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PCEP upgrades pledge from polyolefin industry

The Polyolefin Circular Economy Platform (PCEP) has upgraded its voluntary plastics pledge and commitments after achieving its initial target ahead of schedule.

In 2018, PCEP committed to strong voluntary action for the polyolefin value chain as part of the Circular Plastics Alliance and the European Commission's campaign to reach 10m tonnes of recycled plastic in new products on the EU market by 2025.

The results from PCEP's 2021 Polyolefin Material Flow Study showed it has already reached its pledge to increase the amount of recycled post-consumer polyolefin used in European

IMAGE: KRG



Above: Bales of post-consumer PP and HDPE containers at Kunststoff Recycling Grünstadt

products to 3m tonnes. As a result, the industry has now increased its target to 4m tonnes a year by 2025 – double the amount used in 2016.

Ton van der Giessen, interim Chair of PCEP Steering Board, said: "PCEP is all about action, not just

words. Having achieved our target faster, by revising our pledge and our voluntary commitments we are demonstrating that PCEP is determined to be a major driving force in our industry's transformation to circularity."

➤ <https://pcep.eu>

Erema acquires stake in start-up

Erema Group has acquired 19.8% of Plasticpreneur, an Austrian start-up which manufactures portable recycling machines for plastic waste. These small scale plants and accompanying tooling convert waste plastics to products in areas with minimal infrastructure or processing skills.

In the two years since the company was founded, Plasticpreneur has sold 330 machines to customers in over 70 countries and made over 750 application-specific moulds, many of them custom-built to comply with individual customer speci-

cations. The company's overriding ethos is based on the concept that when recycling becomes a source of income for the operators they become entrepreneurs, hence the name.

Plasticpreneur machines can process HDPE, PP, PS,

Left: Plasticpreneur makes portable plastics recycling equipment



LDPE, PLA, ABS and TPU separately and its product range includes a shredder, an injection moulding unit, an extruder unit and air filters. "For our machines to be used in regions with little infrastructure, they must be easy to operate without prior knowledge. The fact that we also develop end-product solutions needed locally makes our range of services particularly attractive here," said CEO and co-founder Sören Lex.

➤ www.erema.com

➤ <https://plasticpreneur.com>

Partnership starts in PE supply

Manupackaging, a stretch films manufacturer headquartered in Italy, has announced a strategic supply partnership with Saica Natur Cycle Plus to classify and recycle post-consumer LDPE/LLDPE and reintroduce it in the production cycle as a raw material. The PCR material is being used by Manupackaging to produce Manunature RR, a 100% recyclable high-performance PE stretch film.

Depending on the intended use, the film contains up to 60% of PCR material and is part of a portfolio which includes sustainable load security and transport packaging films such as Manunature BB, with 50% renewable feedstock-based LLDPE, and Manunature BD, a biodegradable stretch film.

Pierfranco Di Gioia, CEO of M Stretch, holding company of the Manupackaging Group, said: "Increasing demand for sustainable packaging solutions, especially from industries like food and beverage, is encouraging us to further develop eco stretch films and to extract more value from the total product cycle of our raw materials. On this particular area of focus, we are working closely with key partners throughout the relevant supply chain."

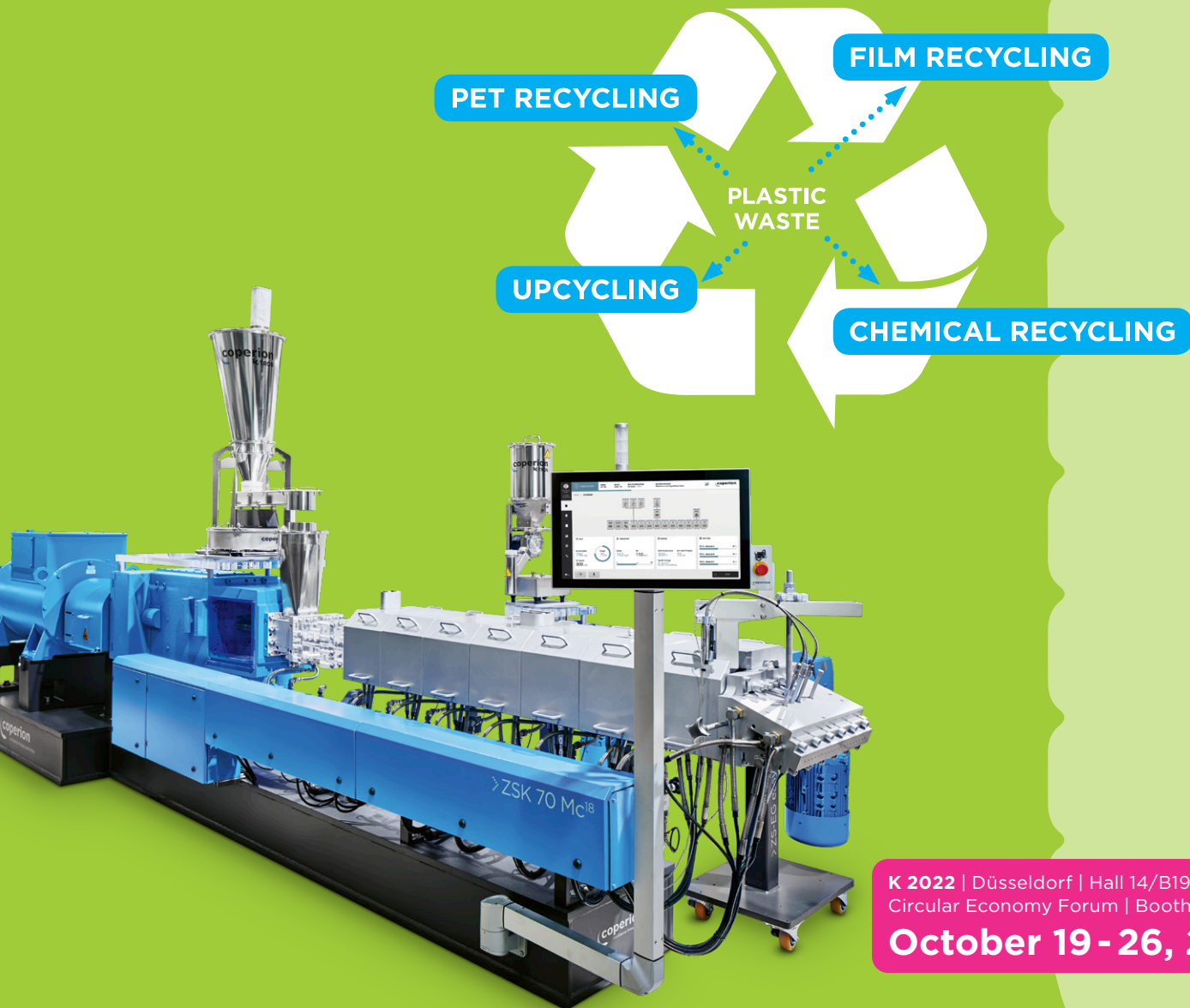
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Coperion invests in recycling

Coperion has commenced construction of a 'recycling innovation centre' next to its existing test centre for bulk solids handling at its production facility in Niederbiegen/Weingarten, Germany. The company said the 5,000 m² centre will support customers in developing new products and recycling processes.

