged, such as caustic cleaning with caustic removal, multi-stage post-washer, a drying step and reliable removal of the sinking fraction and labels. Pre-cleaning sequences or an automated waste management system that reduces the operator's workload are optional.

Teaming up

In 2023, two Austrian equipment makers prominent in plastics recycling, **Lindner Holding** and the **Erema Group**, jointly founded Blueone Solutions, a new holding company which aims to leverage the expertise of both entities by adjusting and optimising processes and conducting joint research projects that set industry standards and add value.

According to the two business interests, potential new raw materials pass through several different recycling processes, which range from sorting, shredding, washing, and drying to extrusion, which itself includes filtration, compounding, and odour optimisation. The biggest opportunity for the industry lies in fine tuning these individual recycling steps, which can bring about an increase in efficiency and can allow quality optimisation to be achieved, the companies said. Breaking new ground in plastics recycling means assessing the value chain from end to end. "A functioning circular economy is only possible by merging waste management with recycling management," said Michael Lackner, Managing Director of Lindner.

Each company owns a 50% stake in Blueone Solutions, to which shares of Lindner's Washtech division were contributed. Blueone Solutions combines Lindner Washtech's know-how as a specialist supplier in shredding, sorting, washing and drying technology and recycling systems with Erema Group's deep knowledge in extrusion and filtering equipment for plastics recycling.

The two companies presented the first results of synergies stemming from their Blueone Solutions joint venture at a tradeshow this year in Germany. According to Lackner, co-ordinating the process steps between recycling and extrusion has already achieved success in energy management, with heat recovery a clear example of the benefit. "We use the latent heat generated during the extrusion process as an energy source for the washing and drying process. This enables customers to sustainably reduce their energy costs and carbon emissions," Lackner said.

A more recent synergistic achievement is in the area of data transfer and standardising the process control system. According to Manfred Hackl, CEO of Erema Group, the two companies have developed a platform that allows data to be exchanged between the extruder and the washing system. "This enables us to analyse the data more precisely so that effective improvement measures can be deduced," he said. All key parameters are taken into account and monitored via a digital interface. In example, it is possible to use information relating to the current throughput of an Erema Pre Conditioning Unit to optimise the Lindner washing process as soon as possible, so that it can compensate for fluctuations in capacity and achieve a significant increase in output. Data transfer represents a new step on the road to digitalisation, Erema said.

The two companies have several examples where together they have improved recycling processes and made it possible to move away from downcycling. An example is the recycling loop of



IMAGE: EREMA/LINDNER

Right: Manfred Hackl (left), CEO of Erema Group, and Michael Lackner, Managing Director of Lindner, whose companies have jointly founded Blueone Solutions

HDPE starting material, which can be processed into high-quality, food-safe rHDPE pellets using the combined technologies of the two companies, said Lackner.

Lindner Washtech offers several washing technologies as modules for plastics recycling systems. This includes Rafter, its pre-washing unit for heavily contaminated, primary shredded plastics, such as post-consumer LDPE films and hard plastics made from HDPE and PP. A three-phase operation separates contaminants and impurities like metal and glass and loose material adhesions, with removal by a chain-type conveyor. Rafter offers slow torque speed for gentle processing with minimal wear and tear and is easy to integrate into an existing system to increase washing efficiency and optimally prepare the input material for the downstream washing process.

Lindner also offers its Twister series of friction washers that ensure highly efficient cleaning of contaminated plastics, where even the finest particles of dirt are removed in a dynamic washing process then separated through a screen. Friction is generated by directing jets of water onto the rotor. The friction washer can be configured with special rotor variants for different materials to guarantee optimum washing efficiency as well as quick-change rotor paddles and screens. The units are designed with a stainless-steel housing and feature a robust design that is maintenance-friendly. The series is available with throughputs up to 5,000 kg/hr.

Lindner also developed a hot-wash system specifically for extremely tough contaminants. It removes grease and oil adhering to the material while also eliminating any glue residues and unpleasant odours. The combined use of three special components – a specially designed reactor, and a hot-wash version of both its Rafter unit and Twister unit – effectively removes particles with optimally dosed system and defined material dwell time. The continuous cleaning process of the



IMAGE: SOREMA/GANESHA

Breaking boundaries in Indian PET recycling

Sorema, the division of Italian group Previero which specialises in the construction of plastics recycling plants, has reported on the success of a PET recycling project in India.

Ganesha Ecopet has pioneered bottle-to-bottle PET recycling in the country with its new brand Go Rewise and the construction of a recycling plant in Warangal. Sorema called it "a pioneering project, the first of its kind in the country, with a production capacity of 5,000 kg/hr of food-grade recycled PET material".

The facility recycles locally collected PET plastic bottles in a process that uses a Sorema washing system, followed by an extrusion and solid stating Starlinger section. The "outstanding quality" of the rPET gained approval from Coca-Cola, PepsiCo and others, said Sorema.

Flavio Previero, President at Sorema Previero, said: "Sorema is pleased to have Ganesha as a valued customer and appreciates the significant contribution of the Ganesha team in operating our recycling systems and their commitment to sustainability in India."

He said Sorema has an operational objective to strengthen its presence in India through local production of some components in its manufacturing process.

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IMAGE: LINDNER

Right: The Twister series of friction washers are part of Lindner Washtech's product portfolio

hot-wash system can be operated with water or a caustic solution operating at a washing temperature between 50C and 85C and is ideal for PET and post-consumer plastics applications. It can be integrated into a water treatment facility if required, with automatic monitoring and control of the caustic solution.

Lindner developed a unit that combines its hot-wash system with a PET hot-wash tower and Lindner's Step series of dryers, developed specifically for the PET sector. The hot-wash system removes adhesives, labels, and prints from PET bottles. The PET hot-wash tower can operate with or without caustic solution and works with a separate water circuit. The unit provides gentle cleaning and defined dwell times to guarantee high-quality output materials. Lindner said the first PET line with the new components has been sold in a German-speaking country, with commissioning to take place in autumn. Lindner Washtech supplied the turnkey line, which includes NIR sorting, label remover and water treatment.

Projects in Australia

The Ecotech division of **Amut Recycling Technology** was selected as the turnkey equipment supplier for three world-class recycling projects in Australia over the last few years that incorporate its washing and other technologies to recycle post-consumer plastic packaging into high-quality resins.

Amut was commissioned for two PET and one PE project by **Circular Plastics Australia** (CPA), a joint-venture company created by Australia's **Pact Group**, the largest plastics recycler in the country, plus Cleanaway, a compatriot waste management and resource recovery company, and two consumer goods/beverage makers serving the region, Asahi Beverages and Coca-Cola Europacific Partners. CPA invests in technology and platforms to accelerate a plastics circular economy in the region by processing post-consumer and post-industrial waste.

Pact Group manages the build and operations of the recycling facilities, while Cleanaway provides the plastic waste to be recycled through its collection and sorting network. Asahi Beverages and CCEP are involved in the PET projects, where they use the recycled material to make100% rPET beverage bottles. Pact Group manufactures food and beverage packaging from the recycled materials for its customers.

CPA announced that a US $50m PET recycling facility capable of recycling the equivalent of up to 1bn 600 ml PET bottles a year commenced operations late last year. The Melbourne-based facility is capable of producing 2.5 tonnes of recycled PET per hour (up to 20,000 tpa of rPET), while trimming CO_2 emissions by 79% compared to processing virgin PET, according to CPA. The Melbourne facility (also given the moniker the Symphony plant), can also process low viscosity PET tubs and trays.

According to Gordon Olsen, Director of Sales at Amut North America, Amut's washing lines at the Symphony plant are equipped with the best technical solutions to guarantee high purity of the final rPO/rPET flakes and, in particular, the removal of organic and inorganic contaminants and separation of PSA labels and glue. The automated washing systems ensure extremely low operational costs with reduced consumption of power, water consumption and chemicals.

The facility incorporates multiple infrared and optical sorters that firstly separate out any non-PET material, such as bottle lids, labels, and metals. The PET bottles are then shredded, ground, and washed before the flaked material goes through a two-stage heating and drying process. The washed flake undergoes an extrusion and purification process to produce the recycled PET material.

The Symphony plant is similar in size and capability to Duet, a PET recycling facility in Albury, New South Wales, that CPA commissioned Amut to supply equipment to, and which commenced operations in 2022. In February this year, Amut said the high performance of its recycling equipment at the facility has allowed processing output there to increase from 3,400 kg/hr to 4,000 kg/hr.

Amut supplied two washing lines for a CPA project designed to produce food-grade rHDPE and rPP resin from 500m milk bottles, containers and food tubs collected locally as kerbside waste. Pact Group and Cleanaway formed the Choir project which operates a state-of-the-art facility in the Victoria region of Australia, processing more than 20,000 tpa. According to Amut, the turnkey solution included a patented sorting solution and washing process to achieve high purity flakes.

Amut's equipment sorts the valuable materials, including natural colour HDPE containers, coloured HDPE containers and PP containers, from the stream of mixed plastic bottles into individual streams. The material, stored in buffers, is automatically dosed to one of two 2,000 kg/hr washing lines. One washing

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line is dedicated to natural colour HDPE with the other dedicated to coloured HDPE and PP containers. Both lines are capable of processing natural colour HDPE for food grade applications. The recycling system at the plant also includes a double stage friction washing system, which is also incorporated at the PET facilities.

Latin American projects

Amut recently announced the advance of three PET recycling projects in Latin America. It has completed the installation of a new 6,000 kg/hr recycling line in Lima, Peru that is the largest in the country producing rPET for bottles. A facility at Città del Guatemala in Guatemala to develop a 3,000 kg/hr integrated sorting and washing solution is also underway with the erection phase begun in January. At the same time, a 3,000 kg/hr facility at a site in Bogotà, Colombia is also under construction. The water, energy and chemically efficient plant is designed to reduce freshwater usage to 1.1 l for each kg of high purity rPET flakes produced.

Amut offers a complete recycling system for PET bottles or for HDPE bottles/LDPE film. The PET line incorporates a pre-washing and delabeling step after bale breaking that removes labels and provides product surface cleaning that extends the life of grinder blades. After passing through metal detection, NIR polymer detection and a waste control step, material is wet ground and further cleaned in a turbo washer. A patented high friction hot washing unit automatically removes glue, organics, label remnants and other impurities from the flake down to 0-70 ppm in a continuous but non-destructive operation. Flakes are typically subject to a cold rinse, mechanical centrifuge, drying step, and final grinding. Product can be sent to a mixing silo, dedusting unit, coloured flake and metal detection step before being moved to a flakes storage silo. Amut offers systems from 1,250 kg/hr up to 6,000 kg/hr.

Amut's standard recycling systems for HDPE bottles or LDPE films can process HDPE bottles at rates from 500 to 4,000 kg/hr, and LDPE films at rates of 500 or 1,000 kg/hr. The washing plant, which includes a decantation trough after a pre-shredding step, wet grinding and high friction washing, recirculates 70-80% of the water for washing in a water treatment step. The remaining 20-30% of washing plant water is purged from the system, about 1 l per kg of rPE made.

