

# Plastics Recycling WORLD



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# Plastics Recycling WORLD

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**AMI**

Third Floor, One Brunswick Square,  
Bristol, BS2 8PE, United Kingdom  
Tel: +44 (0)117 924 9442  
Fax: +44 (0)117 311 1534  
www.amiplastics.com  
www.twitter.com/plasticsworld  
Registered in England No: 2140318

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### EDITORIAL

**Editor-in-Chief:** Chris Smith  
chris.smith@amiplastics.com

**Editor:** David Eldridge  
david.eldridge@amiplastics.com

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

**Contributing Editor (UK):** Mark Holmes  
editorial@plasticsrecyclingworld.com

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

### ADVERTISING

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

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

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

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

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

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# ECP acquires UK-based Biffa

Energy transition-focused investor ECP has completed the acquisition of UK-based integrated waste and recycling firm Biffa in a £2.1 bn (\$2.5 bn) enterprise value transaction.

Biffa has been at the forefront of the UK's waste management industry for over 100 years. The company says it supports the entire waste management process from recycling, treatment and energy generation to collection, disposal and surplus redistribution.

"The closing of the transaction marks an important milestone in this exciting next chapter for



**Above: Biffa's PET recycling facility in Seaham, UK**

Biffa," said Michael Topham, Biffa CEO. "As we continue to invest in our leading position in UK sustainable waste management, leveraging ECP's deep environmental infrastructure

focused expertise will allow us to accelerate our growth, enhance our capabilities, and continue to change the way our customers, and our economy, thinks about waste."

Andrew Gilbert, Partner at ECP, said: "We share the Biffa team's vision to promote a more sustainable, circular economy, and are excited to partner with the company in its next phase of growth. We are impressed by Biffa's visionary leadership, talented employees and commitment to safety. ECP and Biffa will remain focused on providing the highest levels of service to the company's customers."

With the completion of the transaction, Biffa shares have ceased trading and will no longer be listed on the London Stock Exchange.

➤ [www.ecpgp.com](http://www.ecpgp.com)

➤ [www.biffa.co.uk](http://www.biffa.co.uk)

## Alterra announces US deal

Alterra has announced a licence arrangement with a subsidiary of Freepoint for a proposed 192,000 tonnes/yr chemical recycling facility to be sited in the US Gulf Coast region. The facility's output will be ISCC Plus certified and sold exclusively to Shell under a supply agreement.

Alterra currently operates an industrial 20,000 tonnes/yr recycling facility in Akron, Ohio and licenses its proprietary technology worldwide. The Freepoint project will be its first licensing transaction in the US.

➤ <https://alterraenergy.com>

## LG Chem to recycle marine waste

LG Chem has entered into an MOU with South Korean company Netspa to build a resource circulation system by recycling marine wastes.

Through the MOU, LG Chem will be able to secure raw materials for its Seokmun National Industrial Park pyrolysis oil plant in Dangjin, Chungnam, which is sched-

uled to begin operations in 2024. After Netspa has sorted and processed the waste, LG Chem will use it to produce recycled plastics.

About 45,000 tonnes of marine wastes, such as discarded nets and other fishing equipment, is generated every year in Korea, and collecting and

treating it has long been an issue.

Kug Lae Noh president of LG's petrochemicals arm, said: "We will further accelerate eco-friendly technologies and businesses for sustainable growth in the future such as marine waste resource circulation."

➤ [www.lgchem.com](http://www.lgchem.com)

## RePEaT issues licence in China

RePEaT has signed an agreement to license its chemical recycling technology for polyester products to Zhejiang Jianxin Jiaren New Materials, making the Chinese company the first in the world to be licensed by RePEaT.

RePEaT is a joint venture established by Teijin

Limited, JGC Holdings Corporation, and Itochu Corporation to license recycling technology based on Teijin's expertise in DMT, JGC's proficiency in plant construction, and Itochu's wide-reaching global network spanning diverse industries. The JV will provide a technology that

uses DMT for the chemical decomposition, conversion, and then repolymerisation of PET.

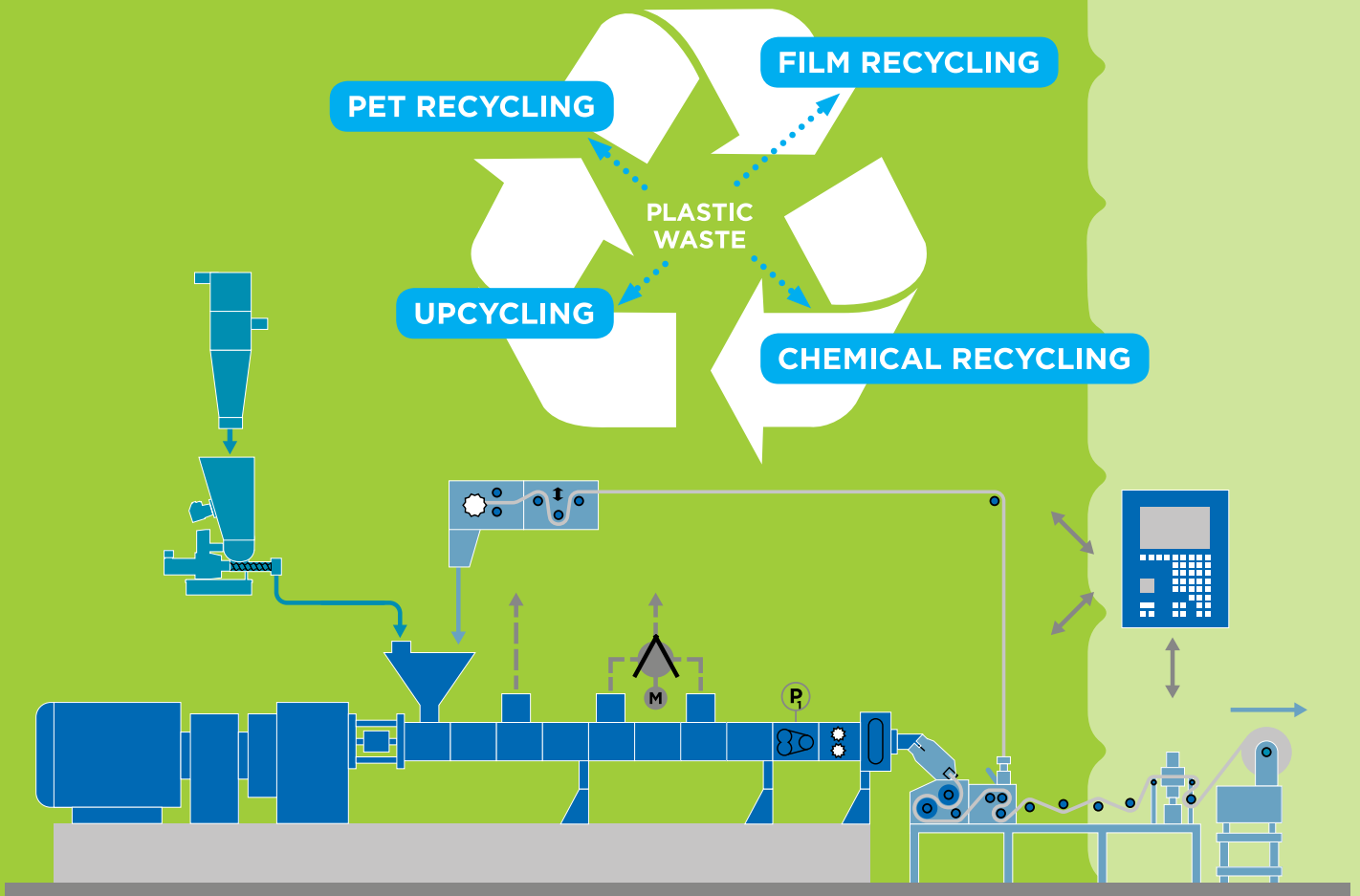
Zhejiang Jianxin will use the technology in a polyester product recycling plant it plans to start up in Shaoxing, Zhejiang Province, next year.

➤ <https://repeat-inc.com>

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# PureCycle announces rPP facility in Belgium

PureCycle has announced its intention to build its first PP recycling facility in Europe at the NextGen District in the Port of Antwerp-Bruges, Belgium. The new plant, expected to have a capacity of 59,000 tonnes/yr, comes with a significant opportunity for expansion since the 14-hectare plot can support up to four processing lines.

PureCycle Vice President of European Operations, Wiebe Schipper, commented: "The announcement of our first location in Europe marks the next phase in PureCycle's global growth

strategy. We are excited to bring our Ultra-Pure Recycled resin to customers in Europe, where companies and policies are at the forefront of the circular economy. Being in the NextGen District will enable us to capitalise on existing efficiencies, collaborate with other innovators in the space and forge new partnerships."

PureCycle is currently engaged in feedstock sourcing and financial planning with the intention of securing a final project timeline by mid-2023. Construction is expected to begin upon completion of

the permitting process, which is anticipated in 2024.

With the company's flagship recycling plant in Ironton, Ohio, US, expected to start pellet production in the current quarter, a second plant in Augusta, Georgia, under construction, and its first PP recycling plant in Asia set to open in 2025, PureCycle is expanding globally and actively scaling up its production capabilities.

The new plant is also expected to create 65-70 new jobs for local residents during the initial phase of the project.

➤ [www.purecycle.com](http://www.purecycle.com)

## Circularix PET plant starts up

Production has begun at food-grade rPET producer Circularix's plant in Hatfield, PA, US. It is planning to build five facilities in the US.

The company has previously stated that it expects the next site, which will be in Florida, to be operational in the second quarter of 2023. After that it plans to open sites in Texas, Arizona, and the Pacific Northwest roughly six months apart, having chosen the locations based on their proximity to customers.

➤ <https://circularix.com>

# Herman Miller uses ocean-bound plastics

Herman Miller has added the Sayl chair to its portfolio of office furniture manufactured using ocean-bound plastics.

Between Aeron, Sayl, and other product lines including OE1 and Revenio textiles, the company estimates that 234 tonnes of ocean-bound plastic, the equivalent of 23m water bottles, will be diverted from the ocean every year.

Depending on the colour, each Sayl chair will contain between 0.91kg and 1.36kg of "mismanaged plastic waste recovered near waterways," with the black version having the highest amount.