"All essential recycling process stages will be covered within the facility, including materials conveying, feeding, extrusion, pelletising and materials post-processing. In addition, Coperion will conduct its own research activities on plastics recycling," the



Above: Architect's rendering of Coperion's planned 5,000m² innovation centre

company said.

Separately, but also with recycling in sight, Coperion has launched the ZS-B Megafeed side feeder, which is claimed to significantly increase fibre and

flake feed rate into ZSK twin-screw extruders.

The feeder's design enables high rates of fibre and flakes – such as PA, PE, PET and PP – to be fed. In tests with PA fibres with a

bulk density of 40-50 kg/m³, throughputs increased fourteen-fold from 70 to 1,000 kg/hour, the company said. Throughput rates increased from 50 to 2,500 kg/hour when feeding recycling carbon fibre, from 50 to 700 with PCR flake, and from 80 to 1,300 with multi-layer film flakes.

Coperion's parent company, US-based Hillenbrand, has also announced the acquisition of German recycling system maker Herbold Meckesheim. It said the company's activities are highly complementary to the Coperion brand (see story on next page).

➤ www.coperion.com

Fiberight gets UK funding

South Wales-based resource recovery expert Fiberight is working with partners on the Uncaptured Unrecycled Plastics project, which has secured £4.2m in co-funding from Innovate UK's Smart Sustainable Plastic Packaging Challenge.

The venture seeks to establish and operate a commercial-scale demonstration facility in Swansea capable of processing post-consumer plastic packaging from mixed waste streams, such as reject material from MRFs, and create a new supply to be used in the economy.

➤ <https://fiberight.com>

Repeats Group invests in Daly Plastics in Netherlands

Repeats Group has announced it has made an investment in Daly Plastics, which is also a producer of recycled LDPE based in the Netherlands. Repeats Group was formed earlier this year with a €100m equity commitment from Ara Partners in order to create a pan-European plastics recycling platform focused on producing high-quality rLDPE.

Under Repeats' leadership, Daly plans to nearly double its production capacity to meet growing demand for recycled LDPE. The Daly investment builds on Repeats' initial base in Spain, with expansion to other European countries envisioned for later this year.

Greg Rung, Repeats' CEO, said: "Daly Plastics has an outstanding reputation in the industry as a leading LDPE recycler in the Netherlands and Western Europe. We see significant opportunity for Daly Plastics to continue to penetrate the

Dutch and German markets while being able to serve more international clients thanks to higher-quality plastic flakes produced with the latest technology available."

➤ www.repeats-group.com

➤ www.dalyplastics.nl



Above: LDPE recycler Daly Plastics is based near Apeldoorn

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Circularix JV to build US rPET facilities

HPC Industries and Macquarie Group's Commodities and Global Markets group have formed a joint venture to recycle PET in the US. Under the name Circularix, the JV's plans include building and operating five recycling facilities across the US with a total annual production capacity of more than 275m lb.

The first facility, located in Hatfield, PA, is expected to be operational by December 2022. Leon Farahnik has been named chairman and CEO while Alex Delnik, former CEO and founder of Verdeco Recycling, will serve as President and COO.

Ben Glover at Macquarie, said: "Ventures such as Circularix are a key part of the supply chain that will drive more post-consumer material back into higher value recycled packaging markets."

➤ <https://circularix.com>

Hillenbrand to acquire Herbold Meckesheim

US-based Hillenbrand has entered into a definitive agreement to acquire Herbold Meckesheim for approximately €79m. The transaction is expected to close during the fiscal fourth

quarter of 2022.

Based in Meckesheim, Germany, Herbold produces a wide range of recycling systems, specialising in key process steps such as washing, separating, drying,

shredding, and pulverising. With annual revenue of more than €50m, Herbold will accelerate Hillenbrand's growth in the recycling end market.

At the completion of this transaction, Herbold will join the Coperion and Rotex brands as part of Hillenbrand's Advanced Process Solutions (APS) segment.

Kim Ryan, President and CEO of Hillenbrand, said: "Herbold expands our position in the recycling end market, which has attractive, long-term growth prospects due to macro demand drivers for durable plastics and the desire for more sustainable solutions."

➤ www.hillenbrand.com

➤ www.herbold.com



IMAGE: HERBOLD MECKESHEIM

Above: Herbold Meckesheim said after IFAT 2022 in Munich that there is high demand for its film and PET washing systems. Hot washing for polyolefins was one of the company's product innovations presented at the fair

Ravago acquires UK PO recyclers

Belgian company Ravago has announced the acquisition of PCR polyolefins recycler Aurora Manufacturing and Venture Polymers in the UK.

The acquired companies

produce rPP and rHDPE compounds at their site in Leigh, Greater Manchester, with a current production capacity of 20,000 tpa. The acquisition will extend Ravago's Ravapura product

portfolio, increasing opportunities to use PCR-based compounds in a variety of markets and applications, and furthering its operations in the UK.

➤ www.ravago.com

RecyClass publishes design book

RecyClass says its new Design Book is a practical guide clarifying the concepts of recyclability and design based on a science-driven approach, providing step-by-step explanation and guidance on how to produce rigid and flexible plastic packaging to make it more compatible with recycling.

Beyond providing valuable insights into how the Design for Recycling Guidelines work, the document also looks into the realities of

sorting and recycling processes and how they determine packaging recyclability.

Paolo Glerean, RecyClass Chairman, said: "Design for Recycling is a crucial, first step in ensuring that a product will be recyclable at the end of its use phase." The book offers insights into how plastic packaging and its different components influence compatibility with recycling, he said.

➤ <https://recyclclass.eu>





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APR highlights growth of recycling in US

The US Association of Plastics Recyclers (APR) has issued a state-of-the-industry report on recycling in the US showing that it is a viable, accessible and scalable solution for reducing plastic waste. It compiles research and analysis from across the \$236bn recycling industry, which provides over 200,000 jobs and includes over 9,000 community programs and more than 100 recyclers.

In a June 2022 survey, nearly a quarter of Americans said plastic waste was an issue Congress must address, a significant increase from two years earlier. APR said consumers are developing a greater understanding of their role in the chain, and several new studies show they are willing to pay more for products created from recycled material.

APR President and CEO



Above: Recycling rate is increasing in US, says Steve Alexander, CEO

Steve Alexander said: "This is an industry that processed almost five billion pounds [2.2m tonnes] of post-consumer plastic material in 2020 despite a pandemic and related lockdown, and we have every expectation that number will continue to grow."

The report explains that 80% of rigid plastic packaging is PET, HDPE, and PP,

and found that 21% of these types of plastic are recycled, based on EPA data. PET and HDPE bottles have reached a current recycling rate of 28%, and with more help from consumers, this figure could be boosted to over 40% using existing processing infrastructure and with minimal new investment.

Alexander added: "Increasing the recycling rate is important because demand for recycled material, a key driver of the recycling chain, is stronger than ever, spurred by a variety of factors including brand sustainability commitments and legislative activity. This report shows that, while there is still work to be done, plastic recycling can succeed. Consumers want recycling to work, and recyclers are ready to process more material."