Hosokawa Polymer Systems has been active in the plastics recycling market, offering a PET washing system, an LDPE washing system and a friction washer. The design of its PET washing system for



IMAGE: AMUT

Above: Amut has been the partner of Circular Plastics Australia on three of its projects to recycle PET and polyolefins

PET bottle recycling is based on experience gained in manufacturing a large number of recycling lines in various countries and obtaining detailed user feedback to continually improve flake quality and output capacity with low operation costs.

The company offers the washing unit in several models with throughputs from 1,000 kg/hr to 5,000 kg/hr. The unit can be powered by electricity or steam, can use washing detergent or water for the wash and features stainless steel construction.

Hosokawa Polymer System also offers a LDPE wash system which can handle agricultural films, post-consumer film or post-commercial and post-industrial film including 100% stretch material. The unit is a special film friction washer developed just for film cleaning and can be integrated with a wet granulator with a high cutting capacity or sink/float tanks for material separation. The unit is constructed from stainless steel and incorporates a unique film squeezer for drying film flake to 6% moisture without special heating. Hosokawa Polymer Systems also offers the Friction Washer suited to pre-cleaning of plastics during a fully integrated washing line process, the company said. Auger type screws are utilised to mix and convey material while adding water via internal spray tubing. The Friction Washer has a significant screen area for removal of water and contaminants. The stainless steel unit features high speed rotation and multiple water pipes for additional water injection, the company said.

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Partners push ahead in chemical recycling

Projects to bring chemical recycling into production are focusing not just on polyolefins, but also PLA, PET, tyre rubber and carbon black. Chris Saunders reports on recent developments



IMAGE: CARBOLIQ

Main image: The Carboliq process can recycle a wide range of materials in addition to polyolefins

The rapid evolution of chemical recycling technologies represents a major shift in waste management, according to industry players. By harnessing the potential of a range of non-mechanical processes, a transition towards a sustainable future where waste is a valuable resource is made more viable.

"We at **Dow** consider advanced recycling to be a truly impactful technology [which can] help solve the problem of hard-to-recycle plastic waste in the environment," said Manav Lahoti, Dow P&SP Global Sustainability Director, Olefins, Aromatics and Alternatives. "McKinsey & Co estimates that $40bn in investments are required to meet demand from advanced recycled plastics supply between 2020 and 2040. To meet that demand, Dow and other leaders in the plastics industry are investing in advanced recycling technologies and infrastructure. Beyond the demand from brands, advanced recycling, once deployed at the necessary scale, can help prevent millions of tonnes of plastic from ending up in landfills or being incinerated, and is a crucial part of building a circular plastics economy."

Dow recently announced a supply agreement with **Freepoint Eco-Systems** to expand chemical recycling capacity in the US. Dow will be the sole off-taker of circular feedstock from phase one of Freepoint Eco-System's chemical recycling project in Arizona. The company says that after further processing of the pyrolysis oil, the properties of these plastics will be the same as virgin materials and have the same performance capabilities, even in products with food grade approval.

Given its expense and complexity, an ongoing trend in chemical recycling is that of several companies coming together to pool specialist knowledge or resources. "Collaboration is a crucial and emerging facet of building advanced recycling capacity in the US and beyond," Lahoti added. "Partnerships and agreements like those between Dow and Freepoint Eco-Systems provide a real-world example of how the industry can work together to build a progressive recycling system that converts waste into valuable resources."

Dow is one of the companies investing in **Mura Technology**, which this year will open what it says is the world's first commercial-scale Hydro-PRT recycling plant in Teesside, UK. The purpose-built facility will produce 20,000 tonnes/yr with room for significant expansion. Steve Mahon, Mura Technology's CEO, said: "Our Hydro-PRT process is unlocking a new market for plastic waste, creating value, and keeping both plastic and carbon in circularity. The technology works alongside existing mechanical recycling to ensure no plastic types are



IMAGE: MURA TECHNOLOGY

Right: Mura Technology will use its Hydro-PRT process at a plant in Teesside, UK

considered unrecyclable."

Mura's Hydro-PRT process uses supercritical water (water under high pressure and temperature) to convert post-consumer multi layered, flexible and rigid plastics such as films, pots, tubs, and trays, which are largely considered unrecyclable via traditional means, into hydrocarbon feedstocks. The company says there is no limit to the number of times the same material can be recycled, meaning Hydro-PRT has the potential to greatly increase circularity. Mura says it has received funding which will enable it to begin scaling the technology worldwide, with plans for more sites in the US, Southeast Asia, and Germany.

Brazil-based petrochemical company **Braskem** says it considers achieving a circular economy one of the most important challenges of today. "Braskem is at the forefront in developing technology for recycling plastic waste," claims Alexander Van Veen, Commercial Director for Europe & Asia at Braskem. "One of Braskem's innovative approaches uses an exclusive catalyst that functions like scissors, breaking down plastic waste into monomers [which can be] used in a wide range of everyday products. Braskem's strategy for chemical recycling is based on four strategic pillars, which include open innovation practices, collaborations with universities for the development of proprietary technologies, and continuous investment in these technologies. Additionally, Braskem establishes offtake partnerships."



IMAGE: BRASKEM

Above: Alexander Van Veen, Commercial Director for Europe & Asia at Braskem, says the company's strategy involves collaboration

Pyrolysis and beyond

ExxonMobil, **Cyclyx International**, Sealed Air, and Ahold Delhaize USA announced their intention to become the first venture in the US to successfully launch a circular food packaging proof-of-concept leveraging ExxonMobil's Exxtend technology which breaks down plastic waste into its molecular building blocks while removing contaminants. Ahold Delhaize USA brand Food Lion is collecting plastic waste at select locations and Cyclyx, a joint venture between Agilyx Corporation and ExxonMobil, is responsible for sorting and pre-processing it before delivering the waste to ExxonMobil's Baytown, Texas facility. Sealed Air later converts the certified-circular polyethylene (PE) resins into food-grade flexible film. This multi-partner, multi-stage collaboration is now being evaluated for scale. "This project helps demonstrate how Exxtend technology can widen the range of plastic materials that can be recycled while delivering certified-circular polymers with the critical performance attributes of virgin plastic," said Dan Moore, Vice President, Polyethylene, at ExxonMobil.

LyondellBasell is building a plant at its site in Wesseling, Germany, using its proprietary MoReTec technology which produces both pyrolysis oil and pyrolysis gas. The new plant is expected to have a capacity of 50,000 tonnes/yr when construction is completed by the end of 2025. In a separate project, the company has secured a location for an integrated hub in Knapsack, Germany, which will combine various sorting and recycling operations when it starts operations in the first quarter of 2026. "The industrial park in Knapsack is the ideal location for our integrated hub as is it close to our world-scale facilities in Wesseling and will allow us to develop additional technologies for the recycling of plastic waste," said Yvonne van der Laan, LyondellBasell Executive Vice President, Circular and Low Carbon Solutions. "The integration of various technologies will allow us to build scale and offer our customers a wide range of products from recycled and renewable resources."

Last summer **MOL Group** announced it was partnering with **Lummus** on the implementation of pyrolysis technology through its Green Circle business unit at sites in Hungary and Slovakia. Gabriel Szabó, Executive Vice President of MOL Group Downstream, said: "MOL Group is actively building a strong plastic recycling and waste integration portfolio as we are aware of its crucial role in the circular economy, and sustainable business models require [a] mindset that considers everything as raw material and potential energy source."

Lummus has also formed an agreement with Dongyang Environment Group to deploy the same technology at a plant in Seosan, South Korea, which is to be operated by Dongyang Environment's

subsidiary, **Seohae Green Chemical**.

UK company **Plastic Energy** has launched a feasibility study with **Nova Chemicals** regarding the development of a 66,000 tonne/yr pyrolysis-driven facility in Ontario, Canada. If the plans come to fruition, it would be the largest such facility in the country. Greg DeKunder, Vice President, Nova Circular Solutions, said: "This agreement is a prime example of two companies working together to create timely, effective, and sustainable solutions that will help us make progress towards our 2030 recycled plastics ambitions while diverting hard-to-recycle plastic waste away from landfills."

Plastic Energy has also pledged to provide its patented TAC process technology, which heats mixed post-consumer waste in the absence of oxygen and produces hydrocarbon vapours that are condensed into pyrolysis oil, for **Petronas Chemicals Group (PCG)** to use at a plant in Pengerang, Malaysia. The 33,000 tonnes/yr facility is expected to be operational in 2026. Plastic Energy also recently commissioned a new pilot plant in its R&D labs in Loughborough University Science & Enterprise Park in the UK to further develop and optimise its technology.



IMAGE: QUANTAFUEL

Left: Quantafuel operates chemical recycling plants in Skive, Denmark and Kristiansund, Norway

Ownership

Earlier this year, UK waste management company **Viridor** assumed full ownership of **Quantafuel**. "Our facility in Skive, Denmark, a first-of-a-kind commercial-scale operation for plastics chemical recycling, represents a key milestone in Viridor Polymers' journey towards chemical recycling excellence," said Lee Hodder, Viridor's Managing Director. "Following our acquisition of Quantafuel,

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IMAGE: COVESTRO

Right: Covestro says it invests in chemical recycling technology as a promising way of using waste to recover raw materials for production

we have significantly increased our investment in this site to optimise and expand its capabilities. These enhancements are vital, as Skive serves both as a model for future projects and as a crucial testbed for refining the technologies that will drive our scaling efforts across the industry."

According to Hodder, the right legislation is key if chemical recycling is to advance further. "Policy creates and drives this market; both in terms of material supply and material demand. To increase recycling, both new and existing technologies must be advanced. Supportive policy frameworks underpin this effort. Clear regulations and stable policy signals are essential to unlock research and investment, as well as to underpin the necessary infrastructure. To achieve the best outcomes, we need investors, industry experts, and NGOs to engage constructively in policy design. Building a truly circular economy, after decades of a wasteful one, will take time and require continuous support and collaboration. Through these partnerships, we [can] transform waste management practices, enhance recycling capabilities, minimise environmental impacts, and build a sustainable model that benefits all stakeholders. Together, we are not just managing waste; we are transforming it into a resource."

Film manufacturer **Suedpack** has acquired a majority stake in German company **Carboliq,** developer of a process that combines thermal, catalytic, and mechanical-chemical mechanisms. The films company says projects it has undertaken have already succeeded in converting multilayer films and contaminated material not suitable for mechanical recycling into oil which was then used in the production of new plastics.



TOTALENERGIES CORBION

Above: Maelenn Ravard, Regulatory and Sustainability Manager at TotalEnergies Corbion, which has developed a PLA recycling process

"Our pilot plant has been in continuous operation for years and meets a degree of maturity that complies with Technology Readiness Level 8," said Christian Haupts, founder of Carboliq. "Based on the results of test campaigns, we are adapting the process and developing solutions for integration into our customers' value chains."