➤ [www.hermanmiller.com](http://www.hermanmiller.com)



# APK attracts new minority shareholders

LyondellBasell and Kirkbi have signed an agreement to invest in APK, which has developed a new solvent-based recycling technology for LDPE dubbed Newcycling.

APK aims to increase the recycling of multi-layer flexible packaging

materials, which make up the majority of mixed plastic waste from the consumer sector. The Newcycling process separates the different polymers present in the packaging and produces recycled materials with a high degree of purity.

Under the agreement, LyondellBasell and Kirkbi will become minority shareholders in APK and together with other co-investors will invest approximately €130m in the company. Further Newcycling plants are being planned.

➤ [www.apk.group](http://www.apk.group)

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## Designing reusable packaging

UK-based plastics resource efficiency and recycling organisation Recoup has launched the inaugural edition of Reusability by Design guidance. The report has been put together to assist stakeholders with the design of reusable plastic packaging that “meets the needs of the value chain from packaging manufacturers, packer/fillers, brands, retailers, consumers, service providers through to waste management companies”.

Based on research, surveys, workshops and interviews, the guidance has been produced as a workstream of the UKRI-funded Trace project, led by Pragmatic, with various partners.

- [www.recoup.org](http://www.recoup.org)
- [www.ukri.org](http://www.ukri.org)

# France to be pilot market for digital watermarks

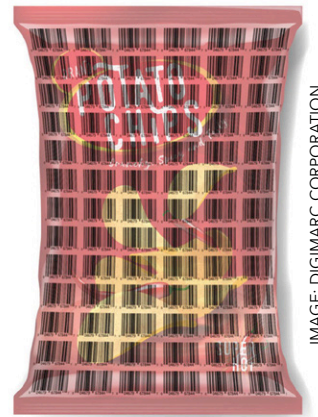
Building on successful semi-industrial digital watermark trials, stakeholders across the packaging value chain have selected France as the European pilot market for Digimarc Recycle. All operators in France have been invited to participate, marking an expansion in activities that were previously limited to HolyGrail 2.0 members.

Results from European trials showed that Digimarc’s technology achieved a 99% average detection rate across all tested categories of plastic packaging. Digimarc said the effectiveness of Digimarc Recycle has also been validated in Canada, again with a 99% detection rate, in a pilot with the Circular Plastics Taskforce. CPT aims to implement Digimarc Recycle in Canadian facilities in 2023.

### Looks Like This



### Performs Like This



Exaggerated view for illustration purposes

IMAGE: DIGIMARC CORPORATION

Above: Simplified graphic of the Digimarc Recycle technology

“As the semi-industrial trials clearly demonstrated last year, digital watermarking technology has the power to transform recycling,” said Digimarc CEO Riley McCormack. “With regulation like the Packaging and Packaging Waste Regulation in the EU on the horizon, Digimarc can

support companies with the innovation they need to comply, demonstrate leadership, and foster a more sustainable future.”

France was chosen as the pilot market for multiple reasons, including support from French producer responsibility group CITEO.

- [www.digimarc.com](http://www.digimarc.com)

# Alpla-headed JV opens first Romanian plant

After a construction time of nine months and an investment of around €7.5m, the Alpla Group, together with partners Ecohelp and UPT, has opened its first Romanian PET recycling plant adjacent to the existing Ecohelp site in Targu Mures.

The joint venture, which was established in 2021, combines the skillsets of the three companies involved, with Alpla bringing its recycling expertise, UPT providing an extensive

distribution network, and local company Ecohelp supplying rPET flakes based on PET bottles from house-

hold waste. The PET Recycling Team Targu Mures JV will supply the southeast European

market with around 18,000 tonnes/yr of food-grade rPET.

Expansion potential has already been identified as the plant has space for a second extrusion line, which would double capacity.

Alpla has been investing more than €50m annually in capacity expansions and technology development since 2021. It plans to double the annual production of recycled materials at its plants by 2026.

- [www.alpla.com](http://www.alpla.com)



The PET Recycling Team Targu Mures facility

IMAGE: ALPLA



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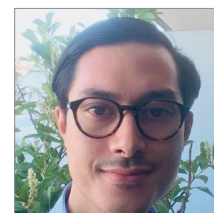
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# Starlinger makes strides in Turkey

Turkish PET recycler Akmert is installing a Starlinger bottle-to-bottle recycling line for its new GSR Granules brand at the company's rPET facility in Kocaeli, near Istanbul.

The RecoStar PET 165 HC iV+ has an output of up to 1,800 kg of bottle-grade rPET pellets per hour and will recycle PET bottles from post-consumer collection. The rPET resin produced, which is 100% food-contact approved, will be used for bottle production creating a closed loop.

Starlinger has also installed a post-consumer HDPE and PP recycling line for Akmert's compatriots Tanrikulu, again in Kocaeli Province, which is currently home to ten plastics recycling and manufacturing plants.

Featuring Starlinger's high-vacuum degassing unit, the RecoStar Dynamic 215 C-VAC has a production capacity of two tonnes of high-quality plastic



IMAGE: STARLINGER

pellets per hour and processes post-consumer HDPE and PP bottle flakes. The line is equipped with a Smart feeder which ensures ideal material preparation prior to extrusion as it effectively dries and homogenises it.

"The Starlinger RecoStar Dynamic recycling lines have been designed with the focus on processing contaminated and highly humid post-consumer plastic waste," said Paul Niedl, Commercial Head of Starlinger Recycling Technology. "The elaborate construction of the SMART feeder allows the recycling of materials with higher levels of humidity. In combination with Starlinger's dynamic automation package which regulates the ideal operating point, it achieves a significant output increase."

Tanrikulu supplies the regranulate to various members of the Turkish plastic product manufacturing industry. While the recycled PP is used mainly to produce automotive parts, furniture, toys, and other injection moulded products, the recycled PE is used for pipes, bottles, plastic bags, and similar products.

➤ [www.starlinger.com](http://www.starlinger.com)

## Revalyu plans rPET investment

PET recycler Revalyu says it plans to invest \$50m during the initial phase of its strategic expansion at its first facility in the US.

The new plant will be located in Statesboro, Georgia, where ground-breaking will take place in the first half of 2023 and commissioning is planned

to happen in 2024.

Upon completion of the first phase, the plant will be able to recycle and process over 102 tonnes per day of used PET waste into PET polymers and rPET chips. After further expansion, the plant will have a capacity of up to 204 tonnes.

Revalyu says process uses

91% less energy and 67% less water than conventional polyester processes. It extracts impurities and delivers rPET of what the company says is the highest purity.

The company says it has already recycled over six billion bottles.

➤ [www.revalyu.com](http://www.revalyu.com)

## Rebrand for PET tray recycler

Thermoformed packaging producer Faerch has announced a rebranding of its subsidiary 4PET Recycling into CIRREC. At its site in Duiven, CIRREC recycles 24,000 tpa of post-consumer pots, tubs and trays to produce food grade rPET.

CIRREC has started scaling its tray-to-tray recycling capabilities into additional countries in Europe and has ordered two additional tray wash lines, quadrupling the output capacity to more than 5 billion food trays annually by 2025.

➤ [www.cirrec.nl](http://www.cirrec.nl)

## Sulzer acquires stake in Fuenix

Sulzer Chemtech has signed an agreement with Fuenix Ecogy, based in the Netherlands, to acquire a strategic stake in its chemical recycling business, which converts sorted end-of-life mixed plastic waste into feedstock.

Sulzer said: "With this

strategic investment, Sulzer is sharing its leading technical expertise to support the scale up and commercialisation of a cutting-edge pyrolysis technology. The agreement also expands Sulzer Chemtech's technology licensing portfolio for

polymer processing, in line with its overarching mission to help industry adopt more sustainable practices."

It said that as the exclusive licensor of the Fuenix pyrolysis technology, it will be able to offer complete as well as partial recycling lines.

➤ [www.sulzer.com](http://www.sulzer.com)

# Ambitious new EU rules for packaging and packaging waste

**The EU's revised Packaging and Packaging Waste Regulation will place more pressure on the plastics packaging and recycling sectors. Silke Einschuetz at AMI Consulting considers the implications**

Following many months of speculation, information leaks, and what has been described as a "watering down" of an initial draft it finally arrived in November – the EU's proposal for a revised Packaging and Packaging Waste Regulation. (The proposal can be viewed on the European Commission's website: [https://environment.ec.europa.eu/publications/proposal-packaging-and-packaging-waste\\_en](https://environment.ec.europa.eu/publications/proposal-packaging-and-packaging-waste_en).)

Note the term 'Regulation' – the existing legislation is in the form of a Directive. What is the difference? A Directive formulates a goal that member states must achieve, but the exact implementation is left to each individual member state. As could be observed with the Single Use Plastics Directive, this can potentially lead to different degrees of implementation and achievement of goals, creating the potential for competitive distortions.

A Regulation, in contrast, is a binding legislative act, every element of which must be applied across the EU. The change thus emphasises the need for the



establishment of uniform rules in the common market which will enable economies of scale for activities to be undertaken to fulfil the new requirements. In addition, the provisions of a Regulation apply directly to economic operators.

## Needed change

To describe the new Regulation in one word – it is very ambitious. But then that is what we need to be to make progress. I am pleasantly surprised by the overall balanced reception of the measures that will be challenging and sometimes costly to achieve and implement by the industry. Given that several of the more ambitious measures include opt-out clauses already, any watering down of the proposal should be avoided – change is almost always challenging but has

never been as necessary as today for industry to continue to operate successfully in a radically changed market environment that requires adaptation and change to achieve the goals of the EU's Green Deal.

It has been pointed out by *The Economist*, investments are flowing into the US because of subsidies becoming available for green energy technologies and renewables schemes under President Biden's Inflation Reduction Act. Europe needs to stay competitive against this background.

One core element of the new Regulation are recycled content targets for 2030 and 2040 respectively. These apply to PET contact-sensitive packaging (30% and 50%), other contact-sensitive packaging (10% and 50%), single use plastic

beverage bottles (30% and 65%) and other types of packaging (35% and 65%).

Targets will have to be met for each unit of plastic packaging, with recycled content from post-consumer plastic waste. While to be welcomed for its push to create much needed market demand for recyclates, success will depend on the availability of sufficient volumes of recyclates to incorporate into these packaging types.