> <https://plasticsrecycling.org>

Amcor joins new global venture

Amcor has joined forces with Minderoo Foundation, an Australian philanthropic initiative backed by Andrew and Nicola Forrest, to launch a project aimed at tackling global plastics waste.

The partnership, called 'Sea the Future', intends to build a global network of recycling plants with the first three hubs in Indonesia, the Netherlands and Brazil. These hubs aim to unlock an estimated \$300m worth of investment worldwide, produce 150,000 tonnes of recycled plastics per year, and prevent the incineration, landfilling and littering of 200,000 tonnes of plastic waste.

Construction of the plants is expected to begin within two years.

> www.amcor.com

> www.minderoo.org



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Free registration opens for North American plastics expos

Free online registration is now open for the North American AMI Plastics World Expos, which are being held at the Huntington Convention Center in Cleveland, Ohio, US, on 9-10 November 2022.

Taking place for the third time, the Plastics World Expos (which are organised by *Plastics Recycling World* publisher AMI) will be 2022's biggest plastics industry event in North America, bringing together the Plastics Recycling World Expo, Compounding World Expo, Plastics Extrusion World Expo and Polymer Testing World Expo.

By registering in advance, visitors

will receive free admission to all four exhibitions, featuring more than 250 suppliers, plus free entry to the five conference theatres hosting technical presentations, educational seminars and business debates. Attendees and exhibitors will also have the option to buy tickets (just \$50 each) for a networking party at the Punch Bowl Social on the evening of 9 November.

"The event will provide visitors with a great opportunity to meet and compare suppliers from around the world, as well as giving them the chance to learn from business leaders and technical experts in the confer-

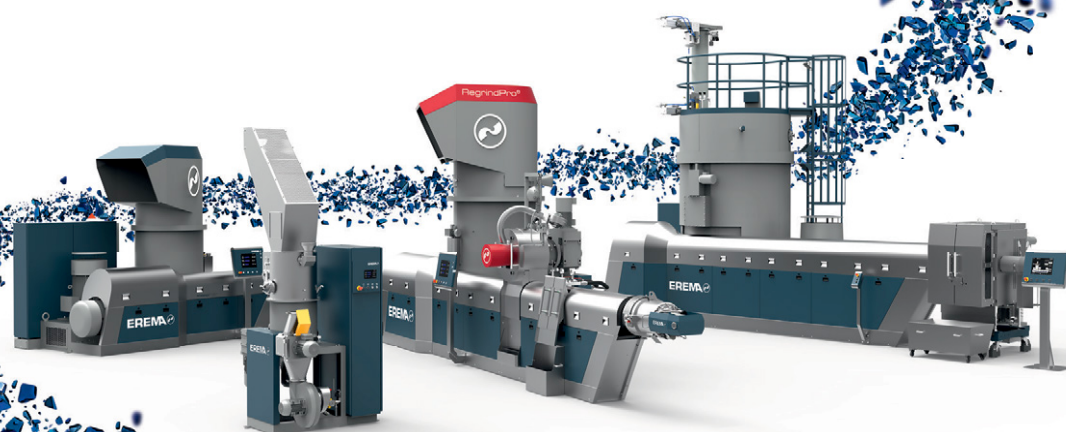
ence theatres," said Andy Beevers, Events Director at AMI. "When we ran these expos in Cleveland last year, they attracted more than 3,000 visitors including buyers and specifiers from leading extruders, recyclers, compounders, OEMs and brand owners."

The exhibitor line-up includes companies such as BASF, Buss, BYK, Clariant, Coperion, Cumberland, Davis-Standard, Erema, KraussMaffei, Leistritz, Maag, Macro, Milliken, NGR, Nordson, Omya, Reifenhäuser, Sestec, SI Group, Steer, Struktol, ThermoFisher, TPEI, Troy, Vecoplan, Wacker, Zerma and more.

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www.ami.ltd/Plastics-World-Expos-NA-Register

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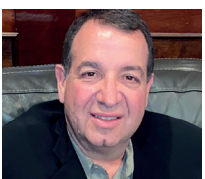
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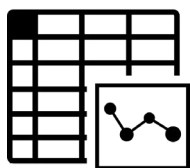
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IMAGE: PYROWAVE



Looking for success in chemical recycling

The success of chemical recycling projects will depend not just on technology, but also feedstock supply, purification, costs and more. Peter Mapleston reports on polystyrene and polyolefin developments

The chemical recycling industry has a few pointed questions to answer: Just how effective is it at reducing post-consumer plastics waste? How good is it for the environment? Can it be done cost-effectively? The winners in this race will be, firstly, those who have technology that has been proven to work on an industrial scale with contained costs and which can clearly demonstrate the ability to help produce plastics with much lower carbon footprints; and secondly, those who source feedstocks that are consistent in quality and quantity. On top of that, players will need to convince nay-sayers – many of them in state legislatures – that chemical recycling really will help keep plastics out of our rivers and oceans, without polluting the atmosphere.

One company that appears to have a strong handle on the supply logistics situation is depolymerisation technology company **Agilyx Group**, headquartered in Portsmouth, New Hampshire, US. Agilyx claims to be the only company in the market to offer an integrated solution for chemical recycling and feedstock management.

Agilyx says it has an asset-light, technology licensing model with multiple revenue streams coming from feedstock IP (feedstock characterisa-

tions and recipes, supply chain optimisation) and depolymerisation IP (plastic-to-plastic, plastic-to-intermediaries, plastic-to-fuels).

In July, Cyclyx International, a consortium-based post-use plastic innovation company jointly owned by Agilyx (75%) and ExxonMobil, said Union Pacific Railroad, one of the largest freight railroads in North America, had joined the consortium. "Expertise in circular economy logistics and cost effective transportation solutions is critical," says Cyclyx.

In its 2021 Annual Report, Agilyx outlines future growth for Cyclyx, through expanding the consortium. At the time of publication, it said it was in ongoing membership discussions with 285 global companies.

Agilyx has developed depolymerisation technologies that can be applied to single streams, most notably polystyrene, and also mixed streams. Chemical recycling of PS is probably the furthest advanced of all plastics chemical recycling technologies. In January, Agilyx and Toyo Styrene said they were entering into the construction phase of a 10 tonnes/day chemical recycling facility in Japan, enabled by Agilyx technology.

The recycling plant will convert post-use PS into

Main image:
Polystyrene is the subject of a number of chemical recycling projects

Right: Feeding polystyrene packaging waste prior to depolymerisation

a styrene monomer that will be purified using Toyo Styrene's proprietary purification process, ready for reuse in production of more PS.

Last year, **AmSty**, the largest polystyrene producer in the Americas (a JV between Chevron Phillips and Trinseo), and Agilyx agreed to explore the development of a jointly owned chemical recycling facility. They plan initially to build a 50-100 tonnes/day plant at AmSty's Styrene production facility in St. James, Louisiana. The two companies already have a chemical recycling JV, Regenyx, at Agilyx's location in Tigard, Oregon, founded in early 2019.