He said Carboliq also offers a way of closing the loop in other sectors where products generally consist of mixed or non-recyclable plastics, for example in the automotive industry.

PLA and PET

In a development which could pave the way for others to follow, in January, **TotalEnergies Corbion** published the Life Cycle Assessment (LCA) for recycled Luminy PLA which concluded that the chemical recycling of PLA as a production process has a lower environmental impact compared to production from virgin feedstock. Maelenn Ravard, Regulatory and Sustainability Manager at TotalEnergies Corbion, said: "Depolymerising PLA via hydrolysis is an energy-efficient process allowing us to close the loop and increase circularity for a bio-based material. The LCA results only confirm this statement."

Last October, Indian PET bottle recycler **Revalyu**, which claims to have recycled over 6bn bottles in its home country, broke ground on its first facility in the US in Statesboro, Georgia, where it is planning to invest over $200m. The plant is capable of recycling 90,000 tonnes/yr of post-consumer PET using a process based on glycolysis which uses less water and energy. Construction is expected to be completed in Q3 2025. Vivek Tandon, Founder of Revalyu, said: "Used PET plastic can now be efficiently, profitably, and easily recycled again and again without degradation of quality. In the years to come, less and less PET will be manufactured from oil as it is replaced by high quality recycled material."

In June, **Covestro** announced it had become a shareholder in Groningen-based technology developer **BioBTX** with a multi-million euro investment. Covestro has been co-operating with BioBTX for more than four years, working on the recycling of rigid polyurethane foam using pyrolysis in the EU-funded Circular Foam project. With its new investment, Covestro will help facilitate the construction of a demonstration facility for BioBTX ICCP-Technology at the PETRA Circular Chemicals Plant in Delfzijl, Netherlands. The technology in question makes it possible to produce chemicals such as benzene, toluene, and xylene from organic sources and mixed plastic waste. These aromatic products are essential building blocks for the chemical industry and are widely used in plastics production. ❯

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Once operational, the demo plant, scheduled to start up by early 2027, will convert 20,000 tonnes/yr and represents a crucial step toward implementing the technology on an industrial scale. "Chemical recycling can make a significant contribution to closing the loop and the BioBTX ICCP technology is a promising way of using waste to recover raw materials that we use in production," said Thorsten Dreier, CTO of Covestro.

Tipping point

"The development of chemical recycling has reached a crucial stage: demand for recycled solutions is growing, the regulatory framework is taking clearer shape, and many technologies are far advanced," said Andreas Teir, Head of Liquefied Waste Plastics at **Neste**. "What's needed to make it to the next level now is commitment and investments into respective facilities. This is the time where trailblazers and first-movers emerge. Of course, being among the pioneers comes with certain risks and challenges, but as there is little doubt that we will need circular solutions at scale as soon as possible, being among the pioneers also comes with huge opportunities. At Neste, through our own investments, we are creating demand for the liquefaction frontrunners to leverage these opportunities. We have the technological know-how, can provide a flexible offtake, and have established connections with plastics manufacturers and brands who are already interested in accelerating circularity."

Neste says it has successfully concluded a series of industrial-scale processing runs with increasing volumes of liquefied waste at its refinery in Porvoo, Finland. The runs in the second half of 2023 doubled the amount of waste processed to more than 6,000 tonnes/yr and led to the company's first successful trial run using end-of-life tyres earlier this year. For this project, Neste sourced pyrolysis oil derived from EOL tyres by Swedish company **Scandinavian Enviro Systems** with the goal being to broaden the pool of waste streams. As a continuation of this project, Neste has formed a partnership with Covestro and **Borealis** whereby it supplies raw material to Borealis, which processes it into base chemicals phenol and acetone. These are then supplied to Covestro to use in the production of polycarbonates for automotive applications.

German chemical producer **BASF** is involved in

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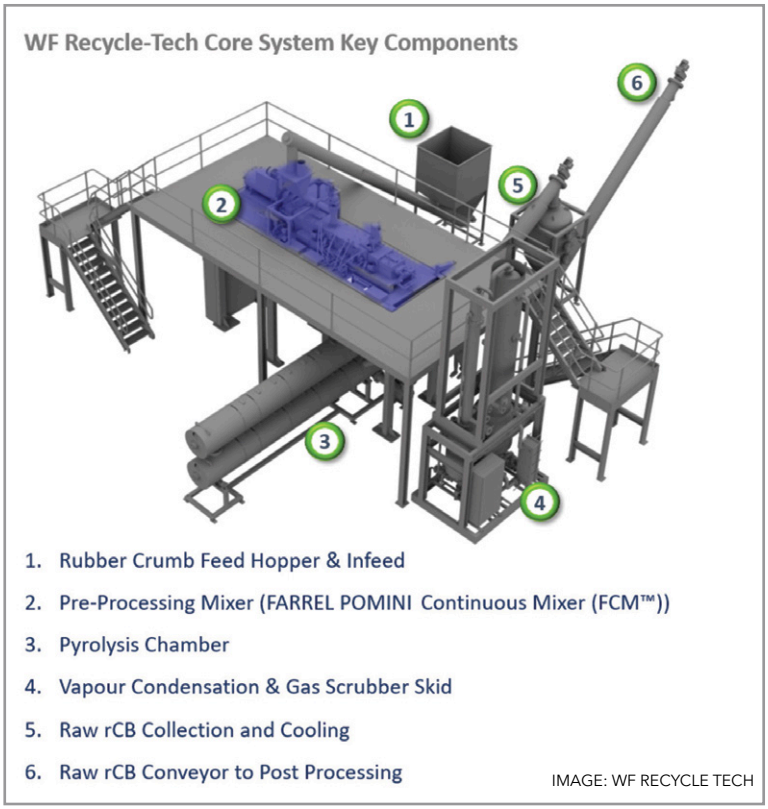

IMAGE: WF RECYCLE TECH

a similar venture. "In our ChemCycling project, our technology partners use pyrolysis to extract pyrolysis oil from mixed plastic waste or EOLT," said Birgit Hellmann, Global Communications Chemical Recycling, BASF. "We feed the pyrolysis oil into BASF Verbund and manufacture new products from it using the mass balance principle. Our Ccycled portfolio now comprises around 240 products, which our customers use for applications from food packaging and transport cases for temperature-sensitive drugs to high-performance plastics for the automotive industry."

In order to expand its portfolio of Ccycled products, BASF signed a new co-operation agreement with **Pyrum** last year which included a conditional loan of €25m which will be used to finance the planning, development, and construction of at least three new Pyrum plants, each with a capacity of 20,000 tonnes/yr of EOLT.

Farrel Pomini, which designs and manufactures continuous compounding solutions, is working with UK company **WF Recycle Tech** which has a patented pyrolysis system for recycling EOLT. At a display at NPE 2024, Farrel Pomini's equipment was shown as the pre-processor in the primary stage of the pyrolysis process to heat and melt the tyre rubber (it can also process plastic waste) before the second stage reactor. The output is 50% pyrolysis oil, 10% gas (which is used to generate electricity for the process) and 40% recovered carbon black (rCB). A key benefit of this system is its modularity, which makes it suitable for the smaller, more regional nature of EOLT processing.

South Korean carbon black producer **LD Carbon** recently closed a $28m Series C funding round led by Woven Capital, Toyota's growth fund. The investment will be used to scale operations to recycle EOLT and other material from end-of-life vehicles into recovered carbon black and pyrolysis oil, which can be used to create new automotive parts. The company's plant in Gimcheon, South Korea, has a current capacity of over 7,000 tonnes/yr of recycled carbon black. LD Carbon has also secured a 10-year supply agreement with **SK Incheon Petrochemicals** for its tyre pyrolysis oil and it is investing in the construction of what is said to be Asia's largest tyre pyrolysis plant in Dangjin City, Chungcheongnam-do, with completion expected later this year.

"LD Carbon is solving a tough chemistry problem that continues to challenge manufacturers across the automotive supply chain as they face increasing pressure to embrace sustainability goals," said Prashant Bothra, Woven Capital principal who is joining the LD Carbon board. He said the company is scaling its proven technology to maximise productivity and reduce the cost of recycled carbon black. "With regulatory and corporate tailwinds, a strong sales pipeline, and a first-mover advantage in Asia, we believe LD Carbon is well-positioned to play an important role in the sustainable future," he said.

CLICK ON THE LINKS FOR MORE INFORMATION:

- **www.dow.com**
- **www.freepointecosystems.com**
- **https://muratechnology.com**
- **www.braskem.com**
- **www.exxonmobil.com**
- **www.agilyx.com/cyclyx**
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- **www.lummustechnology.com**
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- **www.novachem.com**
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- **www.borealisgroup.com**
- **www.basf.com**
- **www.pyrum.net**
- **www.farrel-pomini.com**
- **www.wfrecycle-tech.com**
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Find out more and request to join today



IMAGE: AMI

Key meeting for European plastics recycling industry

Industry leaders will gather at AMI's Plastics Recycling World Expo in September to discuss plastics recycling progress. Here we preview speakers at the free conference

This September, leading plastics recycling industry members will converge at Brussels Expo Centre in Brussels, Belgium for a key event in the European recycling calendar. AMI's free-to-attend **Plastics Recycling World Expo** takes place on 11 and 12 September and will see attendees from across the globe come together for two days of talks, exhibitions and networking.

The latest in plastics recycling technology will be showcased in the dedicated exhibition offering opportunities to discuss recent innovations with the people behind them and a presentation theatre at the show will host expert talks from key figures in the industry.

The speaking theatre opens with an address from European Commission Policy Officer **Julia Roettgerding** on the EU's Single-Use Plastics Directive in which she will provide guidance on the calculation of recycled plastic content in products to ensure compliance. AMI Consultant **Olivia Poole** then takes to the stage with an overview of the latest advances in chemical and mechanical recycling projects in Europe. After these two keynote addresses, **Ole Jan Myhre**, Packaging Advisor for Norner, will then deliver a presentation exploring how different recycling scenarios impact the quality of recyclate. This talk is followed by a look at reactive masterbatch technologies that can improve the quality and performance of recyclate from Nexam Chemical's Business Manager, **Henrik Brenquist**.

Julia Roettgerding then returns to the stage alongside **Maria Vera-Duran**, Project Manager at EuRIC, **Monika Romenska**, Regulatory & Public Affairs Manager at EXPRA, and **Theresa Kjell**, Head of Chemicals Policy at ChemSec, for the first panel of the event. This discussion, which is being moderated by AMI's Editor-in-Chief **David Eldridge**, will focus

on the current and upcoming legislative factors affecting plastics recycling rates in Europe.

After a break for lunch, Cargill's Technology Development Specialist in Polymer Additives, **Dmitris Vgenopoulos**, kicks off the afternoon with a look at additive technology that can protect polymer properties during mechanical recycling. **Giorgio Santella**, CEO of CMG Granulators, will then present the latest developments in granulation technology for post-consumer plastics. Chemical recycling is the subject of a presentation by **Adlan Omer**, Sales Manager for Aixprocess.