Especially where food contact materials are concerned, this is far from certain given the EU's strict food contact rules incorporated in EU Regulation 282/2008 on "recycled plastic materials and articles intended to come into contact with foods". Chemical recycling is unlikely to be able to close the gap between demand and availability in the short and possibly medium term. This is considered by the provision, that targets could be temporarily amended through a delegated act when there are supply issues or when there are excessive prices for specific recyclates.

However, Article 47 paragraph 9 of the draft Regulation (Rules on the calculation of the attainment of recycling targets) provides a potential indication of chemically recycled plastics to be counted towards the achievement of recycling targets, as long as opera-

tions do not convert waste to fuel or for incineration, backfilling, and landfilling.

## Details

The Single Use Directive will have to be amended to be in line with these new targets. In addition, the industry is awaiting the EU's decision regarding the application of a mass balance approach to calculate recycled content in packaging, which would likely unlock investments in non-mechanical recycling technologies.

The obligation to introduce Deposit Return Systems (DRS) for single-use plastic bottles and single-use metal and aluminium beverage containers up to 3l is to be unequivocally welcomed, given the higher rates of PET bottle recovery in countries where a DRS is already operating and the high and growing demand for rPET. Member states will only be able to opt out of this obligation by achieving a 90% separate collection rate through other means in 2026 and 2027.

Similarly to be welcomed are common Design for Recycling criteria with the aim to make all packaging recyclable from 2030 and, lifting "recyclability" from a

theoretical concept to a real-world activity, to be "recycled at scale" from 2035. Packaging with less than 70% recyclability will be banned from 2030.

The devil lies in the detail here as the definition of "at scale" is to be established at a later stage by delegated act, based on the volumes of packaging placed on the market, volumes separately collected, recycling rates for the specific type of packaging and installed recycling infrastructure. If the new recycled content targets will not generate sufficient investments into collection, sorting, and recycling infrastructure this measure could fall short of its potential.

From entry into force of the new Regulation, which is expected to be around 2025, single-use plastic grouped packaging, single-use packaging for fresh fruit and vegetables, single use packaging for foods and beverages filled and consumed within HORECA premises, single-use packaging for condiments, preserves, sauces, coffee creamer, sugar and seasoning in the HORECA sector, and single-use hotel miniature



## About the author

Silke Einschuetz is Senior Consultant Recycling & Sustainability at AMI Consulting, which has published a series of reports on developments in mechanical and chemical recycling of plastics. Find out more about the reports: [www.ami.international/cons/markets/RecyclingSustainability](http://www.ami.international/cons/markets/RecyclingSustainability)

packaging will be banned.

Especially where packaging for fresh fruit and vegetables is concerned this is likely to generate a debate about the increase in food waste resulting from shorter shelf life that might result because of lack of packaging. A complex debate, as illustrated by an article in *The Guardian* last year which claimed that the fact that fruit and vegetables come in packages of multiples leads to food waste in households.

Other types of packaging, including tea/coffee bags, coffee or tea system single-serve units disposed together with the used coffee products, sticky labels attached to fruit and vegetables and very lightweight plastic carrier bags are required to be compostable in industrially controlled conditions in bio-waste treatment facilities two years following entry into force of the regulation.

Further provisions are aimed at packaging minimisation, with packaging to be designed so that its weight and volume is reduced to the minimum necessary for ensuring its functionality and a 40% maximum empty space ratio for grouped packaging, transport packaging

or-e-commerce packaging, all from entry in force of the Regulation.

Detailed labelling requirements, with labels and QR codes providing information about material composition and reusability of packaging, aim to make it easier for consumers to dispose of packaging in the correct way, enabling higher waste collection rates and less contamination of collected post-consumer packaging waste streams.

## Targets

Waste prevention targets to be met by all member states require a reduction of packaging waste per capita by 5% by 2030, by 10% by 2025, and by 15% by 2040, compared to 2018 levels.

Most controversial are the reuse targets formulated in the Regulation for a variety of packaging types and these are indeed the targets that have reportedly been watered down following the emergence of leaked information about the draft Regulation and strong criticism from industry lobbyists.

Detailed life cycle assessments would ideally be required to establish whether a reuse system is more beneficial than optimised existing solutions.



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# Polystyrene recycling gains traction

*Collaboration among materials and technology companies has led to a string of mechanical and chemical recycling projects for polystyrene and other styrenic polymers. By Mikell Knights*

Just a few years removed from being seen as difficult to recycle, innovation, collaboration and application in polystyrene recycling have taken root in Europe, Asia and the Americas. Styrenics producers, packaging converters and brand owners today are forecasting waste polystyrene and other styrenic materials, buoyed by technology advances, to perhaps become the fastest growing recycled polymer, increasing the capture of a wide range of end-of-life products.

**Ineos Styrolution** announced that its sustainable ABS Eco grades, made from post-consumer recycle, were validated by Chinese appliance manufacturer **Midea** for use in its range of sustainable household appliances. The post-consumer material is sourced from end-of-life household goods produced by Midea, with the acrylonitrile butadiene styrene (ABS) processed by waste recycling enterprise **GER** at its pilot plant in Foshan, China.

The collaboration between the three companies is a major milestone that Durante Lin, Director of Systems and Resources for Midea Group Supply Chain Management, calls the “first large-scale home appliance closed-loop circular economy system in the world”. Ineos Styrolution says it will produce specially tailored ABS Eco and PS Eco grades exclusively for Midea that are sourced from Midea’s own products when they reach their

end-of-life. GER will dismantle and recycle the materials. Ineos Styrolution will produce the sustainable grades as a drop-in solution to manufacture Midea’s Eco line of home appliances.

GER has created its own closed-loop industry chain that allows for full-component recycling of household appliances. The company has developed technical and process advances, created an IoT whole-process traceability information platform, an automatic “dimensional” disassembly system, and technologies for controlled crushing of e-waste, fine sorting, and high-value recovery of used plastics. Its disassembly, waste plastics classification and modification and granulation technologies allow the company to achieve national qualifications for standardised disposal of the products.

GER has built many demonstration lines to prove out its technologies. Its technology/process chain combines the dismantling of used appliances, fine separation of waste metals, recycling and modification of waste plastic and the recycling of rare and precious metals on waste circuit boards. GER recycles ABS, HIPS, GPPS and other polymers such as HDPE, LLDPE, PC, PC and PMMA. It developed a low-temperature continuous pyrolysis technology and cascade separation technologies for recovery of metals.

GER and Midea created a partnership last year to

**Right: ABS Eco grades from Ineos Styrolution, made from post-consumer recycle, are used by Chinese appliance manufacturer Midea for use in its range of sustainable household appliances**

maximize the collection and recycling of materials in end-of-life home appliances as a way to implement its extended producer responsibility system. Ineos Styrolution teamed up with GER in 2021 in a collaboration to produce sustainable Terluran Eco GP-22 grades at commercial scale for the Chinese market. The two rABS grades (Terluran Eco GP-22 MR50 and MR70) contain 50% and 70% of recycled post-consumer waste electrical and electronic equipment respectively, are available in standard black, and have equivalent properties to Ineos Styrolution's virgin general-purpose ABS GP-22 formulation, says the company. Ineos Styrolution integrated GER's post-consumer recycled electrical and electronic waste into the state-of-the-art recycling ABS formulations, for use in a wide range of industries including household, electronics, packaging, toys, sports, and leisure. The collaboration enables shorter lead times and improves supply stability for Ineos Styrolution's products and services in China.

Innotech, the research and development technology centre for packaging solutions from the company **Grupo Lantero** announced that trials with a full range of rigid packaging yogurt cup products, made with Ineos Styrolution's 100% post-consumer recycled polystyrene material have been successfully completed, with all European and American dairy formats produced and tested to food contact standards.

Ineos Styrolution's PS Eco 440FC MR100 grade, made from recycled household food packaging waste, can be used as a drop-in replacement to virgin PS, where it is the material of choice for the dairy form-fill-seal market, according to Gonzalo Sanchez, head of recycling with **Coexpan**, Grupo Lantero's rigid packaging division. "It is a massive achievement to be able to confirm the success of this exercise. We now have the proof that mechani-



IMAGE: MIDEA

cally recycled polystyrene offers a solution for [customers'] food contact applications. This will allow customers to concentrate on their core business rather than looking for alternative materials requiring changes to existing processes and investments into new equipment."

**Below: Model of Indaver's planned depolymerisation facility, to be located in the Port of Antwerp, Belgium**

### Depolymerisation

Ineos Styrolution in 2022 signed an offtake agreement with Belgian waste management specialist **Indaver** that will give the company access to styrene monomer that Indaver produces from post-consumer waste at its planned depolymerisation plant. Indaver has started building a new facility for converting difficult to recycle plastics into basic chemicals using a proprietary recycling technology it has been testing since 2017.

The materials that are released in this way are basic raw materials with specifications that are equal to the materials extracted from fossil streams. The high-quality styrene monomer will allow Ineos Styrolution to replace fossil feedstock while producing PS resins that have a lower CO<sub>2</sub> footprint than a virgin material but with identical properties. The material can be used in food-contact packaging as it meets stringent food grade specifications.

Indaver's new facility, located in the Port of Antwerp, Belgium, will treat plastics streams that are not eligible for other types of high-quality mechanical recycling. This primarily concerns polystyrene or polyolefin fractions with household or industrial origins, such as household packaging waste.

The new Plastics2Chemicals facility will recycle approximately 65,000 tpa of waste plastics when



IMAGE: INDAVER



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fully operational. Start-up is scheduled for early 2024 with an initial capacity of 26,000 tonnes, which includes separate campaigns for its polystyrene and polyolefin operations.

In a second phase, the plant will be converted into a dedicated polystyrene plant and expanded with an additional line to process up to 65,000 tonnes of plastics annually. The scale-up of the plant will make it Europe's largest plant for depolymerisation of polystyrene.

The Indaver recycling process is a thermochemical technology whereby long carbon chains in the plastic are depolymerised. The core process, from the extruder to the distillation, will be a bespoke construction to guarantee high-quality recycling.

Ineos Styrolution has also teamed up with Indaver in a four-year project to demonstrate the production of ABS based on recycled feedstock. The Life ABSolutely Circular project, funded by the EU's LIFE programme, will develop a lab-scale solution to prove production and the environmental and economic benefits of using a depolymerisation recycling technology. The project aims to scale up to a demonstration plant and then ultimately to commercialisation.