Canada-based **Pyrowave** has developed modular equipment that uses microwave technology to depolymerise PS. Pyrowave is involved in a major PS chemical recycling project in a partnership with tyre maker Michelin in Europe. Michelin will operate the equipment at a location yet to be decided. It will acquire several units from Pyrowave. Michelin will use the styrene monomer to make styrene-butadiene rubber for tyres, also using bio-butadiene.

The two companies have been working together to fast-track the industrialisation of Pyrowave technology with a view to a certification and commercial roll-out in international markets. The joint development agreement will ultimately account for an investment of more than €20m. Michelin and Pyrowave are working together to develop an industrial demonstrator, funded and operated by Michelin, by 2023. Michelin is the first licensee for the Pyrowave technology.

Jocelyn Doucet, co-founder and CEO of Pyrowave, led the team that developed Catalytic Microwave Depolymerisation. The company works in tandem with major players in the polymer industry, including Total, Ineos Styrolution and AmSty.

Tyre maker Michelin took a stake in Pyrowave in 2020, with part of the investment earmarked for a

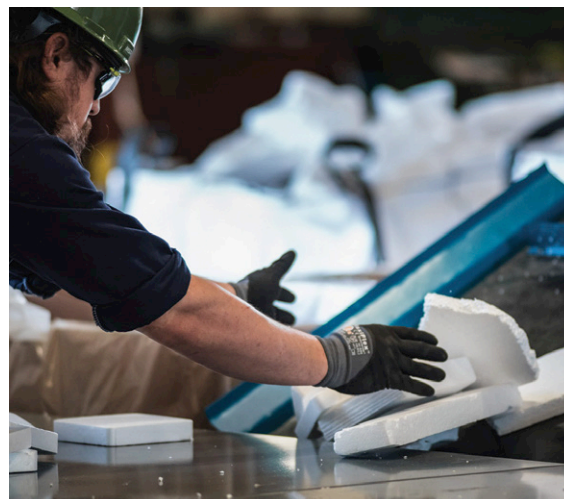


IMAGE: AGILYX

demonstration plant at one of Michelin's facilities. The site has yet to be chosen, with a final investment decision due soon on what will be a 20,000 tpa plant.

Michelin will be sourcing pre-sorted material, which Doucet says will be 90-95% pure PS, having been through sorting and minimal washing and drying. It has already formed partnerships with two recycling facilities, and Doucet says 20,000 tonnes are accessible. He emphasises the need for chemical recycling plants to work with standardised input in the same way that conventional chemical plants do.

"The number one challenge we have is sourcing the feedstock," says Doucet. "You can't pipeline plastic waste. For scaling up the business of chemical recycling, regardless of the technology, there is a need for massive investment in the whole infrastructure. When we select geographies for possible operations, this is the number one thing we look at."

While Pyrowave's main focus at the moment is on the Michelin project, it is also in final negotiations on a project in Japan, where Doucet says there is a particularly strong focus on the circular economy, not least because it has few of its own natural resources and high energy costs. "It probably has the most advanced recycling infrastructure in the world," he says. He hopes to be able to make an announcement before September.

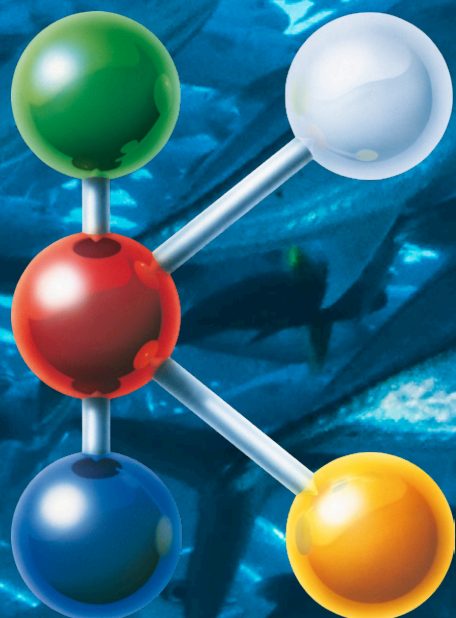
Other discussions elsewhere in the world for implementation of Pyrowave technology are "ongoing", especially in Europe. Doucet says that to a certain extent, developments depend on deployment of legislation. "Elements from a compliance perspective will force companies to move," he says. "These projects can make money, but the capital investment is substantial, so [there needs to be a strong impulse] to change the business model."

Pyrowave intends to publish a peer-reviewed

Below: Agilyx's chemical recycling technology at its Regenyx JV with AmSty



IMAGE: AGILYX



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Distillation column
at Pyrowave plant

LCA of its technology in the autumn. Doucet says: "The majority of impacts on the environment come from by-product management. Do you burn the by-products for energy recovery? Can you reintroduce them into other processes?" Working with Michelin, Pyrowave is looking at how by-products in its process can be used, possibly also in tyre production.

The second biggest impact relates to the sorting process. With PS chemical recycling, there are two levels of sorting: MRF and then PRF. Doucet says: "Both of these steps yield waste. So we are looking at how to cut the waste streams at both levels." Investment is needed in sorting technology, but rethinking in packaging design is also required – "design for recycling."

Also last year, **Styrenics Circular Solutions** (SCS), the value chain initiative to increase the circularity of styrenic polymers, unveiled the results of a comprehensive LCA for PS. "It shows excellent results for the three recycling processes – purity mechanical recycling, dissolution and depolymerisation – compared to the end-of-life option incineration and the production of virgin polystyrene," says SCS. The LCA focused on closed loop recycling routes back to food contact quality products. Dissolution and depolymerisation technologies both exhibit CO₂ emission savings of around 75%.

Jens Kathmann, Secretary-General of SCS, says: "We now have unambiguous, clear data that polystyrene is not only excellently sortable and

uniquely circular, but it also comes with a significantly reduced carbon footprint for all three recycling routes we have been focusing on."

In July, styrenic thermoplastics producer **Elix Polymers** said it had completed a LCA of its more sustainable E-Loop materials. These are ABS and other materials that it has grouped together under the E-Loop brand name to denote commitment to the Circular Economy and which include polymers produced from chemically and mechanically recycled waste.

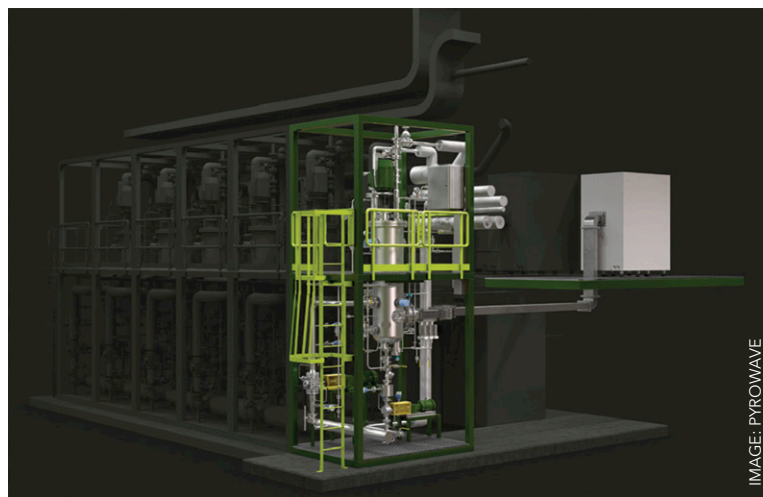
The company has completed an LCA of its production based on ISO 14040 and ISO 14044 (Cradle-to-Gate analysis), taking into account transportation to customers and including direct emissions (Scope 1) and indirect emissions (Scope 2 and Scope 3). The full LCA was validated by the Anthesis group. "The LCA shows that mechanically and chemically recycled products can considerably reduce the environmental impact of the final product and can support Elix customers in achieving their sustainability goals," said Elix.