The day finishes with a top-level discussion on one of the most challenging areas for recycling: packaging. **Alena Maran**, Director of Strategy & Sustainability, Labels at Avery Dennison, **Guido Aufdemkamp**, Executive Director of Flexible Packaging Europe, and **Tony Nawar**, VP of Sustainability, Strategy and Innovation at Berry BPI, join David Eldridge to discuss the current challenges facing packaging recycling in Europe along with the technological and legislative solutions that can address the issues.

The second day of talks begins with a keynote from **Thies Julius Lorenzen**, Nestlé's European Public Affairs Manager, on the multinational's approach to packaging sustainability that will provide insights into the trajectory and requirements of commercial plastic packaging. **Joonas Mikkonen**, Senior Scientist at VTT Technical Research Centre of Finland, will then discuss the use of adaptive in-line rheology control to improve the performance of mechanical recycling systems. Following this, recycle purification becomes the focus with a talk on cleaning and odour reduction in polyolefins from **Florian Mitterecker**, Sales Manager at Starlinger.

This focus on quality improvement continues with a talk from Gneuss' Regional Sales Manager **Niklas Möhlmann** on how new systems for super-clean recycling are allowing industry to meeting the constantly increasing requirements for recycle quality. **Paulo Gomes**, Sales Director at Plasmaq, will further expand on this theme with a look at the effect of moisture content and bulk density consistency on the output and consistency of flexibles material drying during recycling. Aimplas Mechanical Recycling Researcher **Vanessa Gutiérrez** then takes to the stage to explore the ability of mechanical and chemical recycling to tackle complex waste streams in a complementary fashion.

Herbold Meckesheim's Team Leader of Sales **David Hüttig** kicks off proceedings again after lunch with a talk elucidating the company's latest plastics recycling solutions. **Dietmar Dieing**, Vice President of Sales at Sesotec, follows with a look at the latest innovations in sorting and separation that are ensuring high quality feedstocks. The final industry presentation of the event from **Estelle Dalod**, R&D Director of Materials & Process at Axel'One, will look at the hot topic of textiles recycling, investigating current progress towards a circular economy for textiles.

The event rounds off with a panel discussion that looks to the future of plastics recycling. **Siddharth Bagri**, Head of Recycling at Landbell, **Silke Einschuetz**, Senior Consultant at AMI, **Hao Ding**, Global Marketing Director of Total Energies, and **Vanya Veras**, Secretary General of Municipal Waste Europe, will once again be joined by David Eldridge to discuss the the importance of supply chains.



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AMI Researchers have been conducting intensive research and telephone interview programs focused on mapping North America's growing mechanical recycling activity.

The database Plastic Recyclers North America includes a total of 395 sites across Canada (54), Mexico (22) and the US (319).

Over recent years the United States, Canada, and Mexico have made commendable efforts to increase recycling rates and reduce plastic waste. However, challenges such as inconsistent recycling infrastructure persist, leading to variations in recycling rates and practices. Some key findings from the research include:

- 58% (229) of recycling sites listed are 'privately owned'
- HDPE is the most recycled material, followed by PP and LDPE
- 48% of the sites listed recycle at least one type of Engineering Polymers (ABS, PA, PC, PBT, SAN, POM, PMMA)
- 221 sites out of 395 listed (56%) recycle PET
- 57% of the sites recycle 'bottles' and 58% recycle 'packaging film'

What's included in the database?

The first-hand data collected from plant personnel includes details on the following:

- Type of plastics recycled
- Volume
- Machinery
- End products
- Recycling capabilities

It is all presented in a comprehensive database that serves as a valuable reference source for industry professionals seeking accurate and detailed information on plastics recycling.

417 managerial contact names are given including General, Sales, Production and Purchasing Managers. This includes full address details, telephone number and company email.

Brussels hosts key players at plastics recycling expo

Taking place in September, Plastics Recycling World Expo provides a showcase for innovation from groups in Europe and beyond, as shown in this preview feature



IMAGE: AMI

The European edition of Plastics Recycling World Expo – organised by AMI, the publisher of *Plastics Recycling World* magazine – heads to Brussels this September.

The free event features a huge concentration of plastics recycling-related exhibits. Exhibitors include manufacturers of recycling machinery and equipment, as well as suppliers of materials, additives, and chemical recycling groups.

As well as showcasing the latest products and solutions to help plastics recyclers and recompounders improve their processes, the event includes a free-to-attend conference featuring a wide array of speakers. Here, delegates can discover and debate the latest innovations and best practices in the industry in Plastics Recycling World Expo's dedicated conference theatre. The conference features two full days of industry debates and technical presentations by leading experts in their fields.

Taking place in Brussels on 11-12 September, the free-to-attend trade show is co-located with Compounding World Expo and Plastics Extrusion World Expo – giving ticket-holders access to three shows, more than 50 conference speakers, and over 150 exhibitors from across the entire supply chain.

Attendees can take advantage of extensive networking opportunities in the exhibition halls of the three co-located events.

On the pages that follow, you can find out more about exhibitors at Plastics Recycling World Expo, from technology leaders in extrusion lines, size reduction and decontamination to specialists in sorting and additives.

PLASTICS RECYCLING WORLD EXPO

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Register for free attendance at the exhibition and conference **HERE**.

Aixprocess

Aixprocess says it seamlessly translates digitally-generated knowledge into real-world engineering solutions. Its digital modelling tools mitigate risks for over 500 global customers, bridging the gap between system language and digital equivalents. With 20 years of experience, the company optimises processes, accelerates product development, and maximises returns on investments.

› **www.aixprocess.de**

AKW

AKW Equipment + Process Design is a specialised German company focused on engineering solutions and equipment delivery for the wet mechanical treatment of materials. Its core product, the AKA-Vortex hydrocyclone, plays an important role in plastic recycling processes. These hydrocyclones are engineered for various applications including the recovery of metals and plastics from cable scraps, PET recycling, recovery of PP from battery waste, separation of polyolefins from pre-sorted domestic waste, and recovery of sorted plastic fractions from automobiles.

› **https://akwauv.de**

Altech Recycling Technology

Founded in 1974, Altech Recycling Technology began as a manufacturer of diverse machines and later expanded to producing plastic recycling machines and extrusion components. Now operating from an 11,000 m² facility, Altech exports recycling equipment to 28 countries. The company produces plastic recycling lines, filtration systems, granulators, shredders, and more, supported by a dedicated R&D team.

› **www.altechmakina.com**

Axel'One

Axel'One offers comprehensive R&D and industrialisation services, focusing on the transition from laboratory scale to industrial production. Its services include R&D support, polymer processing, online analysis, digitalisation, industrial onsite intervention, investment advice, and participation in collaborative projects. Axel'One's expertise spans across various stages of polymer and chemical processing, contributing to advancements in the circular economy through innovation and technology.

› **https://axel-one.com**

Below: R Pet Series of recycling lines from Altech Recycling Technology



IMAGE: ALTECH

B+B Anlagenbau

B+B Anlagenbau designs and manufactures advanced plastic recycling machines tailored to the needs of various industries. Its equipment includes shredders, granulators, washing lines, and sorting systems, suitable for both industrial and post-consumer plastic waste. With extensive experience in the food, chemical, and pharmaceutical sectors, B+B Anlagenbau provides customised recycling solutions, from design to installation and maintenance.

› **www.bub-anlagenbau.de**

Bano Recycling

Bano Recycling is a company that focuses on designing and producing recycling machinery, particularly for the plastic and metal recycling industries. It offers innovative solutions and equipment for various recycling processes, contributing to sustainable waste management and resource recovery.

› **www.shredder-bano.com**

Bio Plastics Recycling

Bio Plastics Recycling focuses on the recycling of bioplastics. It provides solutions for processing and reusing bioplastic materials, supporting the growth of the bioplastics industry and contributing to the reduction of plastic waste.

› **https://bio-pr.de**

› BoReTech

BoReTech, a pioneer in the recycled polyester industry, offers comprehensive solutions for plastics recycling systems, polyester staple fibre production, and textile machinery. Founded in Taiwan in 1989, BoReTech leverages over 30 years of PET recycling experience and 15 years of equipment manufacturing expertise. Its systems are in operation globally.

› **www.bo-re-tech.com**

Break Machinery

Break Machinery, an Italian company founded in 2019, designs and produces innovative screen changers for plastic filtration and recycling. The company offers two models: the traditional One system and the Duo system with a double filtering surface. Break Machinery also provides laser and punched

screens for various filtration needs.
› **https://breakmachinery.com**

Bruno Folcieri

Bruno Folcieri specialises in the design and manufacture of machinery for the recycling and processing of plastic materials. It offers a range of shredders, granulators, and related equipment, emphasising innovation, quality, and efficiency in recycling operations.
› **www.folcieri.com**


IMAGE: BRUNO FOLCIERI

Left: Top Line granulator from Bruno Folcieri

Buss

Buss says it is a global leader in high-end compounding and pelletising systems. The Buss Kneader is a highly versatile compounding extruder with excellent references in the plastics, aluminium and chemical industries for over 75 years.
› **www.busscorp.com**

Cargill

Cargill provides a wide range of base chemistries, specialised products, and customised solutions across various industries. Its Polymer Additives division offers a diverse portfolio of specialty polymer additives designed to enhance the performance and processing of plastics. These additives are used in multiple applications, contributing to the production of high-quality plastic products.
› **www.cargill.com**

Chang Woen Machinery

Chang Woen Machinery specialises in manufacturing recycling machinery, particularly for plastic materials: PET bottle, PE/PP film, PE/PP rigid washing lines.
› **www.changwoen.com**

CMG Granulators

Established in 1979 in Budrio, Italy, CMG Granulators designs and produces recycling solutions including granulators, shredders, and conveying systems. Known for quality and innovation, CMG serves various plastics processing sectors, from thermoforming to cable recycling. With over 30,000 units installed worldwide, it offers competitive, efficient solutions and collaborates with machine suppliers to develop personalised granulation and in-line recovery systems.
› **www.cmg-granulators.com**

Collin and BritAS

Collin provides intelligent and modular laboratory, pilot, and production lines for the plastic processing industry, serving universities and research institutes globally. With over 50 years in business, it offers solutions like platen presses, roll mills, calenders, extruders, and more. Its lines support research, development, and production scaling in sectors such as medical technology, pharmaceuticals, and industrial plastics.
› **www.collin-solutions.com**

Coperion

Coperion is a global leader in compounding systems, feeding technology, and bulk materials handling. It designs, manufactures and maintains systems and components for industries including plastics, chemicals, pharmaceuticals, food and minerals. With over 30 locations and 2,500 employees, Coperion provides solutions for plastics manufacturing, recycling, engineering plastics, and chemical processing, ensuring efficient and sustainable production processes. The company will show a 3D simulation tool at its stand.
› **www.coperion.com**

CTE (Creative Technology & Extruder)