**Dissolution**

Ineos Styrolution established a joint development agreement with **Polystyvert**, a Montreal, Canada-based clean technology startup that has developed what it calls a cost-effective, low-carbon footprint dissolution technology to recycle all types of styrenic polymers in a closed-loop, including PS, ABS, SAN, HIPS and SBS.

The company's patented dissolution method of recycling takes plastic waste in its solid form and dissolves it in an essential oil solvent. Once dissolved, the process can separate contaminants

**Above: Polystyvert's dissolution recycling process has been used in a collaboration with Grupo Lantero's businesses**



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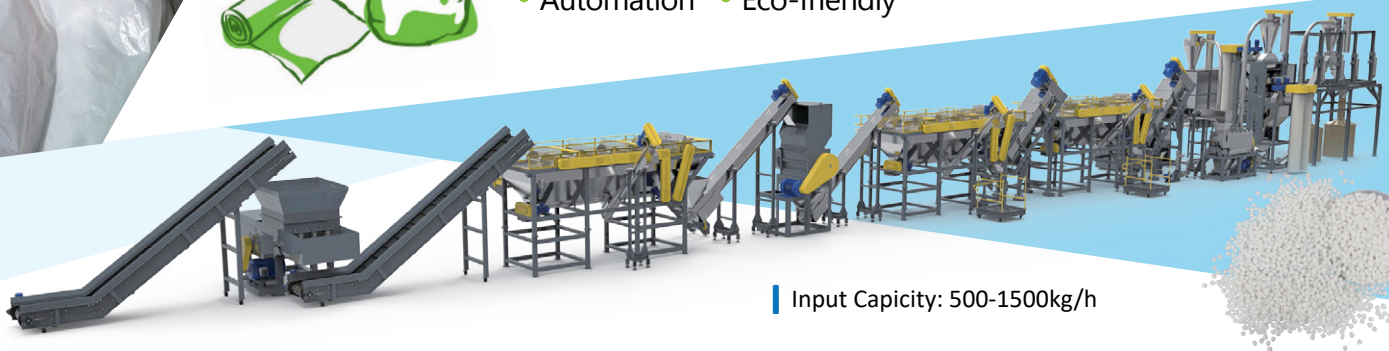


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and additives, before finally separating the original polymer from the solvent. The end-product is a cleaned polymer that is pelletised and may be used as new raw material resin. The essential oil solvent is safe and can be reused to recycle additional material.

Polystyvert's dissolution technology includes a purification/decontamination process that removes all contaminants. The purification technology offers the ability to treat all types of feedstock, from industrial waste to post-consumer streams, and can eliminate a wide range of hard-to-remove contaminants such as pigments and brominated flame-retardants. "Using this method, recycled polystyrene is produced at a competitive price," says Solenne Brouard, CEO of Polystyvert. The high purity recycled material can be reused for upcycled PS products, including food grade applications.

Polystyvert is working to build its first full-scale recycling facility in Montreal

and is in discussions regarding several recycling facilities in other geographical areas, including Europe. It has a demonstration plant that has been running in Quebec since 2018.

Polystyvert and the rigid and flexible packaging divisions of Grupo Lantero announced a collaboration last year to validate its dissolution technology for form-fill-seal (FFS) yogurt packaging applications. Testing is taking place at Grupo Lantero's Innotech innovation and technology centre, which serves the company's Coexpan rigid packaging division and Emsur flexible packaging division.

The technology was used in the first validation stage to remove contaminants from feedstocks, such as dyes and pigments. Next, two types of rPS materials were made, including a formulation with 50% post-industrial content from an ABA structure, and a grade from a monolayer 100% post-industrial PS. Innotech then extruded the rPS pellets into sheets, which were thermoformed on FFS industrial yogurt packaging systems into yogurt pots and analysed at its development centre laboratory.

**Elix Polymers**, the manufacturer of specialised styrenic-based thermoplastics, says it is the first ABS polymer producer to receive ISCC Plus certification for its production facility, in Tarragona, Spain. Also in 2020, it incorporated its Sustainable Portfolio Solutions and its Circular Plastics and Responsible Innovation developments under the new E-Loop brand name which encompasses all of

its Circular Economy activities.

The company also signed a collaboration agreement with energy and chemicals company **Repsol**, through which Repsol will supply recycled styrene to Elix Polymers on a regular basis, starting in 2021. Repsol, which itself received ISCC Plus certification in 2019 for all of its production centres of polyolefin and other circular petrochemicals including recycled styrene, supplies the recycled products from the chemical recycling of post-consumer plastic waste that is not suitable for mechanical recycling. Elix Polymers will use the certified circular materials to produce high-performance technical polymers such as ABS and SAN.

The agreement also includes the possibility of developing joint projects in the field of circularity for applications with strict standards and requirements such as automotive exterior and interior parts, medical devices, toys and small household items.

Elix Polymers last year launched its E-Loop ABS circular material grade developed from a sustainable acrylonitrile monomer material, offered by **AnQore**, a specialist European chemical supplier and acrylonitrile producer based in the Netherlands. AnQore's Econitrile is an ISCC Plus certified sustainable acrylonitrile that is made from non-fossil feedstocks, which it says has a 60% lower carbon footprint when compared to its incumbent materials.

AnQore, which produces Econitrile at its plant on the Chemelot industrial site in Geleen, the Netherlands, says two key feedstocks are needed to make the sustainable acrylonitrile. The feedstocks of propylene and ammonia come from ISCC Plus certified suppliers Sabic and OCI-Nitrogen. "They guarantee the sustainable nature of these chemicals by co-feeding sustainable feedstocks, like bio-naphtha and bio-gas, to their plants (also at the Chemelot site) and assigning these to ammonia and propylene on a mass balance basis," according to the company.

Elix Polymers, AnQore and OCI-Nitrogen announced last year that a major European consumer goods manufacturer will transition to Elix E-Loop ABS made with Econitrile, in a move to substantially reduce the carbon footprint of its products.

**Americas Styrenics** (AmSty), a 50/50 joint venture between plastics resin maker Trinseo and Chevron Phillips Chemical, has made several advances in polystyrene recycling using mechanical,



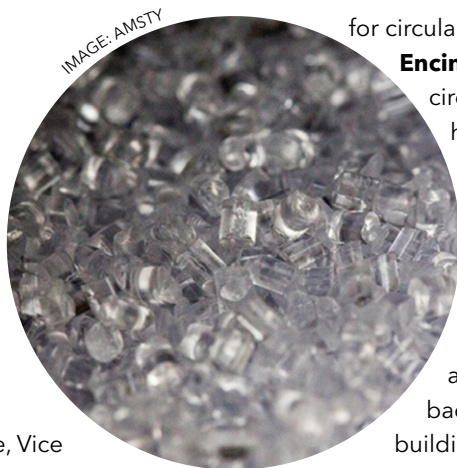
**Right: Elix Polymers has signed a Circular Economy partnership agreement with Repsol**

dissolution or other advanced recycling methods.

The Woodlands, Texas, USA company has since 2013 marketed a variety of products with post-consumer recycled content under its PolyRenew brand, which is suitable for food contact applications. The resins are produced using an internal dissolution process developed at its Connecticut polymer plant, says Tim Barnette, Vice President of Polymers and Sustainability.

Its material has been used in extruded low-density foam products such as egg cartons, meat trays and takeout containers, and in rigid applications including condiment packaging, cups, and cutlery. This year AmSty will begin transitioning all of its PolyRenew products, including its dissolution products, over to the ISCC Plus system, to provide total flexibility to customers in their efforts to target sustainable end products.

AmSty last year entered into a Memorandum of Understanding and long-term offtake agreement



for circular polystyrene feedstocks with **Encina Development Group**, a circular chemicals producer that has developed a proprietary recycling technology that creates circular monomers from post-consumer and scrap plastic. Encina's BTX/P catalytic process works at the molecular level, where the polymer chains are split apart and converted back into their original chemical building blocks. The building blocks can then be reused to make new products.

Encina last year received ISCC Plus certification.

Encina plans to construct recycling facilities in the US, Asia, and South America. Each facility is expected to process approximately 450,000 tonnes of post-consumer and scrap plastic material each year, says Sheida Sahandy, Chief Sustainability Officer at Encina. The company's first US commercial plant in Pennsylvania is anticipated to come into production in early 2025.

Under the MoU, AmSty will have the opportunity to purchase up to 250,000 tonnes per year of

**Left: AmSty is using mechanical, dissolution and other methods to recycle polystyrene**



# THE CLEAN WAY.



Members of Styrenics Circular Solutions undertook successful trials in incorporating rPS in foam food trays



IMAGE: MAGIC PACK

circular feedstocks from Encina. The circular feedstocks from the new US production site will be available for purchase as recycled content credits, based on the ISCC Plus mass-balance system. AmSty plans to enter into additional offtake agreements to purchase circular feedstocks as each new Encina plant comes online, says Barnette. “We are excited to be Encina’s first announced off-take partner. Teaming up with Encina will significantly increase our capability to produce recycled content, to produce PolyRenew credits and begin merchandising recycled polystyrene across a host of new applications,” says Barnette.

AmSty also has a collaboration with recycling technology developer **Agilyx** called Regenyx, a joint-venture PS recycling operation in Tigard, Oregon. At that facility, Agilyx’ advanced chemical recycling technology converts post-use polystyrene products back into styrene monomer with virgin-equivalent properties but with a 50-70% lower carbon footprint. AmSty refines the monomer in what it calls the PolyUsable process then uses it to make new products.

Global materials company **Trinseo** last year said it plans to build a world-class chemical recycling plant at its Tessenderlo, Belgium site that will be dedicated to polystyrene. Trinseo planned for construction to begin by the end of 2022, with the finished facility capable of processing 15,000 of recycled PS flake annually that will be converted into high quality recycled styrene, to enable further production of PS and/or other styrenics including ABS and SAN.

Trinseo selected Synova, a provider of technology for the recycling of mixed plastic waste. The technology has been invented by independent Dutch research organisation TNO and features a highly efficient process to convert waste into high value products while improving the CO2 footprint.

Members and partners of the recycling initiative

of international styrenics producers **Styrenics Circular Solutions (SCS)** last year confirmed the recyclability of foamed PS trays into a high purity recyclate through a mechanical recycling process, with the recyclate being integrated into new foamed PS trays for food contact applications.