Elix also formed a partnership in 2020 with Repsol, which has ISCC PLUS certification for all its production centres of polyolefin and other circular petrochemical products, including recycled styrene. The agreement includes the possibility of developing joint projects within the scope of the circular economy for applications in areas such as toys, small household appliances, external and internal automotive parts, and medical devices.

Styrenic plastics major **Ineos Styrolution**, together with partners including **Recycling Technologies**, is currently exploring scaling-up of PS chemical recycling technology and bringing it to commercial level, says a spokesman. Ineos Styrolution plans to build its full commercial scale recycling facility in Wingles, France, but has not given a date.

Recycling Technologies was selected by Ineos Styrolution as the technology provider for commer-

Below:
Pyrowave
depolymerisation plant for PS is modular



cial scale recycling of PS back to styrene monomer. Prior to building the commercial scale recycling plant, a PS recycling pilot plant will be built in the UK.

In June, it was announced that Indaver, a leading player in the European waste industry, and Ineos Styrolution had signed an offtake agreement today giving Ineos Styrolution access to styrene monomer produced from post-consumer waste at Indaver's planned depolymerisation plant.

The new plant will be based in Antwerp, Belgium and will start production in 2024. Indaver already manages and treats industrial and household waste in specialist facilities with plants and operations in Belgium, the Netherlands, France, Germany, Portugal, Italy, Ireland and the United Kingdom.

In September 2020, **Trinseo** and Indaver signed an offtake agreement for recycled styrene monomer. Trinseo said it would buy a minimum of 50% of the monomer produced at Indaver for a 10-year period, following start-up of the plant planned in 2023.

Indaver will collect post-consumer PS, such as yogurt pots and single-use packaging, and recycle and produce the recycled styrene through a proprietary depolymerisation technology at its

Antwerp, Belgium site. The recycled styrene will then be sent to Trinseo's Tessenderlo, Belgium site nearby and will be used to manufacture recycled PS resins for dairy packaging and other applications. Both the recycled styrene and recycled PS products will be ISCC Plus mass balance certified.

Earlier this year, Trinseo announced that its plans for a world-class chemical recycling plant in Europe are progressing rapidly. The company has contracted with global technology provider Synova and global engineering services company Worley on the project and is planning to begin construction at Trinseo's Tessenderlo, Belgium location by the end of the year.

The plant will process 15,000 tpa of recycled PS flakes to enable further production of PS and/or a styrene derivative including ABS and SAN.

Trinseo has been working with CEDAP, an expert in plastic film extrusion and thermoforming, to provide food contact compliant recycled PS for the yoghurt cups of the French brand Les 300 Laitiers Bio since April 2022. Last year, Trinseo supported a similar yoghurt pot application in collaboration with sheet extruder Intraplàs and Yoplait in France. The material used for both applications is a Styron



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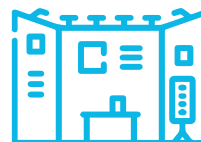
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branded PS that combines 55% recycled styrene monomer feedstock with virgin, fossil-based content.

Controlling costs

Beyond PS, many developments are ongoing to create chemical recycling operations that can survive and prosper on a large scale. For example, **Nexus Circular** in Atlanta, Georgia, US, has developed chemical recycling technology that uses a proprietary process and pyrolysis. It says it has optimised the technology to create a highly efficient, economic, commercial and scalable system for delivering cost-effective, high quality distillate, or “circular liquid.”

Nexus is currently operating with an input of around 40 tonnes/day (50 US tons), providing a yield of around 85%. Input is predominantly film, which is supplied mostly in the form of bales. The technology can handle polyolefins and PS films. President and co-founder Eric Hartz says the prices Nexus pays for its feedstock are very advantageous, partly because the company has little competition to bid against. The film is otherwise destined for landfill.

Nexus is taking post-industrial, post-commercial, post-retail, post-agricultural, and post-consumer film. Hartz reckons other recycling operations are paying as much as three to five times as much for feedstock, because it has to be pelletised or shredded, or because intermediates with their own costs are involved. He also emphasises the importance of other infrastructure elements such as site location to keep transport costs as low as possible.

Quality of output is also said to fall within very tight specification parameters. “Char is not entrenched with our liquids, so we have no post-treatment such as distillation or hydro-treating that adds a lot of complexity or cost.” The process is a closed-loop system, with no air pollution issues, and which creates no wastewater, Hartz says.

He says that within five years, Nexus plans to have at least 12 large plants chemically recycling film waste coming from various sources, both post-industrial and post-consumer. Current input is over 90% post-consumer.

The original Nexus plant has been running since 2018, and while not divulging how much waste it has processed in that time, Hartz said in early July that the one hundredth truck load of output from the plant had just gone out.

In July, Nexus Circular and **Dow** announced that they have signed a detailed letter of intent (LOI) for Dow to secure the production output of a newly constructed advanced recycling facility in Dallas,



IMAGE: NEXUS

Texas. The new facility will process and convert over 26,000 tpa annually of previously non-recycled plastic into feedstock that will be delivered back to Dow as a raw material to create new plastics for food-contact, health, hygiene, and fitness applications.

Nexus already has a supply agreement with **Shell**, announced in late 2020, for 60,000 tonnes over four years, of pyrolysis liquid made from plastic waste, which Shell will convert into various chemical products. Shell called the agreement “a next step towards Shell’s ambition to use one million tonnes of plastic waste a year in its global chemical plants by 2025”.

Early last year, Shell and **Pryme** signed pyrolysis oil supply agreements to use in Shell’s chemical plants in Europe. Also last year, Shell and Environmental Solutions Asia signed a supply agreement for pyrolysis oil to use at its Energy and Chemicals Park Singapore.

“We are driving third-party volumes across the globe to help grow the market of pyrolysis oil through long term relationships with pyrolysis oil producers,” says a Shell representative. “We are also collaborating with the waste management industry to develop the critical infrastructure needed to collect and sort the plastic waste that would otherwise go to landfill or incineration. Each of these elements is crucial to Shell achieving its ambition, and we are making steady progress.”

The first Pryme plant in Rotterdam is under construction and scheduled to start commissioning in 2022. This will be followed by the rollout of its technology across Europe and globally in collaboration with strategic partners.