CTE specialises in twin-screw extruders for various applications, including automotive, building materials, medical, and recycling. Its HTM tandem


IMAGE: CMG

Left: CMG Granulators is presenting the innovative cutting chamber design of its EV916 super granulator and also a new evacuation system

extruder features a twin-screw upstream and a single-screw downstream, enabling low-temperature extrusion and reduced resin degradation. Known for excellent degassing performance, CTE says its extruders are highly effective in recycling processes, particularly in removing impurities.
› **www.cte-japan.com**

Ecoo

Recycling company Ecoo focuses on providing sustainable solutions for plastic waste management and recycling. It develops technologies and systems that enhance the efficiency of plastic recycling processes, contributing to the circular economy and reducing environmental impact.
› **www.ecoo.eu**

Eco-World Plastics Recycling

Eco-World Plastics Recycling specialises in the recycling of various plastic materials. It offers services and solutions aimed at converting plastic waste into reusable materials, supporting sustainability and environmental conservation efforts.
› **www.eco-world.com.pl**

Erema

Erema, headquartered in Ansfelden near Linz, Austria, is a global leader in plastics recycling systems and components. Founded in 1983, Erema has installed around 7,000 recycling systems worldwide. The company offers innovative technologies for processing in-house waste, bottle-to-bottle recycling, post-consumer plastics, and fibres, producing high-quality recycled pellets.
› **www.erema.com**

Euro Machinery

Euro Machinery specialises in buying and selling used machinery for flexible plastic converting and recycling. It deals in European brands, offering equipment like blown film extruders, flexo printers, laminators, and recycling machines such as shredders and granulators.
› **www.euro-machinery.com**

Fimic

For 25 years, Fimic has specialised in automatic self-cleaning melt filters. The Italian company offers five different models designed for highly contaminated plastics, particularly post-industrial and post-consumer types. Its innovative solutions are tailored to meet the needs of the plastic recycling industry, ensuring efficient and effective filtration processes.
› **www.fimic.it**

Gamma Meccanica

Since 1987, Gamma Meccanica has been designing and producing machinery for recycling a wide range of plastics. Its lines, including Compac, Tandem and Conventional, focus on automation, high-quality granules, and energy efficiency. The company provides customised solutions, leveraging extensive experience and technical expertise to meet specific customer requirements.
› **www.gamma-meccanica.it**

Gaudenzi

Gaudenzi manufactures perforated metal sheets, catering to various industries, including extrusion, with high-quality, durable products. Its long-standing expertise ensures reliable and precise solutions for numerous applications, maintaining a strong reputation in the market.
› **www.gaudenzi.it**

Genox Recycling Tech

Genox specialises in innovative and cost-effective recycling solutions for plastics, tyres, wood materials, e-waste, lithium-ion batteries, and domestic appliances. Its commitment to reliability and innovation ensures efficient processing and recycling of diverse materials.
› **www.genoxtech.com**

Gneuss

With over 40 years of experience and 100+ patents, Gneuss offers advanced solutions for the recycling industry. Its patented MRS extrusion technology and fully automatic Rotary Filtration Systems enable efficient processing of highly contaminated materials. Gneuss provides customisable turnkey Omni recycling machines to meet the highest quality standards.
› **www.gneuss.com**



The Gneuss OMNI Recycling Line with 3C rotary feeder, MRS extruder, vacuum system, RSFgenius Rotary Filtration System and VIS online viscometer

IMAGE: GNEUSS

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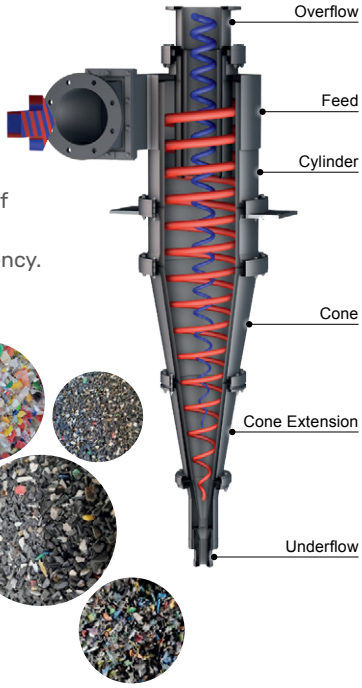

AKA-VORTEX hydrocyclones are engineered for:

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- Recovery of plastic fractions from automobile industry
- Recovery of metals and plastics from cable scraps
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- Separation of polyolefines from pre-sorted domestic wastes

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Heather Nortz
Manager, Sustainability & Materials
Plastics Industry Association (PLASTICS)



Astrid Torres
Global R&D Packaging Principal Engineer,
PEPSICO



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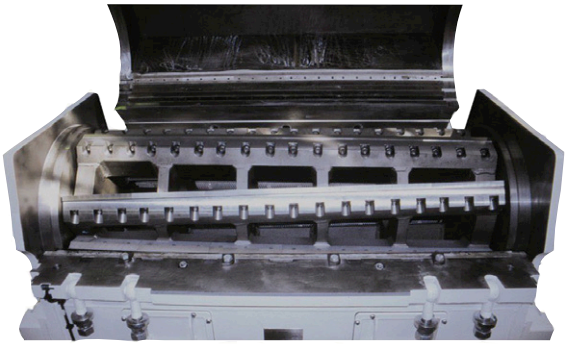


IMAGE: HOSOKAWA ALPINE

Left: Rotoplex granulators will be among the products promoted by Hosokawa Alpine at the exhibition

GSF Upcycling

GSF Upcycling has pioneered the development, scale manufacturing and use of nanomaterials to upcycle mixed plastics. It says it leverages proprietary in-house production of graphene-based nanomaterials to enhance any pyrolysis process.

› **www.gsfupcycling.com**

Herbold Meckesheim

Herbold Meckesheim, a leader in recycling technology, designs and produces machines for processing pure plastic waste and contaminated plastics. Part of Hillenbrand, its offerings include shredders, granulators, and washing systems. The company's solutions focus on low energy consumption, ease of maintenance, and wear protection, ensuring efficient plastic recycling.

› **www.herbold.com**

Hosokawa Alpine

Hosokawa Alpine manufactures machines for processing powders, granules, and bulk materials, as well as systems for producing blown film. Its recycling systems focus on efficient in-house recycling and dry recycling tasks, offering complete solutions based on extensive experience and technical expertise.

› **www.hosokawa-alpine.com**

Kreyenborg

Kreyenborg specialises in bulk material handling solutions for the plastics industry. With over 70 years of experience, it offers innovative processes for rPET decontamination, odour reduction, and efficient material supply. Its turnkey solutions ensure safe and efficient production chains for its customers.

› **www.kreyenborg.com**

Kunststof Recycling van Werven

Kunststof Recycling van Werven focuses on the recycling of plastic waste into high-quality reusable materials. Its expertise ensures the efficient transformation of discarded plastics into valuable resources, promoting sustainability and environmental conservation.

› **www.recyclingplastics.eu**

Lorandi Silos

Founded in 1952, Lorandi Silos designs and manufactures storage installations and pneumatic conveying systems for raw materials like powders, regrind materials, and plastic granules. It offers customised solutions, including monolithic and ring silos, mixing silos, and low-pressure conveying components, ensuring compliance with current regulations.

› **www.lorandisilos.it**

Maag Group

Maag Group provides integrated systems for the polymer, chemical, petrochemical, pharmaceutical, and food industries. Its solutions include pump and filtration systems, pelletising and pulverising systems, and recycling systems. With over 1,500 employees worldwide, Maag Group ensures efficient process technology and customer-centric services.

› **www.maag.com**

Nexam Chemical

Nexam Chemical offers reactive masterbatches and chemical additives to enhance recycled polymer processing and properties. Its cost-effective solutions for rPET, rPE, rPP, and rPA support a sustainable and circular economy, helping polymer manufacturers and recyclers improve product performance and also reduces plastics' environmental impact.

› **www.nexamchemical.com**

NGR

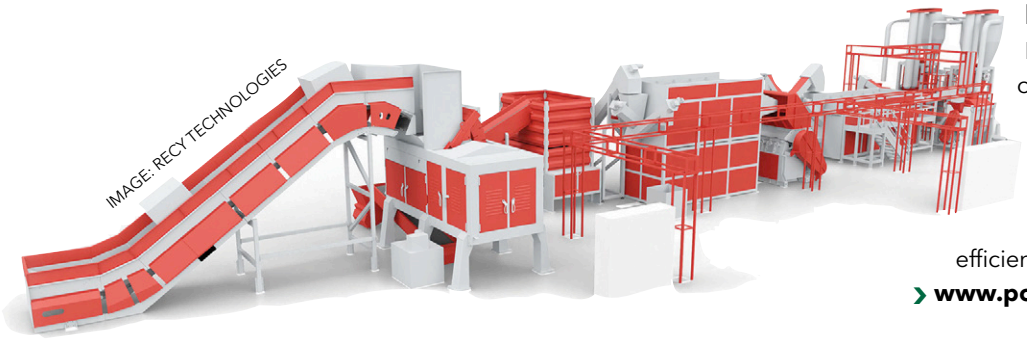
NGR develops customised recycling machines for plastic waste processing, focusing on post-industrial and post-consumer recycling. Its innovative solutions, such as its shredder-feeder-extruder combination and Liquid State Polycondensation (LSP) process, ensure high-quality pellets and efficient PET recycling.

› **www.ngr-world.com**

Nordson BKG

Nordson BKG specialises in melt delivery and underwater pelletising systems for polymers. Its backflush technology, including the BKG HiCon K-SWE-HD/RS filter, handles high contamination levels easily and will enable producers to comply with regional recycling laws.

› **www.nordsonpolymerprocessing.com**



Above: Recy Technologies produces complete plastic recycling systems, including washing systems for rigid HDPE and PP

ORA Machines

ORA Machines supplies top machinery and peripherals for the plastics processing industry. It offers complete project engineering, realisation, and aftercare, representing leading brands to ensure efficiency and innovation in every solution. It says its comprehensive services meet diverse customer needs.

› **www.ora.be**

Pallmann

Pallmann Maschinenfabrik specialises in size reduction and recycling technologies for various industries. Its extensive product range includes machines for shredding, granulating, pulverising, and agglomerating materials, providing efficient solutions for processing plastics, wood, and other materials.

› **www.pallmann.eu**

Piovan Group

Piovan Group is a global leader in systems for the automation of production processes for polymers and plastic and food powders. It offers comprehensive technical assistance from design to installation and start-up, ensuring efficient and effective solutions for its customers' automation needs.

› **www.piovan.com**

Plasmaq

Plasmaq designs and manufactures innovative recycling systems for plastics. Its advanced technology and expertise help customers achieve outstanding recycling results, enhancing performance and demonstrating the value obtained from waste materials.

› **www.plasmaq.pt**

Plastic Recycling Export

Plastic Recycling Export is a Romania-based recycler which produces granules from high and low density PE, PP, PS and ABS.Plastic Recycling Export has two factories with production capacity of 48,000 tpa.