The tray-to-tray closed-loop recycling scheme required a consortium of companies across the value chain. This included: Corepla, a Milan, Italy-based private and non-profit consortium that brings together packaging companies; recycling equipment and technology developer Tomra of Norway; and German waste management company Zimmermann Recycling & Transporte, which performed the high-purity deep sorting, hot washing, and flake sorting operations. Milan-based Foreverplast developed the dewatering and finishing of the PS recyclate. Versalis performed a quality assessment to verify the purity of the recyclate.

Converter Magic Pack, a member of the company ProFood Italy, integrated the rPS in the new foamed food trays. The rPS is incorporated as the functional middle layer in an ABA structure between virgin PS layers. The foamed PS trays contained 50% rPS, are 100% recyclable and can be recycled multiple times over again. “The proof that PS food trays can be effectively and efficiently sorted, recycled and returned even to its original food contact applications should inspire accelerated scale-up,” says Jens Kathmann, Secretary-General of SCS. Tomra confirmed that foamed polystyrene packaging can be effectively and efficiently separated and sorted with existing technology.

SCS noted that several further examples of foamed polystyrene collection, sorting and recycling projects are being established in France, Sweden, Ireland, and Belgium.

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- > [www.ineos-styrolution.com](http://www.ineos-styrolution.com)
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# Recycling packaging films needs flexible approach



IMAGE: POLYSTAR

*To meet the technical challenges of recycling film-based packaging waste, an innovative and flexible approach is needed. David Eldridge reports on progress from system developers and machinery suppliers*

**Main image:** **Repro-Flex, which incorporates a cutter-compact unit, is the Taiwan-based Polystar group's system for recycling PE and PP film**

A lot of work is going on in plastics recycling to create the technological basis for a circular economy in flexible packaging. Multi-partner projects in Europe are finding the best methods to segregate mixed waste streams and tackle the technical challenges of difficult-to-recycle items such as laminated multilayer packaging. Technology suppliers are also innovating to help film recycling customers realise the full potential of post-consumer packaging waste. The common goal is to create an efficient recycling system that captures nearly all types of flexible packaging waste and creates high-quality materials for use in new products.

The ambitious **Ceflex** initiative has gathered momentum and is planning for work to start on a demonstration recycling plant in Europe this year.

Since its inception in 2017, Ceflex has been collaborating with the entire value chain (now numbering more than 180 stakeholder companies) to make flexible packaging in Europe circular by 2025. It is a multi-programme project with workstreams on flexible packaging collection, sorting, recycling, design, technology and markets.

Ceflex has transitioned from the initial project design stage to a position where it is ready to implement its findings. Graham Houlder, Ceflex Consortium Co-ordinator, said: "We are making good progress, this ship has sailed." Speaking at AMI's Recycling Flexible Packaging conference in Cologne, Germany, in December, he said the project is well on its way to meeting its goals, although full circularity will probably not be achieved by 2025.

Ceflex has moved on to a demand-driven

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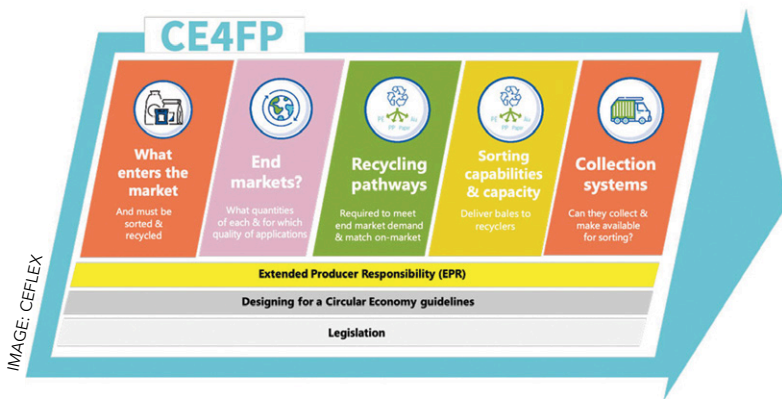
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**Above: Ceflex is focusing on many elements to help create a circular economy for flexible packaging**

approach with a focus on the pull from end markets. “A demand-driven process is, we believe, so important in making flexible packaging materials sustainable,” he said. By identifying the potential to use recycled materials in different packaging markets, Ceflex is able to work backwards to frame the needs in mechanical and chemical recycling, sorting capacities and collection.

**Right: A prototype detergent pack with 35% PCR content derived from beverage carton waste was produced in a partnership between, Henkel, Wentus and Saperatec**

There are four key enablers for achieving a circular economy for flexible packaging, according to Ceflex. These focus on: materials, packaging design and end markets; sorting and recycling capacity; EPR systems suited to flexible packaging’s complexity; and a supportive legislative framework.

In 2020, the Ceflex Designing for a Circular Economy (D4ACE) guidelines were published and now a second phase has started which will provide details for the many different designs in flexible packaging. “We are working now to actively backfill the data gaps,” said Houlder.

In October last year, Ceflex and the **Alliance to End Plastic Waste**, announced their collaboration on a demonstration plant for recycling different types of flexible packaging, to be built at commercial scale in Europe. They invited expressions of interest from partners in the industry to develop what will be the first-generation ValueFlex facility. The demonstration plant has a planned 50,000 tpa processing capacity and aims to be operational by 2025.

“By improving the value and flexibility of sorting and recycling processes for polyolefin-based flexible packaging, we can support market demand for high quality post-consumer recyclates from mechanical recycling and feedstocks for chemical recycling,” said Martyn Tickner, Chief Advisor for Circular Solutions at the Alliance.

The demonstration plant will use the Ceflex Quality Recycling Process (QRP), a modular and flexible approach to sorting and recycling to

maximise value from flexible plastic packaging waste. QRP has been developed following semi-industrial trials by Ceflex consortium companies.

Houlder said at the Recycling Flexible Packaging conference that QRP is a “clever” process in enabling the creation of valuable streams from mixed waste. For example, transparent films can be “cherry picked” for film-to-film recycling, while pallet film can be sorted and recycled for use in new pallet film or injection moulding compounds. As the input waste materials change, the plant is able to “flex the types of materials it produces, enabling you to valorise as much of the recyclable materials in streams as possible”, he said.

Elements of QRP are already being implemented by some companies, said Houlder. “We’re hoping this demonstration facility will show the potential to multiply this model, not only in Europe but elsewhere in the world too.”

Ceflex had received 20 expressions of interest in the project by December. He said these proposals were being analysed on the basis of showing proof of principle, preferred location and other criteria.

Plant construction is under way at another innovative flexible packaging project in Europe. Unlike the wide range of packaging targeted by Ceflex, German company **Saperatec** is focusing on recycling composite packaging using a delamination process to separate the layers. The plant it is building in Dessau will tackle plastic-aluminium laminated packaging and is expected to recycle about 18,000 tonnes of packaging waste per year.



IMAGE: SAPERATEC

“After years of extensive research and thorough testing, we are thrilled to be constructing our first industrial-scale recycling plant, which will commence operations [in 2023],” said Thorsten Hornung, CEO of Saperatec. “Our goal is to have a true, lasting impact on the circularity of composite packaging materials, which have proven notori-



IMAGE: SAPERATEC

**Right: Saperatec’s delamination process uses separation liquids based on different chemical mixtures for different applications**

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IMAGE: VEOLIA

## Veolia gives support to Thailand plans

Thailand has an ambitious policy to limit plastic pollution, which can be supported by developing high quality recyclate from film waste, according to Veolia, which opened a PE recycling plant in the country in 2021.

The waste management and recycling group says: "Only a small fraction of plastic waste [in Thailand] enters into the circular economy, with significant discrepancies between rigid plastic packaging (PET bottles, HDPE bottles) and flexible PE films (with a recycling rate of less than 5%). The majority of the plastic waste ending up in landfill and leaking into the oceans are flexible plastic bags made of PE or PP."

New regulations and commitments are on the way in Thailand, including an EPR system which is expected to start in 2025, to finance more efficient collection (through segregation of the packaging types at source) and sorting.

"These policies have an impact: we can see that the share of PCR in the formulation of new packaging is increasing every year," says Veolia.

"Veolia Circular Polymer Thailand offers a solution that both supports reducing mismanaged plastic waste flows and serves companies which are willing to source sustainable recycled pellets," says the group.

The Thailand factory produces extrusion-grade rPE with a small environmental footprint due to measures like a solar panel roof able to produce 230 MWh of electricity per month, internal waste water treatment process, and other features.

"Our washing lines make us able to recycle plastic inaccessible for other recyclers, such as films collected from landfill. This technological leverage makes a real difference in order to produce high environmental value PCR without compromising on the quality of the pellets," says Veolia.

Veolia Circular Polymer Thailand is one of almost 40 plastics recycling plants that form part of the PlastiLoop worldwide network of experts of Veolia. These range from PE film recycling plants in Spain, Czech Republic and elsewhere to a capability to produce a large slate of circular polymers developed for demanding applications (PET, HDPE, PP, ABS, MMA, PS).

ously challenging to separate and repurpose."

Saperatec has developed separation liquids based on different chemical mixtures for different applications. The process involves treating shredded laminate waste with the liquid which is warmed and stirred until the layers are separated. This is followed by washing, sorting and drying stages. The hot-wash separation fluids are water-based and solvent-free, and are reused more than 30 times in the process.

The company says its delamination technology has been extensively tested in both materials science labs and near-industrial pilot environments. "The highly encouraging results are the impetus for the plant's construction, as well as for significant investments from several leading venture capital investors," it says.

The initial focus for Saperatec's delamination technology is composite flexible packaging materials and tube packaging with aluminium foil barriers, as well as plastics and aluminium from beverage cartons. Hoffmann Neopac last year became the first tube manufacturer to sign a partnership with Saperatec. The manufacturer of barrier tubes for pharmaceuticals, cosmetics and oral care products will supply its production waste to the plant in Dessau.

Saperatec has worked with partners to develop a prototype detergent pack with 35% PCR content. Packaging film supplier Wentus manufactured the flexible pack, which is a two-layer design made entirely from PE, with the inner sealing layer comprising more than 50% PCR LDPE from beverage carton waste. The outer layer is printed with less than 50% surface coverage, and laminated with Henkel's optimised adhesive for recyclability.