Pryme’s Rotterdam plant has an initial intake capacity of 40,000 tpa of plastic waste and will

Above: The original Nexus plant has produced over one hundred truck loads of distillate from film waste

IMAGE: BASF



Above: In BASF's ChemCycling project, pyrolysis oil from plastic waste can be fed into the BASF Verbund. BASF partners include Quantafuel, which is specialised in the pyrolysis of mixed plastic waste and the integrated purification of the resulting oil. Photo shows Michael Bachtler from BASF (right) and Rasmus Kærsgaard, Plant Director at Quantafuel in Quantafuel's pyrolysis and purification plant in Skive, Denmark

produce 30,000 tpa of oil. This capacity will be increased by 50% in 2023. Boudewijn van Vliet, Executive Director at Pryme, said in mid-July that the Rotterdam plant was in the process of being brought onstream.

Pryme has also bought a site in Amsterdam where it plans to install capacity of 35,000 tpa. It is looking at various potential locations in Europe for further plants. The capacity of these plants will be based on multiples of 160,000 tpa of intake. Pryme is looking to establish partnerships with what van Vliet calls "significant" waste management partners to provide material. "We are planning partnerships all along the value chain," he says.

BASF's efforts in chemical recycling are grouped in its ChemCycling pyrolysis project, which has been running for four years in collaboration with various partners. BASF invested €20m in 2019 in **Quantafuel**, a Norwegian company specialised in the pyrolysis of mixed post-consumer plastic waste and the purification of the resulting oil. In September 2020, Quantafuel started up its first pyrolysis plant with a nameplate capacity of approximately 16,000 tpa in Skive, Denmark. It is not yet fully operational, however.

"Together, we are working on further developing and improving the process to produce pyrolysis oil from mixed plastic waste," says Christoph Gahn, Head of Chemical Recycling at BASF. Developing suitable catalysts for the new process technology is an important aspect of this. These catalysts aim to ensure that high-purity pyrolysis oil is always produced, even when the composition of the

plastic waste varies.

Gahn says that "despite technical difficulties in the first months of 2022, Quantafuel's technology remains one essential building block for BASF's ChemCycling project. BASF and Quantafuel continue to jointly develop a pilot plant (design capacity: 10 tonnes/day) in Kristiansund, Norway, in which a further developed technology is tested." Test runs started in 2021.

"We can feed pyrolysis oil into our Verbund structure as an alternative to fossil raw materials and use it to make new products," says Gahn. "We use a certified mass balance approach to allocate the percentage of recycled materials to the end product." Various packaging products have already been commercialised by customers using "Cycled" products.

The third of four production lines at Quantafuel's Skive plant in Denmark was completed on 30 June and is now in commercial production. "The onboarding of the fourth production line is targeted for early fourth quarter," says Quantafuel's CEO Lars Rosenløv.

"Our focus for the Skive plant has been on increasing production capacity and stable production. We are exposed to prevailing general market conditions with pressure on key cost drivers like natural gas, electricity, feedstock, as well as disposal costs. We are also exposed to a contractual fixed oil off-take price at the moment but are discussing this with our off-take partner."

The focus on high regularity and stable throughput at Skive continues, as well as the ability to process a variety of plastic qualities. Quantafuel processes plastic from mixed household waste, including waste contaminated with biological material. "The Skive plant continues to produce oil within product specifications, confirming Quantafuel's chemical recycling process," the company says.

In late June, Quantafuel submitted a planning application for a new plastics upcycling plant in Sunderland, UK. Quantafuel hopes to have the plant operational in 2024. The facility will be designed to process around 100,000 tonnes of low value plastic waste, such as soft food packaging and a variety of domestic and industrial plastics.

SABIC and Plastic Energy are over one year into the construction of the first commercial unit to significantly upscale production of SABIC's certified circular polymers derived from used plastics. The project in Geleen, Netherlands is expected to become operational in the second half of this year.

SABIC is also involved in projects for chemical recycling of so-called ocean bound plastic (OBP). It is, for example, cooperating with Portuguese firm

producer Polivouga and Nueva Pescanova, a leading Spanish seafood producer, in a packaging solution using certified circular PE from such materials.

SABIC is also involved in a project that will see UPM Raflatac launch the world's first packaging label materials made from SABIC certified circular polypropylene based on chemically recycled OBP. In this case, OBP is recovered by local partners of HHI, a Malaysia based recycling company. It converts OBP into a pyrolysis oil, which SABIC uses to make PP that is processed into film by Taghleef.

In May, **TotalEnergies** and **Vanheede Environment Group** signed a long-term commercial agreement for the supply of post-consumer recycled (PCR) raw material, to be used as feedstock in the production of circular polymers for durable applications.

Under this agreement, Vanheede Polymers & Compounds will supply PCR raw material coming from its sites in France and Belgium, including Dottignies, where a new plastic waste treatment facility using innovative technology is currently under construction.

In February, **ExxonMobil** announced its first sale of certified circular polymers, to Berry Global which will use the polymers in production of food-grade packaging containers. ExxonMobil says initial quantities of the circular polymers is based on plastics waste processed at its advanced recycling facility in Baytown, Texas, US. The facility began operations in 2021 and has already processed more than 1,800 tonnes of waste.

The company says: "The operation in Baytown will be among North America's largest advanced

plastic waste recycling facilities with a capacity to recycle 30,000 tpa of plastic waste when its expansion is complete later this year."

ExxonMobil also announced in February that it and **LyondellBasell** had signed a memorandum with FCC Environmental Services, which runs one of the state's largest material recovery facilities in the city of Houston, and Cyclyx. According to Dave Andrew, Vice President of New Market Development for ExxonMobil's chemical division, the idea is to improve used plastic collection rates so FCC can sort and clean it and Cyclyx can match it to both mechanical and chemical recycling efforts at ExxonMobil and LyondellBasell.

Mura Technology says it is pioneering a globally scalable technology to prevent millions of tonnes of plastic and CO₂ from entering our natural environment every year and turning an \$80bn lost resource of plastic waste into a valuable global commodity.

Mura's proprietary technology, HydroPRS (Hydrothermal Plastic Recycling System) uses supercritical steam to convert post-consumer household waste plastics, including flexible and multi-layered plastic packaging, into industry-ready, liquid hydrocarbon products. HydroPRS differs from pyrolysis in that heat is applied to the water and not directly to the plastic, which avoids creating 'char' and this maximises hydrocarbon product yield, whilst hydrogen donation helps to reduce reactivity and excess cracking.