› **www.reciclamplastic.ro**

Polystar

Polystar is a Taiwan-based manufacturer of plastic recycling machinery. Specialising in post-industrial and post-consumer recycling, it provides simple, easy-to-operate systems for PE/PP packaging film and PP raffia/woven, ensuring efficient and effective recycling processes.

› **www.polystarco.com**

Prodecologia

Prodecologia offers environmentally friendly equipment for recycling, including electrostatic, NIR, and magnetic separators. Its advanced technologies efficiently separate and clean various materials, enhancing recycling processes and contributing to environmental sustainability.

› **https://prodecolog.com**

Recy Technologies

Recy Technologies designs and manufactures complete plastic recycling systems. Its innovative technology and expertise help customers achieve outstanding recycling results, it says, enhancing performance and demonstrating the value obtained from waste materials.

www.recytechnologies.it

RSH Polymere

RSH Polymere is a Germany-based producer of compounds made from PIR and PCR raw materials. Its products are developed for applications in automotive, packaging, consumer goods and construction.

› **www.rsh-polymere.de**

RunTai Knives

RunTai Knives manufactures high-quality knives for industrial applications, including plastic recycling. Its products ensure efficient cutting and processing, supporting various industries with reliable and durable solutions.

› **www.rtknife.com**

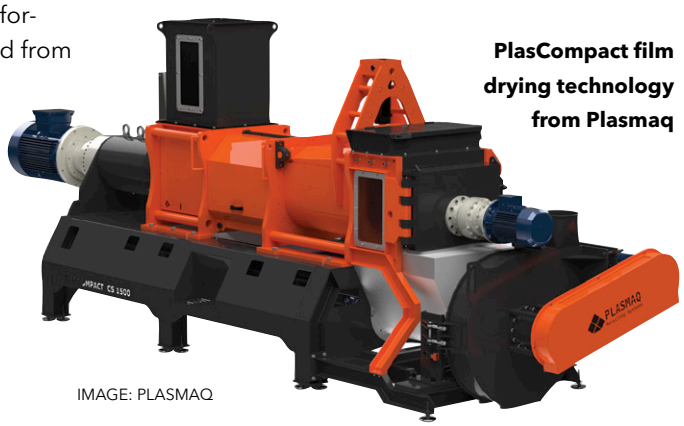


IMAGE: PLASMAQ

PlasCompact film drying technology from Plasmaq

SMO
SMO is a machine builder which controls every step of the process: concept, 3D design, strength calculation, welding, machining, assembly, programming.
› **www.smo.be**

Sogapol
Sogapol, part of Grupo Valtalia in Spain, specialises in the recycling and processing of plastic materials. It operates two recycling plants for low and high density polyethylene.
› **http://sogapol.com**

Sorema
Sorema, which is part of Previero, designs and manufactures plastic recycling plants for various materials. Its comprehensive solutions include washing, sorting, grinding, and drying systems, ensuring efficient recycling processes and high-quality output.
› **http://sorema.it**

Starlinger
Starlinger Recycling Technology and Viscotec provide machinery solutions for recycling and refining plastics. Their processes for food-safe rPET and rHDPE have received approvals from major authorities, ensuring high-quality recycled materials for food applications.
› **www.starlinger.com**


IMAGE: WEIMA

Left: Rigid PCR plastics is one of the waste streams Weima shredders are designed to deal with

Tecni Plasper
Tecni Plasper produces calcium carbonate and desiccant masterbatches, and flexible PVC and HFFR recycled compounds. It manages industrial waste and offers innovative solutions for the recycling and processing of plastic materials.
› **www.plasper.com**

Tecnova
Tecnova specialises in modern plastic recycling systems, focusing on resource, energy, and cost savings. With over 30 years of experience, it offers innovative solutions for diverse recycling projects, ensuring high efficiency and environmental responsibility.
› **www.tecnovarecycling.it**

Terratico
Terratico is an eco-concrete startup using recycled plastic to replace natural gravel in concrete. Its innovative material surpasses standard concrete in strength and weight efficiency, offering sustainable substitutes for conventional building materials and promoting recycling in the construction industry.
› **www.terratico.com**

TotalEnergies
TotalEnergies Petrochemicals & Refining provides advanced solutions for the petrochemical and refining industries. Its expertise ensures efficient processing and transformation of raw materials into high-quality products, contributing to sustainability and environmental conservation.
› **https://polymers.totalenergies.com**

Vecoplan
Vecoplan develops high-quality machines for shredding, conveying, and processing raw materials. With over 50 years of experience, it offers individual machines and complete system solutions, supporting recycling and waste management industries with advanced technologies and comprehensive services.
› **www.vecoplan.com**

VTT
VTT Technical Research Centre of Finland is a leading research institution advancing technology commercialisation. Its Polymer Pilot facility offers advanced mechanical recycling, sorting, and washing services.
› **www.vttresearch.com**

Weima
Weima manufactures shredding and compacting machines for waste recycling. With over 40,000 machines sold worldwide, it provides durable solutions for processing plastics, wood, paper, and metals. Weima's German-made products ensure high efficiency and reliability.
› **https://weima.com**

Xplore Instruments
Xplore Instruments produces high-quality lab compounders and post-die processing tools for polymers. Its products are designed for formulation development, feasibility studies, solving technical marketing issues and screening of polymer materials.
› **www.xplore-together.com**



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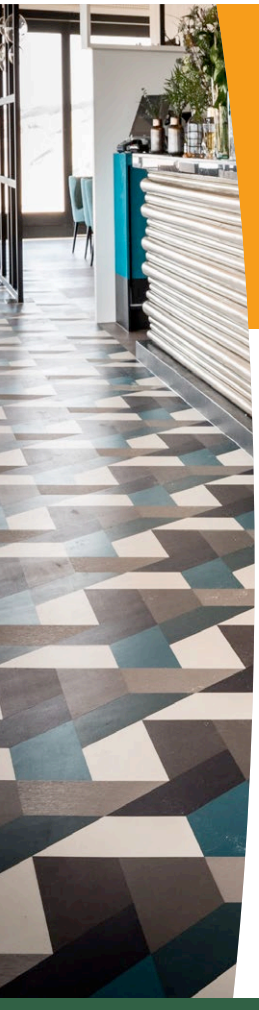

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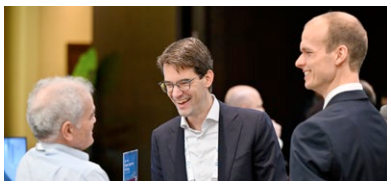



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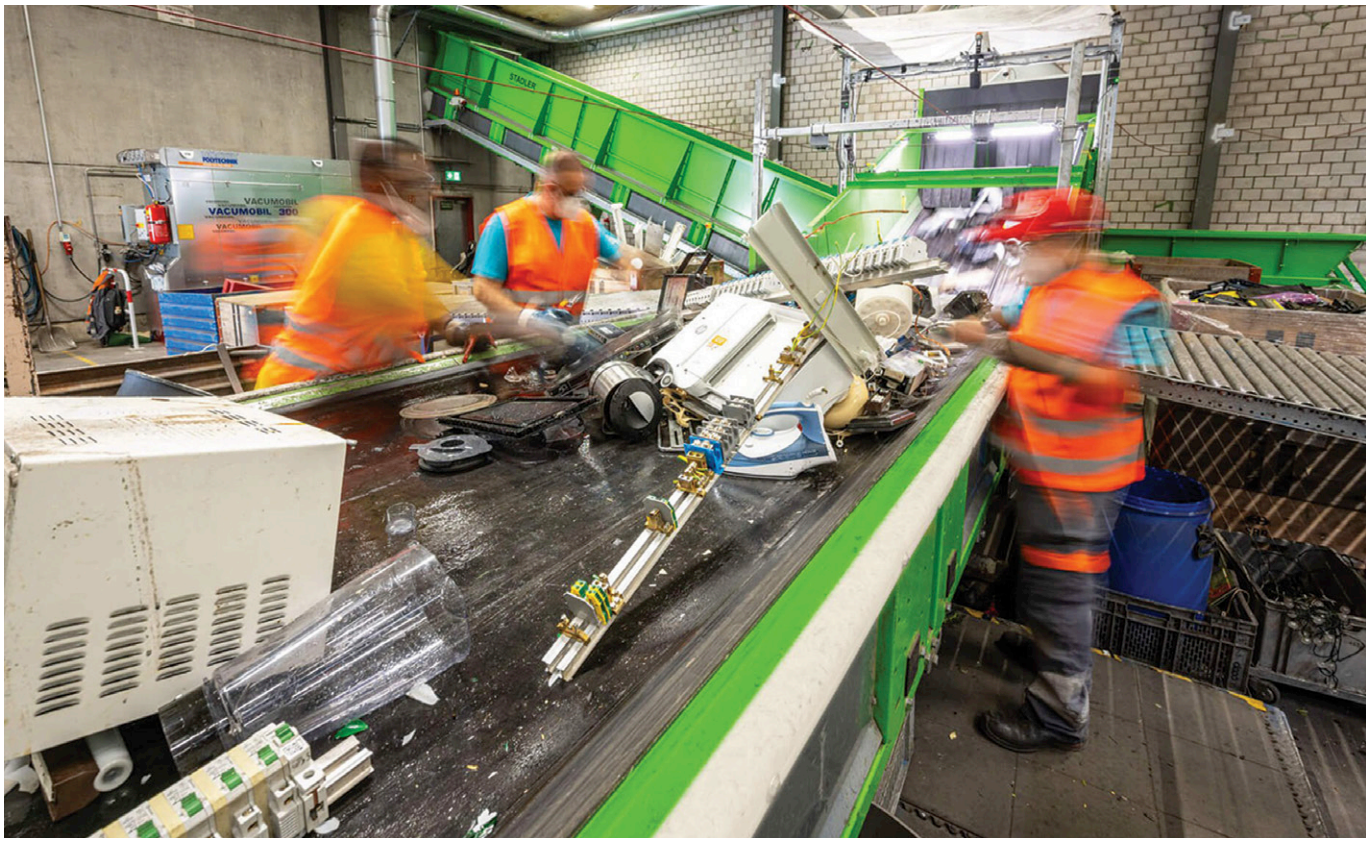
IMAGE: STADLER



Expansion of e-waste and automotive recycling

*Sustainability and regulatory pressures are behind a surge of activity by industry groups aiming to improve recycling of used electronics and old cars. By **Chris Saunders***

The generation of Waste Electrical and Electronic Equipment (WEEE, or e-waste) is rising five times faster than documented recycling rates, according to a recent study by the United Nations Institute for Training and Research and the International Telecommunication Union. The Global E-waste Monitor found that 31m tonnes of metals were contained in e-waste in 2022, along with 17m tonnes of plastics and 14m tonnes of other materials. As some types of e-waste contain plastic additives or hazardous substances, the issue presents both health and environmental challenges, the organisations say.