A different delamination technology uses air rather than liquid to separate flexible packaging layers. German company **Pla.to Technology**, which makes cleaning, washing and separation technology for plastics recyclers, developed the separation process as part of a joint research project with **Zirkon** - Zittau Institute for Process Development, Recycling Management, Surface Technology and Natural Materials Research at the Zittau-Görlitz University of Applied Sciences.

The two-stage separation process is optimised for high film throughputs. In the first step, a newly developed conditioning process changes the aerodynamic properties of the single and multilayer films to varying degrees. This allows the materials to be sorted in the second step in an air sifter. To enable this separation, Pla.to has adapted the separator to the materials to be processed and optimised it for the small bulk densities of film waste. ➤

AMI | Events

# Agricultural Film

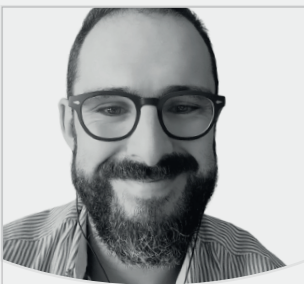
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**Right: Erema's new Intarema TVEplus DuaFil Compact is suited to recycling film waste**

Pla.to says: "The process was tested, among other things, on real material mixtures such as the Green Dot's 310 film fraction from the post-consumer sector. The PE [materials] recovered in this way were not only processed into reusable granules, but also successfully used to blow new films, completing the cycle from film-to-film."

Pla.to presented its new and established technologies at the K2022 fair in October where many other machinery suppliers highlighted recycling of film and flexible packaging.

**Erema** launched a double filtration machine Intarema TVEplus DuaFil Compact which combines the group's TVEplus technology with a new compact design. The engineering design features the use of a melt pump tailored to the application, so the necessary pressure build-up for the second filtration unit is particularly efficient and the temperature is therefore significantly reduced, says Erema.

Sebastian Sochor, R&D Engineer at Erema, says: "The lower melt temperature of the DuaFil Compact in this area has a positive effect on the melt quality and significantly reduces energy consumption."

This gentle treatment is beneficial to the production of high-quality pellets from PCR packaging waste. Compared to the previous Erema double filtration solution, the Intarema TVEplus DuaFil Compact in size 1108 is said to achieve a mass temperature that is 18.5° C lower upstream of the second filter unit and a 10% lower overall energy consumption when processing LDPE supermarket film with paper content (measured as specific energy consumption in kWh/kg).

Erema indicates the new machine is also adept at dealing with LDPE/LLDPE material flows which often have different degrees of moisture and contamination from impurities such as paper labels, wood particles or other polymers, that lead



IMAGE: EREMA

to malodours and discoloration.

Repro-Flex is the Taiwan-based **Polystar** group's system for recycling printed and non-printed PE, PP film, multi-layered film, shrink film, stretch film, PE and EPE foam. Repro-Flex incorporates a cutter-compactor unit which, it says, has an advantage for larger-sized recyclers: through the heat and friction generated from the rotation of film waste in the unit, it can quickly compact and densify the light-weight material into a more solid form to be fed into the extruder at a constant rate.

Polystar says the Repro-Flex model is one of its most popular products among recyclers due to its high level of efficiency and stability in recycling both soft and hard plastic scraps in a variety of forms. It says there are 1,200 Repro-Flex recycling machines in operation worldwide.

For recyclers who process washed and fully printed post-consumer waste, Polystar offers the option of adding a second extruder to the Repro-Flex model. Having a cutter compactor built in and operating with the same working principles means the two-stage Repro-Flex Plus model has a total of three degassing zones and two filtration steps in the recycling process. This model is also ideal for processing post-industrial laminated/multi-layered waste, says the company.

Italian compounding machinery maker **ICMA San Giorgio** demonstrated a One-Step upcycling line for flexible packaging at K2022. In its latest patented version, the line features one co-rotating extruder which the company says can produce top quality recycled compounds at a high productivity level, with a very good energy saving performance. ICMA also showed new techniques and solutions for its established compounding/upcycling systems, like stripping, optimal design simulation and integration of devices, which it says maximises a high-quality outcome even from the most challenging waste.

**Below: The Repro-Flex system from Polystar can have one or two extruders**



IMAGE: POLYSTAR



Suppliers of blown film extrusion lines demonstrated the possibilities of incorporating recycled material in new PE production during K2022. Italian manufacturer **Macchi** displayed an R-POD Flex line, the latest in its polyolefin film lines, which has been specifically designed for very high productivity and for the use of recycled materials. The company says: "This new technology allows [us] to meet the growing market demand of highly flexible extrusion lines, capable of extruding recycled materials up to 1,200 kg/h at 2,500 mm net width."

The new design and mix of extrusion screws in R-POD Flex allows greater flexibility in the processing of different materials and, at the same time, a greater extrusion capacity in 65/80/120/80/65 configuration. It also features a new TE556 Coex-flex series extrusion head, specifically designed to manage both polyolefin and regenerated film formulations on the same line, says Macchi.

**Reifenhäuser's** blown film business showed the new EVO Ultra Fusion process, which can handle strongly fluctuating recyclate quality and ensures a stable production process. The system relies on direct extrusion and avoids energy-intensive and costly regranulation of the starting material. Fluff (foil snippets) and all types of production waste and PCR material can also be processed directly. Reifenhäuser says this is made possible by its twin-screw technology, which homogenises the melt better and thus ensures a stable process. In addition, processors can degas the system very easily and effectively, thereby removing unwanted components in the recyclate.

At K2022, Reifenhäuser also highlighted the help that processors of recyclate-containing materials can receive from its Reiloy screws and barrels business. It says: "Whether film manufacturer, injection moulder or plant manufacturer: The processing of recyclate poses challenges for everyone, because recyclate is complex as a raw material and a stress test for the plasticising unit.



IMAGE: ICMA SAN GIORGIO

Highly wear-resistant cylinders and screws from Reifenhäuser Reiloy enable a long service life of the unit and high quality of the products."

Reifenhäuser Reiloy's screws and barrels are made from special iron-based alloys and nickel-based alloys, which are suitable for the raw material being processed, and ensure greater resistance to wear. It says the decisive factor is the composition of the alloys, because wear protection not only depends on the hardness of the layer.

**Above: ICMA San Giorgio demonstrated a One-Step upcycling line for flexible packaging at K2022**

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- > <https://endplasticwaste.org>
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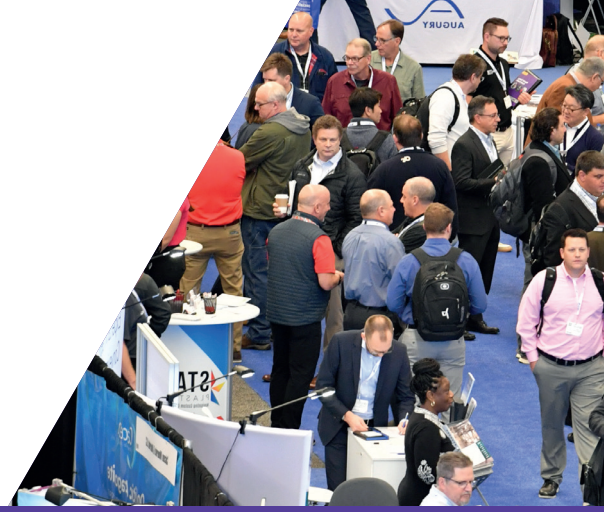
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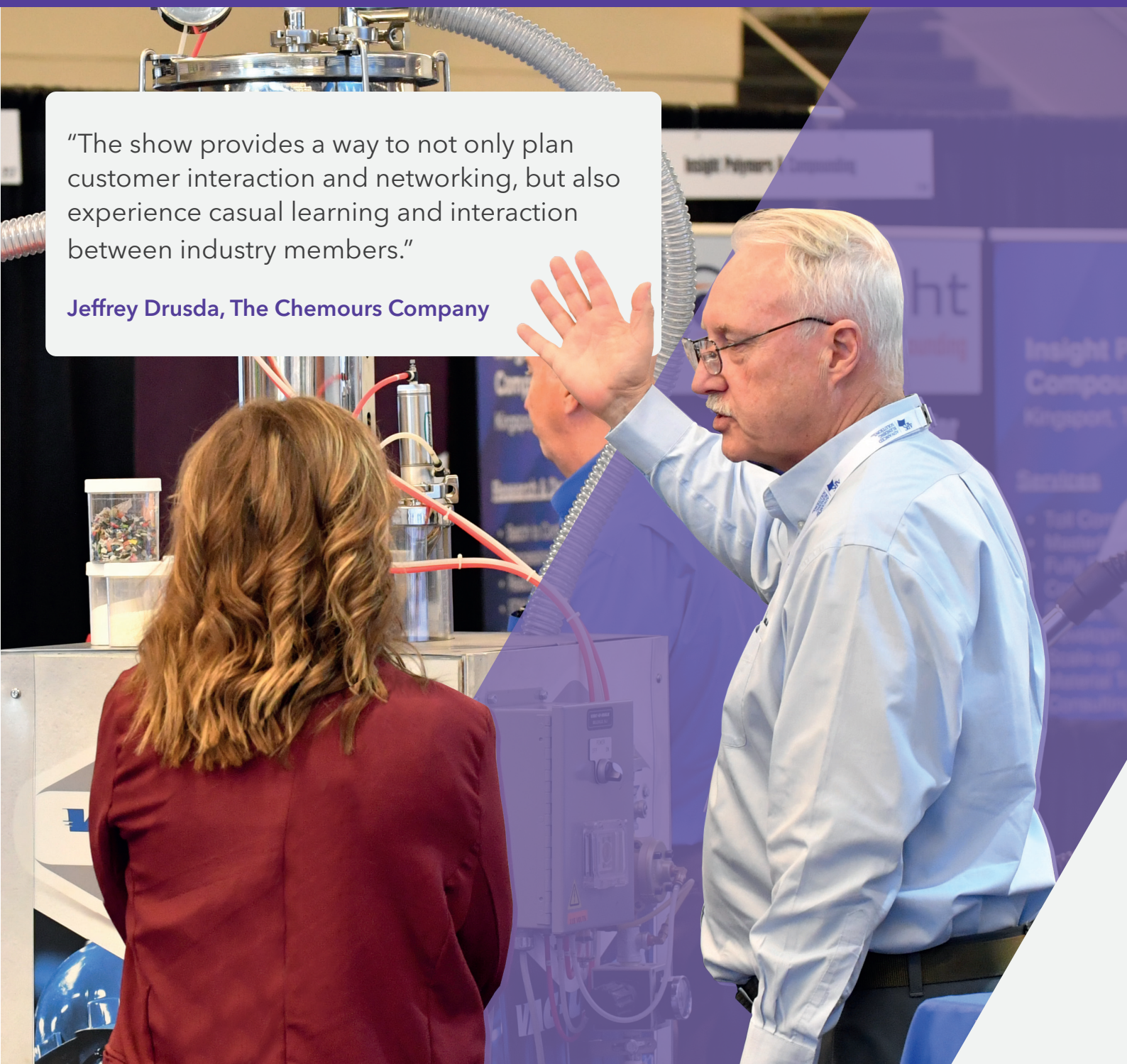
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LAST CHANCE TO BOOK YOUR PLACE

*The latest pelletiser introductions are engineered for better and more efficient performance with simplified maintenance. Jennifer Markarian reports*

# Pelletiser innovations target quality gains

Pellet quality is not simply a cosmetic issue; irregular pellets can lead to melt quality issues and feeding problems. So taking steps to ensure pelletisers run at their best and produce pellets of optimal quality makes sound sense. The first step towards optimising pellet quality is to understand the material being processed.