Mura Technology is developing a project pipeline including own-developed sites in the UK, Europe and the USA, and HydroPRS licence sales through its partner, KBR. The first site to use the



IMAGE: SABIC

Left: SABIC chemically recycled PE is used in seafood packaging for Nueva Pescanova

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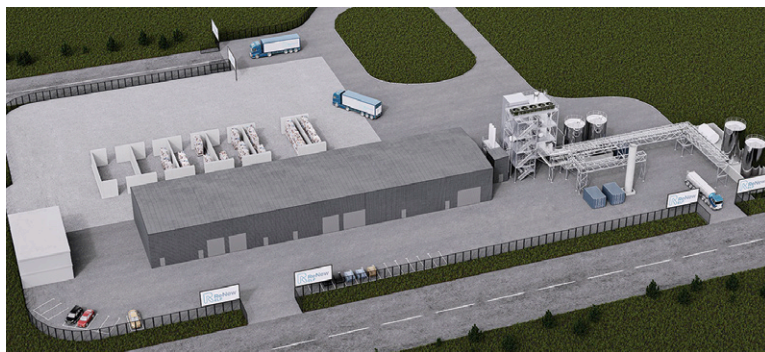
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IMAGE: RENEW ELP



Above:
Rendering of
ReNew ELP
chemical
recycling site in
Teesside, UK

HydroPRS process is under construction by **ReNew ELP** in Teesside, Northeast England. This 80,000 tpa capacity recycling site is located at Wilton International, an established industrial site, with readily available utilities and potential for laboratory, scale-up, and pilot facilities. ReNew ELP looks to be operational in early 2023 with the first 20,000 tonne line, with three further lines to follow by 2025.

ReNew ELP has a contract with Geminor UK to act as principal feedstock supplier to the Teesside project. The new agreement will see at least 15,000 tonnes of PE and PP rich plastic diverted away from incineration and into recycling per year, making up

the majority of the feedstock supply for the first 20,000 tpa phase of the 80,000 tpa ReNew ELP project.

Dow says it will be a key off-taker of material from Mura. The two companies will also build multiple 120,000 tpa facilities in the US and Europe, adding as much as 600,000 tpa of capacity by 2030, Dow said in July.

"Using supercritical steam means the technology is also inherently scalable," says Dow. "Unlike other methods, which heat waste from the outside, the steam imparts energy from the inside, providing an efficient conversion of plastic waste; a process which can be maintained regardless of scale."

Dow says it is actively pursuing a number of commercial partnerships with customers and brand owners to scale chemical recycling technology "as quickly as possible." It has, for example, announced a strategic investment with **Plastogaz SA**, a technology start-up and proprietor of a chemical recycling technology. Dow says: "Plastogaz's proprietary catalytic hydrocracking technology solution is more efficient and less energy-intensive than some other current forms of advanced recycling."

Dow and **Fuenix Ecology Group** are also expand-

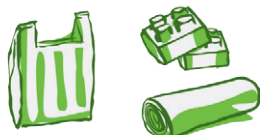


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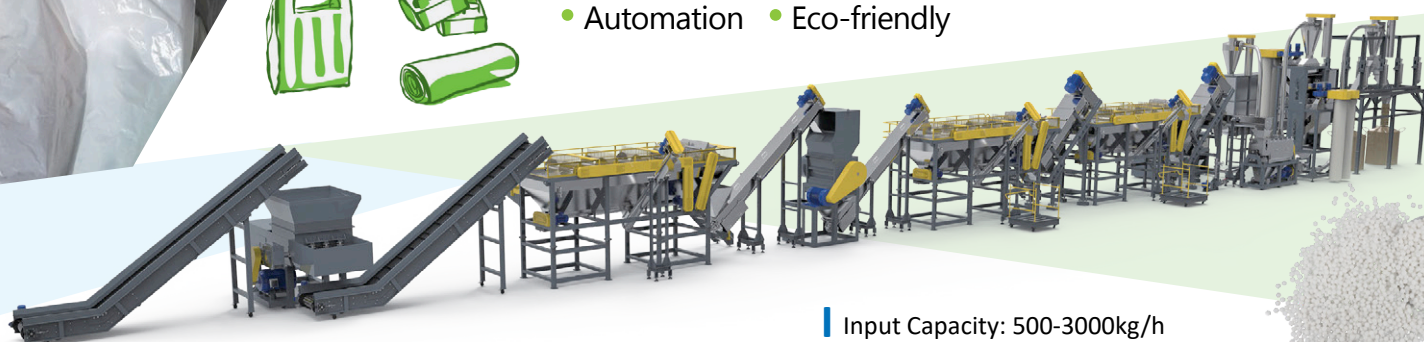


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ing upon the companies' initial agreement to scale circular plastics production through chemical recycling with the construction of a second plant in Weert, the Netherlands. The new plant will process 20,000 tonnes of waste plastic into pyrolysis oil feedstock, which will be used to produce new circular plastic at Dow's Terneuzen site in the Netherlands.

Dow has been busy signing supply deals in the recycling area, not just with Nexus Circular (see above) and Renew ELP. The group said in July it will be the main off-taker of post-consumer plastics from **Valoregen's** project in Damazan, France, which will have capacity to process up to 70,000 tpa of plastics waste by the end of the end of Q1 2023. The project is unusual in being a hybrid recycling site combining chemical and mechanical recycling facilities in one location.

"By bringing these technologies under one roof, the plant will increase energy efficiency by enabling a yield greater than 80%, well above the average conventional mechanical recycling efficiency of approximately 60-70% - minimising waste - thanks to a smart energy management system," says Dow.

Braskem, the largest polyolefins producer in the Americas, announced in late July that it has developed a next-generation technology for addressing plastic waste. It says the process, which uses a proprietary catalyst, reduces the need for external energy sources. "This results in a significant reduction in CO2 equivalent emissions compared to the traditional advanced recycling technologies."

Jan Kalfus, Global Bioprocess Catalysis & Circularity Manager at Braskem, says the project has demonstrated high production yields for valuable intermediates, such as aromatics and monomers. "We are scaling up our reactor that will provide important data to support our future expansion. The pilot project is planned for 2025 and the technology should become available at scale by 2030."

Currently located in a lab in Sarnia, Ontario, Canada, **Aduro Clean Technologies** is expanding its R&D footprint to a much larger laboratory in London, Ontario. The purpose of the new lab is to house the bench scale process now under construction and to support optimisation of process parameters for its Hydrochemolytic technology. Aduro has also initiated the design of a pilot plant (1.5-2 tonnes/day of waste plastic feed) to be located in Ontario and expected to be completed before the end of 2023.

Aduro is also advancing its relationship with the

Chemelot Campus of Brightlands in the Netherlands to build the next stage scale-up - a pre-commercial unit designed to process complex plastics that are harder to recycle and that are rejected by traditional mechanical recycling or thermal processes such as pyrolysis. Anticipation is for the process in Brightlands to be in the range of 10 to 25 tonnes/day (demonstration facility).

Aduro continues to focus on the scale up of its Hydrochemolytic process for the chemical recycling of mixed plastic waste. Ian McLennan, Senior Advisor Technology and Regulatory Affairs, says its process "involves the use of specific hydrogen donors combined with a proprietary process to specifically deconstruct various plastics (including addition polymers such as LDPE, HDPE, PP, and PS) to produce high yield, low molecular weight, saturated hydrocarbons that require minimal upgrading. Process engineering calculations have demonstrated a substantial reduction in GHGs for the Aduro process as compared to those involving thermal and hydrothermal cracking."

The company plans to build a next-generation (so-called R3) reactor with a capacity of 2 tonnes/day, which would be scalable up to 100 tonnes/day.