In June, **The European Recycling Industries' Confederation** (EuRIC), sought to address the issue by holding an event called "Plug into sustainability: E-waste recycling," which brought participants together to discuss the challenges in advancing circularity and chart the way forward for increased material recovery in the EU. The main take-aways included calls to step up collection, incentivise consumers, and improve ecodesign. At the event, Ioannis Bakas, circular economy monitoring expert at the **European Environment Agency** (EEA) also identified the need for more binding, target-orientated policies, and value chain-specific strategies.

The European Commission is currently evaluating the EU's WEEE Directive which was first introduced in 2003, with a new directive taking over in 2012. It said the evaluation "will assess whether the Directive is still fit for purpose, explore possibilities to simplify the Directive, and determine whether a review is needed". The Commission has already held a public consultation to gather feedback from stakeholders, and said a final report

Main image: Stadler designed and installed an electronic waste sorting plant jointly with Immark at its site in Regensdorf, Switzerland



IMAGE: VOLUTION

Right: Spraying plastic tubes at Volution, a UK ventilation company which uses recycled plastics in its manufacturing

of the study will be published by September.

Responding to this regulatory impetus, the cross-industry initiative **RecyClass**, which has devised design-for-recycling guidelines for plastics packaging, said it will extend its scope to encompass plastic components used in electrical, electronic, and automotive applications. "Anticipating upcoming European regulations on the recyclability of plastics in electrical and electronic products and vehicles, RecyClass demonstrates proactive leadership by staying ahead of these changes," said the group. Its focus will be on polymers including PS, ABS, PP, and PE plus others.

Across Europe, recyclers and industry groups are increasing their efforts to improve WEEE recycling. Data published by the UK Department for Environment, Food and Rural Affairs shows that the UK collected 473,019 tonnes of WEEE in 2023, eclipsing the target of 471, 942 tonnes for the first time in seven years. In January, **Enva** acquired fellow Scottish company **WEEE Solutions,** which deals with materials such as large and small domestic appliances, flat panel displays, IT equipment, batteries and fluorescent tubes, to further expand its recycling capacity. This was the company's fourth acquisition since Enva Group was itself bought by private equity firm I Squared Capital last year. The acquisitions include WEEE recyclers Environcom and Shore Recycling.

Plastics challenge

Volution claims to be one of the first ventilation companies in the UK to use recycled plastic in manufacturing, but achieving this was far from straightforward. "Initially we faced a challenge since test houses would not certify products made from recycled material due to variations in recycled plastic content and the absence of materials data," said CEO Ronnie George. "To address this we began batch testing recycled plastics to international standards in our own labs. We also created a materials database to share with test houses enabling product certification and third-party accreditation. The data now validates fans manufactured from recycled plastic. Volution is the only ventilation company to set such high targets around the use of recycled plastics, especially within electrical devices. Others have recycled material in ducting and grilles but no other has it in the actual fans. Insights from recycled plastic research have enhanced our understanding of materials, but more work needs to be done and we need the whole sector to buy into it. The industry needs to better understand the materials used in industrial processes and there needs to be more competition in the recycled polymers market."

In Switzerland, **Stadler**, the German company specialising in the planning, production and assembly of turnkey recycling and sorting plants, and its subsidiary **WeeeSwiss Technology**, installed what is said to be the largest processing

BSH chooses chemically recycled ABS



IMAGE: BSH/ELIX

Chemically recycled polymers are a new option for electronics manufacturers to consider for their products. **BSH Home Appliances** selected a chemically-recycled ABS resin by **Elix Polymers** for the stand, arm and other components of the latest Stand Mixer by Bosch. Elix said the specialised, tailor-made ABS P3H-AT CR25 provides excellent impact resistance and a high level of stability, while also possessing high chemical resistance and offering a high gloss finish to improve the product's aesthetic appeal.

ABS P3H-AT CR25 has a 25% content of certified raw materials (certified according to ISCC+ using the mass balance approach). The carbon footprint of this material can therefore be reduced by 21% compared to the traditional raw material, according to Elix. The company's E-Loop range includes materials with chemically recycled content and also materials with mechanically recycled content.

plant for e-waste in the country with **Immark** at its site in Regensdorf. The new facility significantly increases the site's processing capacity and is the first e-waste sorting plant to use a Stadler STT5000 ballistic separator which pre-sorts material into fines, flat plastics, and cables, as well as cube-shaped material such as electronic motors.

The new sorting plant receives materials in WEEE Directive Groups 1-3 (Household Appliances and IT Equipment) and 4 (Consumer Equipment), which are processed in several different modules. In the first module, the infeed material is manually sorted to remove hazardous components, as well as valuable materials such as cables and printed circuit boards. Once the hazardous components have been removed, the material is crushed so the various recyclable materials can be sorted. This is achieved through use of magnetic technology, eddy current separation, and sensor sorting.

According to the **WEEE Forum,** the umbrella grouping of producer responsibility organisations, 5.3bn mobile phones were discarded in 2022 alone. In the Netherlands, a new project at Schiphol Airport in Amsterdam involves Dutch airport electronics retailer Capi joining forces with Renewd, a Utrecht-based supplier of certified pre-owned equipment, to offer travellers an environmentally friendly alternative to buying new electronics whereby they can trade in their old smartphones for cash. Capi has more than 50 stores at 21 airports worldwide, and the two companies have already signed a deal to replicate the arrangement at other airports.

"The WEEE Forum is at the forefront of turning the extended producer responsibility principle into an effective electronic waste management policy approach through our combined knowledge of all management aspects of collection, logistics, de-pollution, processing, preparing for reuse and reporting of e-waste," said Director General Pascal Leroy.

Investments

Coolrec is investing in a new electrostatic separation line at its location in Waalwijk, the Netherlands. The new separator, the result of a collaboration with manufacturer **Hamos**, separates mixed waste streams such as paper, wood fibres, or pieces of rubber from the plastic streams. The plastics are then sorted by type. Ramon Bongers, plastics manager at Coolrec, said, "With this expansion, Coolrec can produce a very high-quality flake, and as a result, we will also produce an even better and more stable PS and ABS granulate in the next phase."

In November 2023, the revised Renewable Energy Directive entered into force with the aim of increasing the share of renewables in the EU's overall energy consumption to 42.5% by 2030. This means the production of solar photovoltaic (PV) equipment needs to increase dramatically, and there will be an inevitable transition as the first generation of PV panels reach their end of life. **Soren**, a new member of the WEEE Forum, acts as the government-approved eco-organisation for the collection and processing of used PV panels in France.

The disposal of PV panels is clearly a growing concern. Earlier this year, **Müller-Guttenbrunn Group** (MGG) acquired a stake in Austrian start-up 2nd Cycle which aims to develop an automated upcycling system for used PV modules. The system will check modules and analyse which parts are still functional, then decide which modules need to be recycled. Here is where MGG comes in, as it has been working for some time on how to separate and recycle non-reusable PV modules. The company says it sees huge potential in this area. Around three million PV collectors are installed



The Plast2bCleaned project investigated recycling of WEEE plastics with flame retardant additives

Plast2bCleaned shows results from project

The five-year, EU-funded **Plast2bCleaned** project has concluded, with results presented at workshop events earlier this year. The project was launched to address the recycling of the common WEEE plastics ABS and high impact PS, which can contain up to 20wt% brominated flame retardants (BFR) and up to 5wt% of the synergist antimony trioxide (ATO).

Among the results, it discussed the use of a dissolution process, highlighting the advantages of using a low boiling point, single solvent system and adding suitable separation steps for the effective separation and recovery of the additives. In a programme involving Electrolux, 23 washing machine door frames were produced from material recompounded at Elix Polymers incorporating 30% recycled ABS.

IMAGE: FRAUNHOFER IWU



Above: The ZEvRA project team at the kick-off meeting in January 2024 at Fraunhofer IWU in Chemnitz, Germany

worldwide every day, and by 2030, 50m modules are expected to be returned annually in Germany alone. "Increasing module performance makes the replacement or upgrade of existing PV modules economically interesting for many system operators," said MGG CEO Christian Müller-Guttenbrunn.

North America has also had positive developments in the e-waste sector. In June **CompuCycle**, an IT asset recycler based in Houston, Texas, announced the expansion of its plastics recycling system. CompuCycle claims to be the only company in the US that provides businesses a responsible and sustainable disposal solution for both metals and plastics in-house utilising no further downstreams. "Properly managing all components of electronics is a cornerstone of sustainability and environmental responsibility," said CEO Kelly Adels Hess. "Making single polymer plastics that OEMs can reuse while adhering to international recycling standards is a gamechanger."

On the right road

There is crossover between plastics recovered from WEEE and materials from end-of-life vehicles (ELV), particularly in the broad group of engineering plastics – market prospects have been assessed by AMI Consulting in its report **An Introduction to Recycling of Engineering Polymers Europe 2023** (see *Plastics Recycling World* January-February 2024).

The European Commission is planning to strengthen the EU's ELV Directive, with one proposal being that OEMs are required to ensure that 25% of the plastic used in new cars comes from recycled sources (of which 25% derive from closed-loop material). By 2035, the EU aims for new vehicles to be manufactured almost entirely of recycled, refurbished, repurposed, repaired, or reused parts, saving over 1.5 tonnes of material per vehicle. Established recycling routes for plastics from ELV focus on polyolefins with low mineral and fibre content which can provide limited feedstock for low-performance exterior automotive components. The high share of technical thermoplastics, mainly ABS, PC/ABS, PA6 and PA6.6 and filled or fibre-reinforced polyolefins, are a large challenge for the recycling industry.

"Regarding the proposed ELV regulation, I see challenges in relation to the legislative process as well as in the implementation of the proposed measures," said Stefan Vellekoop, Manager Circular Solutions at **Otto Krahn Group**. "The 25% minimum recycled content quota for plastics is a challenge, especially as the figure is high and does not include a staggered time scale to allow the market to develop accordingly. At the same time, recycled content quotas are being introduced for other product groups as well, which correspondingly limits the available quantities. Additionally, only post-consumer material is counted, but not post-industrial material. As a result, there is a risk that this valuable waste stream, which can usually only be processed with higher effort, will be lost as there are no incentives to recycle it."

Sorting chains

In collaboration with manufacturers of sorting technologies, **Fraunhofer IVV** is developing advanced sorting chains, including wet and dry sorting technologies, that allow the production of regrinds from ELV shredder residues characterised by high shares of target polymers and low contaminants. This has been tested and demonstrated within a pilot project in co-operation with Audi by the enrichment of thermoplastics such as PA and PC/ABS or fibre-reinforced polyolefins in concentrated regrind fractions containing 80-90% of the target polymer. At present, these may not be sufficiently pure for mechanical recycling.

Fraunhofer IVV has also developed and optimised physical dissolution recycling to purify and recover pure thermoplastics from sorted ELV plastic streams and complex post-industrial composites.