According to Martin Baumann, Vice-President and General Manager of **Maag Americas**, both the type of resin being processed and the additives it contains play a part in selection of the best pelletising equipment. Speaking at the Compounding World Expo in Cleveland, Ohio, US last year, he said strand pelletising can be better for abrasive materials while underwater pelletising has a reduced sticking tendency. "In our lab, we can test customer compounds to help choose the optimal system for their product," he said.

A common problem in underwater pelletising is that some polymers tend to build up tails during the cutting process, and these tails can easily break

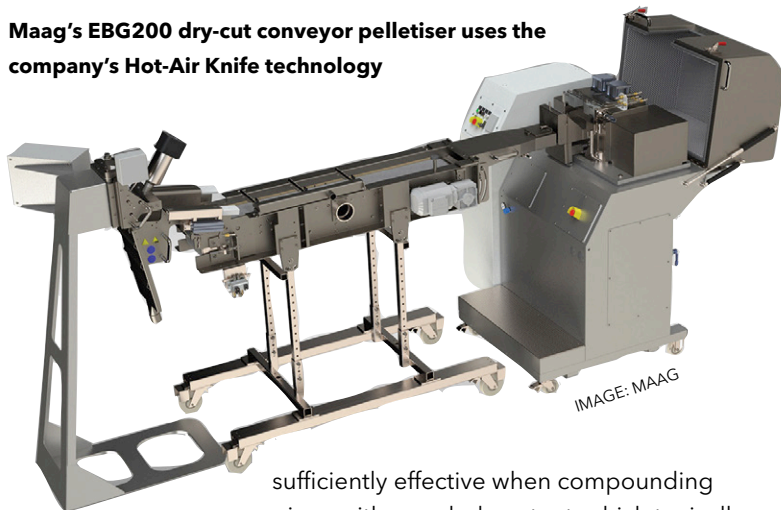
off to generate fines. Meanwhile, in strand pelletisers fines are created not by cutting but rather through the die drool phenomenon on the die plate, Baumann explains.

A recent Maag development for strand pelletising equipment is its Hot-Air Knife, which eliminates die drool using compressed and heated air. "It is a small change with a big impact," says Baumann. The Hot-Air Knife can be equipped as an add-on to all MAAG strand die heads or as a stand-alone machine. Maag's EBG dry-cut belt conveyor pelletising system also uses the Hot-Air Knife technology. This system can be used for water-sensitive or soluble polymers as well as for highly filled compounds. EBG systems can also re-feed broken strands to efficiently reduce downtime and production interruptions.

Choosing a melt filtration system that is able to keep contaminants out of the pelletiser is also crucial, according to Baumann. Conventional screen changers and backflush filters may not be

**Main image:**  
**Improved pellet quality is one of the key aims in pelletiser development**

**Maag's EBG200 dry-cut conveyor pelletiser uses the company's Hot-Air Knife technology**



sufficiently effective when compounding recipes with recycled content, which typically contain increased contamination levels.

Maag's Ettlinger continuous filtration system can handle up to 16% contamination. Material flows over a rotating drum to remove contamination in the equipment, which is self-cleaning. The filters are equipped with a pressure sensor to automatically adjust and maintain a steady pressure, allowing them to run for weeks or months at a time without intervention. Baumann says the minimal pressure change characteristic of this system is beneficial for any type of compounding, whether or not it contains recycle.

At K2022 in November last year, Maag launched the ContiNeo backflush screen changer, which it says combines the advantages of a piston screen changer with those of large-area filtration. The automated, self-cleaning filter keeps pressure constant and is designed to minimise material loss. On average, backflush material loss is said to be 0.5-1%.

Maag's underwater pelletisers use turbine-style blades that are designed to produce less turbulence for more consistent water cooling while tangential input into the cooling chamber optimises pellet residence time in the cooling chamber. Careful attention to cooling is especially important for handling of crystalline polymers, such as PET, says Baumann, who explains that consistent cooling produces more consistent crystallinity.

The company also introduced some new pelletising hardware at K2022. The Primo SI strand pelletiser is an updated version of the Primo S, providing an open frame design that is flexible in terms of configuration and is accessible from all sides. A centralised drive system allows the operator to configure parameters via a Bluetooth interface and read process data in real time, while all controls are located next to the cutting head to make them easy to access and read. The sound insulation system has

been optimised to reduce operational noise levels. Maag says spare parts can be exchanged between the original Primo S and new SI models.

**Advanced die plates**

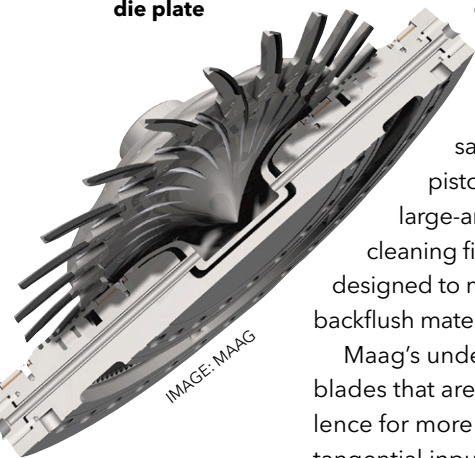
Also new is the Pearlo XXL high-capacity underwater pelletiser, which is designed for production throughputs of more than 40 tonnes/h. It features updated tools and chamber that improve thermodynamic performance. The large-diameter, liquid-heated die plates include more than 2,000 die holes using technology from AMN, a French specialist that Maag Group acquired in 2022.

AMN dies include a cutting face with tungsten carbide nibs, intelligent one-way heating circuits, and a vacuum insulation system. The latter places insulation under the cutting face and is said to help create a tight pellet size distribution. The AMN Central Injection System is said to improve pellet cooling and injection and can provide benefits in high-volume pelletising of high melt index materials.

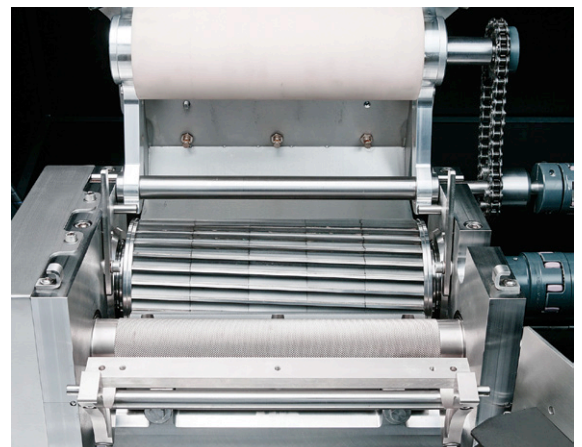
Maag's new introductions are completed with the eXso pellet dryer, which is an updated, smaller-footprint version of the company's legacy dryers. It offers multiple pellet inlet and water outlet connections that make it suitable for a wide range of underwater and wet cut strand pelletising applications with throughputs up to 8,200 kg/hr. The new design also has fewer wear items and improved access for cleaning.

The SP line of strand pelletisers from Coperion has been updated with new features that are designed to simplify handling, reduce downtime for product changes, and improve pellet quality. The SP140, SP240 and SP340 pelletisers cover throughputs from 100 to 3,000 kg/h and use an improved strand intake design in which strands are continuously and directly guided into the cutting section at the optimal cutting angle. This is said to ensure that a high cut quality is achieved even with soft polymers. Flanges are designed to enable

**Below: Maag's new Pearlo XXL high output underwater pelletiser uses AMN's liquid-heated die plate**



**Right: Coperion's SP strand pelletisers are said to offer easier operation and improved pellet quality**



optimal use of the entire width of the cutting rotor while the compact cutting chamber design leaves very little dead space, which reduces cleaning time.

The updated pelletiser design also significantly reduces setup times. Coperion says the cutting gap can now be adjusted quickly with no tools. The company adds that the complete cutting area is now accessible without tools and the cutting unit can be exchanged quickly and easily in one piece, which further minimises machine downtime.

Other standard SP features that ease operation include a pellet outlet chute with soundproof cladding, frequency-controlled rotor drive and upper feed roll, and pneumatic control of feed roll pressure that can be directed from the control panel using an air pressure display.

**Expanded strand options**

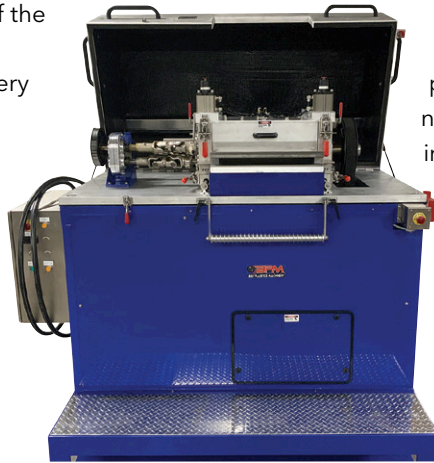
Two new strand pelletisers were introduced by **Bay Plastics Machinery (BPM)** at the end of last year. The AXP (HD) system is a heavy duty version of the company's A-Series X-Class pelletiser. Available in 12" and 16" cutting widths, the new version incorporates larger motors to handle compounds such as heavily glass-filled materials. Larger diameter rolls and bearings reduce deflection across the cutting width, and a push-pull bed knife holder enables users to easily adjust the bed knife gap so that the cutter is consistent from end to end.