The main target is that recycled polymers comply with high-level mechanical performance as well as odour and VOC-emissions. In several research projects, the recyclability of PC/ABS and fibre-reinforced polyamides and polyolefins from complex waste mixtures has been proven. Recently, pure polyamides PA6 and PA6.6 have successfully been produced on small-technical scale from a PA-rich fraction sorted from Audi shredder residues.

Under the leadership of **Fraunhofer IWU**, a consortium of European partners is exploring pathways towards consistently resource-efficient production in the ZEvRA (Zero Emission electric vehicles enabled by haRmonised circulArity) project. The partners hope to develop a virtual concept based on a popular Skoda model for demonstration purposes, and will assemble a vehicle with parts made from recycled materials that comply with the principles of the circular economy. The project will focus on materials covering more than 84% of a typical EV, and is backed by manufacturers such as Volkswagen, Skoda, and Stellantis, along with major suppliers including Faurecia and Continental. Insights from the project, scheduled to run until the end of 2026, can potentially be used throughout the automotive industry.

Though the ZEvRA project shows a willingness of the major players to improve the situation, there is still a long way to go. Jens Kaatze, CEO of **Mocom,** said: "Mocom and other recyclers are enhancing technologies for composite separation and paint removal [but] many components currently cannot be recycled sustainably or economically. Technologies like infrared face challenges, especially with black or painted plastics commonly used in the automotive sector. Through dismantling steps prior to shredding, pure material streams can be obtained before they are mixed. In a pilot project, Mocom recovered 40-50 kg of pure plastic per vehicle. This approach shifts us further from a linear to a circular economy. Moving from designing for recycling to designing with recycling is another important aspect. The transformation to a circular economy for technical plastics requires a paradigm shift and the involvement of all stakeholders."

At Chinaplas 2024, materials manufacturer **Covestro**, along with various partners from the value chain including automotive brands NIO and Volkswagen, recycling company **GEM**, and third-party certification bodies like TÜV Rheinland,

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announced its intention to spearhead the concept of car-to-car closed-loop plastics recycling. Under a joint pilot program initiated by German federal enterprise **GIZ** (Deutsche Gesellschaft für Internationale Zusammenarbeit), Covestro and its partners aim to establish closed-loop pathways for high-value plastics from ELVs.

"The automotive industry stands as one of the most resource-intensive sectors globally, yet the potential of high-value plastics from ELVs remain largely untapped," said Martin Hofmann, Cluster Head in charge of Climate, Energy, Environment and Biodiversity at GIZ. "I firmly believe that GIZ and our partners can forge a path towards the transition to a sustainable, circular economy."

MBA Polymers has launched an initiative to recycle car bumpers into high quality polymers for use in the automotive industry and started up a dedicated processing line at its site in Wimblington, UK. By receiving bumpers from authorised treatment facilities, insurers, and garages, as well as accessing feedstock from ELV recyclers, the company can recycle bumpers directly rather than reclaiming the polymers after a shredding process, and so enables it to explore improved performance grades. Paul Mayhew, General Manager, said: "We believe that recycling the bumpers before the end-of-life vehicle recycling process will allow us to harness the intrinsic properties of the material and produce a high-performance polymer to go back into visual exterior parts. This will help car manufacturers as they face up to the implications of the EU's ELV Directive [and] provide a new sustainable route for this material."

In June **Stena Recycling** announced the launch of Europe's first complete and scalable value chain for the reuse and recycling of EV batteries which is being established at Stena's new battery management facility in Ausenfjellet, Norway, in collaboration with the technology company **EV HUB** with a total investment framework of NOK 100m (€8.4m). When fully operational the facility, set to be completed later this year, will be able to handle up to 3,000 tonnes/yr of high-energy batteries, equivalent to 6,000 - 8,000 individual units. The project includes the development of advanced infrastructure, AI algorithms for assessing battery health, innovative disassembly and diagnostic methods, and a modular battery storage bank. Ragnhild Borchgrevink, CEO of Stena Recycling, said: "This project focuses on both the reuse and recycling of electric car batteries and will help reduce the carbon footprint and promote a circular economy."

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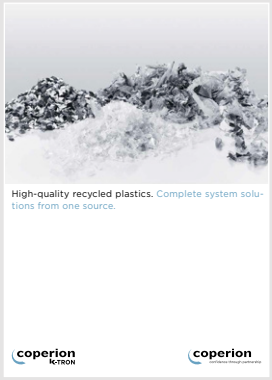

Whatever your recycling need – mechanical, solvent or chemical - Coperion provides a single source solution. Its offer ranges from shredding and agglomeration, through washing and conveying, on to melt processing and degassing, and pelletising.

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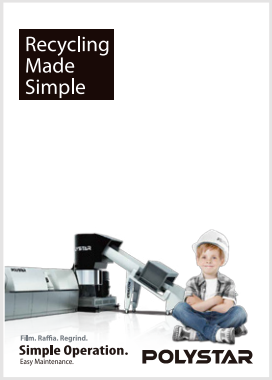
POLYSTAR: PLASTICS RECYCLING



Recycling Made Simple is the brochure from Polystar where you can find information about all of the company's plastics recycling systems. Its Repro Flex lines can recycle post-industrial and post-consumer PE/PP packaging and PP raffia/ woven materials.

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GLOBAL COLORS GROUP



Find out about Global Colors Group in this brochure showcasing the group companies, their vision and focus on quality, R&D, technology and sustainability. Its portfolio includes colour, white and black masterbatches.

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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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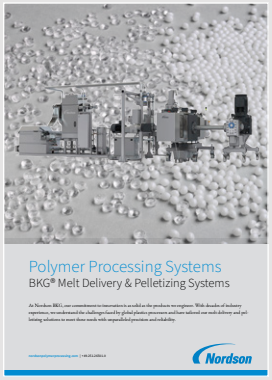
NORDSON BKG: MELT DELIVERY



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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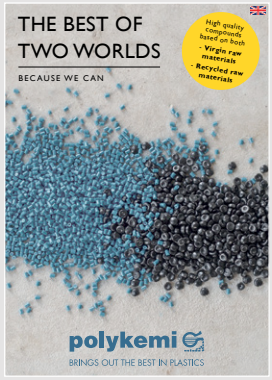
POLYKEMI: COMPOUNDS



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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If you would like your brochure to be included on this page, please contact Claire Bishop claire.bishop@amiplastics.com. Tel: +44 (0)1732 682948

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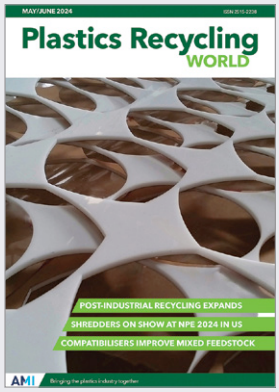

Plastics Recycling World May/June 2024
The Plastics Recycling World May-June issue has a cover feature on the growing number of developments in post-industrial recycling, plus articles on compatibilisers and new shredding technology demonstrated at the NPE 2024 show.

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Plastics Recycling World March/April 2024
The March/April edition of Plastics Recycling world explores some of the latest innovative ideas in recycling of textile waste. It also takes a look at some recent developments in additives for recycled compounds and melt filtration technology.

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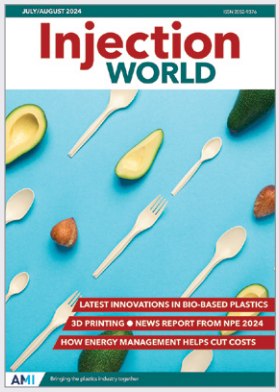

Injection World July/August 2024
The July-August 2024 edition of Injection World magazine looks at how bio-based and compostable plastics are used in injection moulding applications. The other feature articles cover developments in energy management and 3D printing.

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Compounding World July 2024
The July issue of Compounding World magazine has a cover feature explaining how odours can be reduced using new technologies and additives. Plus articles in materials handling, colour management and antimicrobial additives.

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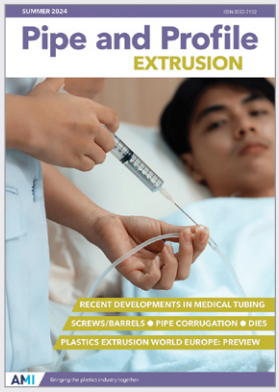

Pipe and Profile Summer 2024
Pipe and Profile Extrusion's Summer 2024 edition has a cover feature on developments in medical tubing, including PVC tubing and substitutes. Other features cover screws and barrels, corrugated pipe and extrusion dies.

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Film and Sheet July/August 2024
Film and Sheet Extrusion's July-August edition has features that delve into film applications that use bio-based materials, developments in plastic pouches and new downstream equipment. Plus a preview of the Plastics Extrusion World Expo in Brussels in September.

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

GLOBAL EXHIBITION GUIDE

2024	**11-12 September**	Plastics Recycling World Expo, Brussels, Belgium	www.plasticsrecyclingworldexpo.com/eu
	18-19 September	Kunststoffenbeurs, 's-Hertogenbosch, Netherlands	www.kunststoffenbeurs.nl
	23-27 September	Colombiaplast, Bogota, Colombia	www.colombiaplast.org
	24-26 September	Fachpack, Nuremburg, Germany	www.fachpack.de
	24-28 September	TaipeiPLAS 2022, Taipei, Taiwan	https://www.taipeiplas.com.tw/en/index.html
	8-10 October	Plastprintpack West Africa, Abidjan, Ivory Coast	www.ppp-westafrica.com
	8-11 October	Plastex, Brno, Czech Republic	www.bvv.cz/en/plastex/
	15-19 October	Fakuma, Friedrichshafen, Germany	www.fakuma-messe.de
	13-14 November	Plastics Recycling World Expo, Cleveland, Ohio, US	https://na.plasticsrecyclingworldexpo.com
	4-7 December	PlastEurasia, Istanbul, Turkey	https://plasteurasia.com/en/
2025	**11-14 March**	Plastimagen, Mexico City	www.plastimagen.com.mx
	24-28 March	Plástico Brasil, São Paulo, Brazil	www.plasticobrasil.com.br
	6-9 May	Moulding Expo, Stuttgart, Germany	https://www.messe-stuttgart.de/moulding-expo
	7-8 May	PlastTeknik Nordic, Malmö, Sweden	www.plasttekniknordic.com
	14-15 May	Plastics Recycling World Expo, Mumbai, India	https://plasticsrecyclingexpoindia.com
	27-30 May	GreenPlast, Milan, Italy	www.greenplast.org
	8-15 October	K2025, Dusseldorf, Germany	www.k-online.com

AMI CONFERENCES

10 September 2024	PFAS Workshop, Brussels, Belgium
17-18 September 2024	Bioplastics, Cincinnati, OH, USA
30 Sept – 2 Oct 2024	Single-Serve Capsules,Malaga, Spain
2-3 October 2024	Wind Turbine Blades, Boston, MA, USA
21-23 October 2024	Executive Summit, Savannah, GA, USA
23-24 October 2024	Plastics Recycling Technology,Vienna, Austria

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

www.amiplastics.com

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