AXP (HD) series pelletisers can be equipped with an optional gearbox that allows users to engage both upper and lower feed rolls. Positive drive of the upper feedroll assists in pulling heavy filled materials, which may be difficult to feed, especially on start-up, says James Forgash, Vice-President of Sales at BPM. He says having both feed rolls engaged reduces the chance of strands slipping or possibly dropping and makes start-up much easier.

Feed roll air cylinders are larger on the HD machines than on the standard design, so users can apply more clamping force as needed. An optional rotor coupling drive allows the rotor to remain free of belt load with higher horsepower options.

US-based BPM has been stepping up its focus on global markets, including Asia, according to Forgash. As a result, its equipment is being designed with AC motors that are more reliable and more accepted globally compared to DC motors, he says.

IMAGE: BAY PLASTICS MACHINERY



An updated version of its BT25X benchtop pelletiser, which previously used a 110V DC motor, now uses an AC motor that drives in a range of voltages. The new design offers a wider speed range than the previous model, and also provides the option to run in batch or continuous mode. Drives are housed in the control cabinet, which gives the new system a higher environmental rating. A new safety feature on the BT25X is a

streamlined version of the Safe Torque Off function found in the company's full production models.

**Safer operation**

New feature additions to **Nordson's** BKG pelletising systems focus on safety and ease of use, both of which are especially important in compounding applications that frequent product changes, according to the company. One example is a new locking system that improves coupling of the pelletiser to the water box.

In the past, the pelletiser was coupled to the water box with a special clamping flange and security was ensured with a key system. In the new system, the safety lock is activated upon closing and this action releases the signal for the start. After start-up, the safety lock remains active until the pelletiser motor is stopped completely.

Another new feature is an updated bearing design used in some of the dryer models in the Nordson BKG pelletiser. "The lower bearing of a dryer is susceptible to seizing since polymer material tends to build up in that area. As a result, particularly when processing wear-intensive materials, the mechanical seals are highly stressed and must be replaced more frequently. And this is quite a bit of work. It isn't easy to pull the bearing from the shaft, especially when it is seized. But it is also no option to remove the shaft itself," says Udo Hoesker, Application Engineer at Nordson.

In the redesigned lower bearing area, the shaft is divided into two parts. Each is fixed with an easy-to-release coupling and can be taken out separately.

The improvements are valuable for compounding applications and also beneficial when processing recycled material. "We expect more inquiries from

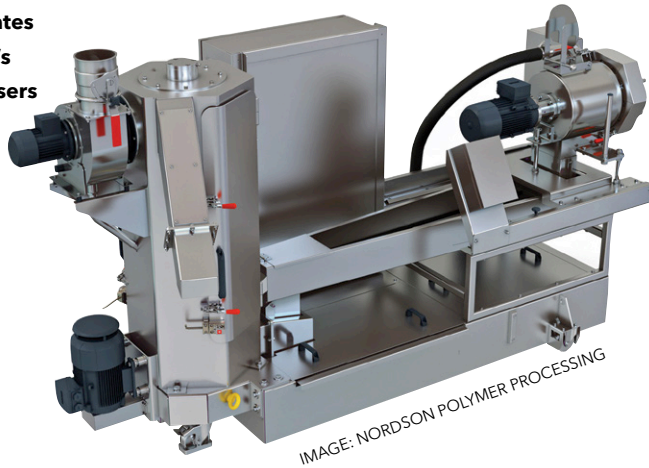
**Left: BPM's AXP (HD) is a heavy duty version of its current X-Class pelletiser**

**Below: The BT25X laboratory pelletiser from BPM offers AC drive and improved safety features**



IMAGE: BAY PLASTICS MACHINERY

**Right: Updates to Nordson's BKG pelletisers include an improved water box safety connection**



the recycling sector in the coming years, and we are prepared for it," says Bolwerk. "In recycling, time is money, and easy and quick equipment handling is key to an efficient process."

**Robust recycling**

Demand for recycled material is increasing and recycling companies are looking for robust and flexible pelletising systems that can handle a large variety of materials, according to Simon Weis, Product Manager for Underwater Pelletising

Systems at Germany-based **Intelligent Pelletizing Solutions (IPS)**.

The company recently commissioned an ips-UWG 120 S underwater pelletising system for use with highly viscous polyolefins at RSH Polymere, a compounder of recycled plastics located at Hamburg in Germany. A challenge in this application was to design the die plate to generate as low a pressure drop as possible for the required throughput of 3,000 kg/h, says Weis. The installed system uses a perforated die plate design and a new size of the company's ips-GT 3000/3 pellet dryer to achieve the high throughput required.

In 2022, IPS added a co-rotating twin-screw extruder for compounding, recycling, and LFT production to its portfolio. Weis says the company can now quote complete production lines and be a single-source equipment supplier for its customers.

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- > [www.coperion.com](http://www.coperion.com)
- > <https://bayplasticsmachinery.com/>
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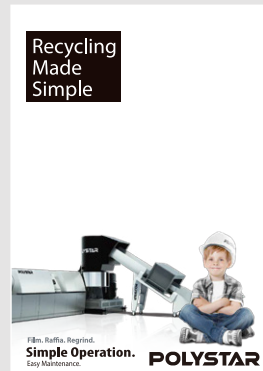
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Recycling Made Simple is the brochure from Polystar where you can find information about all of the company's plastics recycling systems. Its Repro Flex lines can recycle post-industrial and post-consumer PE/PP packaging and PP raffia/woven materials.

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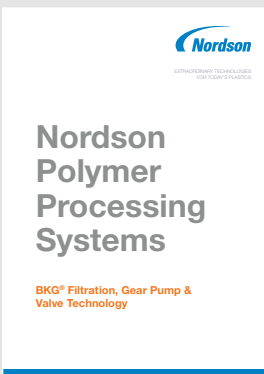
## STRUKTOL: CREATIVE RECYCLING



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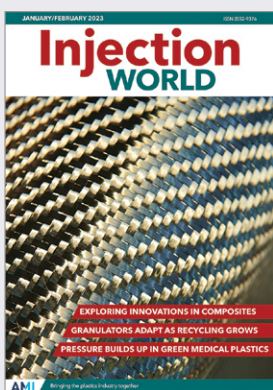
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## Plastics Recycling World October 2022

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## Compounding World February 2023

The February edition of Compounding World looks at some of the latest innovations in low carbon footprint sustainable compounds. It also reviews new opportunities for plastics in production of electric vehicles and the latest in electrically conductive additives.

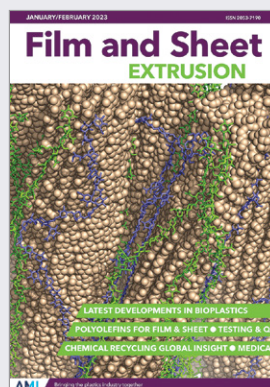
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## Pipe and Profile Extrusion January/February 2023

The January-February edition of Pipe and Profile Extrusion has a cover feature on the diverse applications for pipes made with composite materials. The magazine also has features covering melt filtration, titanium dioxide and the latest in controls and instrumentation.

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## Film and Sheet Extrusion January/February 2023

The first 2023 edition of Film and Sheet Extrusion looks at the latest innovations in the bioplastics arena. It also reviews developments in materials testing, medical materials, and polyolefins for film applications. Plus, Chemical Recycling Global Insight 2023.

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**GLOBAL EXHIBITION GUIDE**

|      |                        |  |  |
|------|------------------------|--|--|
| 2023 | <b>17-20 April</b>     | Chinaplas 2023, Shenzhen, China                | <a href="http://www.chinaplasonline.com">www.chinaplasonline.com</a>                             |
|      | <b>25-27 April</b>     | JEC World 2023, Paris, France                  | <a href="http://www.jec-world.events">www.jec-world.events</a>                                   |
|      | <b>30 May - 2 June</b> | Equiplast, Barcelona, Spain                    | <a href="http://www.equiplast.com">www.equiplast.com</a>   |
|      | <b>14-15 June</b>      | Plastics Recycling World Expo, Essen, Germany  | <a href="http://www.plasticsrecyclingworldexpo.com/eu">www.plasticsrecyclingworldexpo.com/eu</a> |
|      | <b>5-8 September</b>   | Plast 2023, Milan, Italy                       | <a href="http://www.plastonline.org/en">www.plastonline.org/en</a>                               |
|      | <b>20-21 September</b> | Injection Molding & Design Expo, Novi, MI, USA | <a href="http://www.injectionmoldingexpo.com">www.injectionmoldingexpo.com</a>                   |
|      | <b>26-28 September</b> | Interplas, Birmingham, UK                      | <a href="http://www.interplasuk.com">www.interplasuk.com</a>                                     |
|      | <b>17-21 October</b>   | Fakuma, Friedrichshafen, Germany               | <a href="http://www.fakuma-messe.de">www.fakuma-messe.de</a>                                     |
|      | <b>8-9 November</b>    | Plastics Recycling World Expo, Cleveland, USA  | <a href="http://www.plasticsrecyclingworldexpo.com/na">www.plasticsrecyclingworldexpo.com/na</a> |
|      | <b>28 Nov-2 Dec</b>    | IPF Japan 2023, Chiba, Japan                   | <a href="https://www.ipfjapan.jp/english/">https://www.ipfjapan.jp/english/</a>                  |
| 2024 | <b>6-10 May</b>        | NPE 2024                                       | <a href="http://www.npe.org">www.npe.org</a>   |


**AMI CONFERENCES**

|                         |   |
|-------------------------|---|
| <b>6-8 March 2023</b>   | Agricultural Film, Barcelona, Spain               |
| <b>7-8 March 2023</b>   | Single-Serve Capsules, Tampa, FL, US              |
| <b>20-22 March 2023</b> | Chemical Recycling, Houston, TX, US               |
| <b>18-20 April 2023</b> | Stretch & Shrink Film, Valencia, Spain            |
| <b>23-25 May 2023</b>   | Polymer Sourcing & Distribution, Hamburg, Germany |
| <b>13-15 June 2023</b>  | Plastic Closure Innovations, Barcelona, Spain     |

For information on all these events and other conferences on film, sheet, pipe and packaging applications, see [www.amiplastics.com](http://www.amiplastics.com)

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