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IMAGE: KRG

High quality recyclate with flexible productivity are the aims of new developments and installations of washing and drying facilities. Ink removal is a focus area for some companies, reports Mark Holmes

De-inking raises quality of packaging recyclate

Washing and drying plays a crucial role in the plastics recycling process. New developments and installations are targeting ink removal and other ways to provide high quality recyclate, as well as offering processing flexibility and ever higher throughputs.

Sorema-Previero has developed a de-inking module in an advanced washing system for the removal of inks. De-inking is a treatment by which cured ink systems are removed from packaging waste to allow the printed plastic packaging to be recycled and reused in the manufacturing process. The company says that inks and coatings are an integral part of packaging but can represent a serious challenge when trying to enhance materials and to transform packaging waste into a resource. Nowadays, market demand is growing for high quality recycled material coming from post-industrial and post-consumer flexible and rigid packaging waste. This situation has highlighted the need for new recycling plants and processes for the economic removal of printing inks.

To facilitate a high-quality product, inks must be

removed down to a very low level. Inks that remain in the recycled material can alter the colour and/or the transparency of the material, create defects on the final product and degrade to form odour, gassing or migratable species. The flakes and granules contaminated by ink residues are also of great concern in their reuse in new food contact packaging. Once inks are removed then the plastic can potentially be recycled back into its original application.

Current technologies for the recycling of printed waste rely on processes of thermal degradation of the inks in extrusion with their elimination during the degassing and filtration phase of the melt. However, as efficient as they may be, these processes are unable to eliminate high inks loads. These can remain in the recycled polymers with consequent limitations in the material's reuse in new packaging. Sorema has therefore introduced a de-inking process upstream of the extrusion phase, which produces materials with minimal printing ink residues and allows the subsequent extrusion operation to produce a high-quality polymer. ➤

Main image:
Flakes at
washing plant
in Kunststoff
Recycling
Grünstadt
facility

Below: Sorema has developed a de-inking module, an advanced washing system for the removal of inks

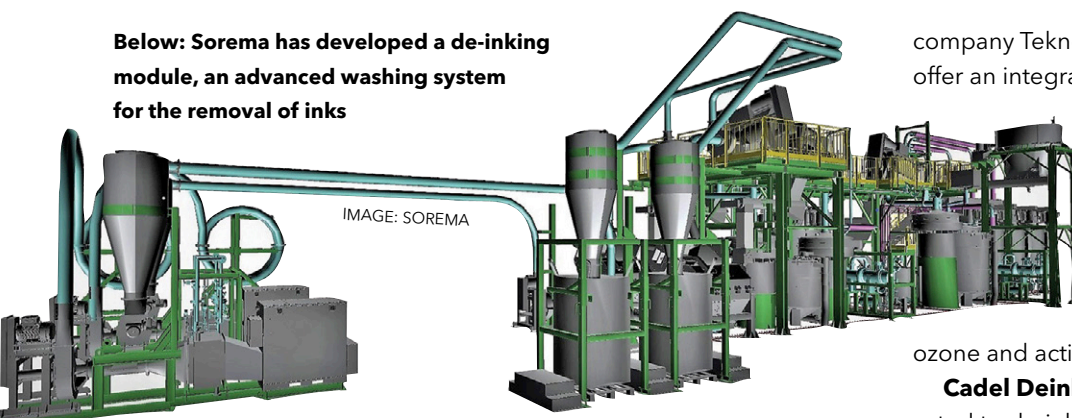


IMAGE: SOREMA

The de-inking module involves feeding incoming material using volumetric or gravimetric dosing, controlled and independent dosage of chemical additives, and imparting high friction to the material in hot water with a defined residence time that is adjustable to specific inks and materials. This allows a single plant to be used to wash both rigid and flexible plastic materials. The recycling process is then completed by one or more rinsing and drying phases of the flakes, before extrusion into granules.

According to Sorema, the de-inking process is mainly applied to post-industrial waste, but it is also being studied for use in post-consumer waste recycling plants. Good results have been achieved in many applications, however, not all types of printing inks are completely removable. For this reason, a pilot plant line in operation at the company's laboratory, located in Alzate Brianza, Italy, has been optimised with all the necessary full-scale modules for de-inking. The laboratory is available for de-inking tests to validate processes and optimise chemical formulations and washing times. These tests can also be completed with in-house extrusion to verify results.

Sorema adds that it can supply complete turnkey washing and recycling plants, which can manage all stages of the process, including cleaning the chemical de-inking circuit and wastewater treatment. In collaboration with sister

company Teknodepurazioni Aquae, Sorema can offer an integrated washing and recycling plant with wastewater treatment from the de-inking process. The wastewater treatment phase combines mechanical filtration processes with high-speed centrifuges, sedimentation with chemical adjuvants and purification with ozone and activated carbon treatments.

Cadel Deinking is a Spanish company dedicated to de-inking solutions for printed plastics waste. In December 2020, Erema subsidiary Keycycle became a major partner to Cadel, taking over exclusive worldwide sales and project implementation of its technology for ink removal. As part of the agreement, both companies will jointly operate the pilot system at Cadel's facility in Sant Vicente del Raspeig, Spain.

Cadel has also partnered Dow Packaging and Specialty Plastics – along with HP Indigo, Reifenhäuser and Karlville – in a project to develop a pouch-to-pouch mechanical recycling concept. Starting with a PE-based barrier food pouch designed for recyclability, the project team used mechanical recycling and de-inking to create a high-quality dishwasher MDO-PE pouch with 30% recycled content which is itself suitable for recycling.

"To produce the recycled PE resins for the second pouch, we used our deinking technology to achieve the best outcome," says Pablo Cartagena, Business Development Manager at Cadel Deinking. "The deinking process is key because it effectively removes ink from the plastic surface to obtain a plastic with similar characteristics to the raw virgin material which helps to provide high-quality pouch-to-pouch recycling. We are very happy to collaborate closely with all these leading companies and to demonstrate that Cadel's deinking technology is considered 'crucial' to achieve circularity in plastic."

In Japan, **Toyo Ink** has developed a plastic recycling technology for multilayer flexible packaging, where a de-inking coating agent and a delaminating adhesive are applied to the plastic film surrounding the ink layers. After use, the packaging waste is subjected to an alkaline treatment in which the coating agent, adhesive and interlaying ink layers are cleanly released from the film substrate. Toyo Ink has a pilot plant demonstrating this technology.

Herbold Meckesheim has developed a new washing plant for shredding and cleaning hard PP. The company says that the plant provides high purity recycle and high throughput, as well as

IMAGE: SOREMA



Above: Flexible packaging waste-printed LDPE before (left) and after (right) Sorema's de-inking process

being robust and easy to maintain with a high degree of automation. Designed for high capacities and 24-hour continuous operation, 2 t of PP flakes can be produced per hour with a residual moisture of less than 1% and a flake size of 12 mm or less.

In the plant, the shredded PP material firstly passes through the bottom outfeed of a big bag into a funnel with a volume of 0.5 m³ in an emptying station. The material is then discharged via a screw conveyor onto a conveyor belt. A large buffer hopper of around 2 m³ ensures even feeding of the material to the downstream coarse material separator. This is important where a direct upstream shredder discharges unevenly.

The coarse material separator segregates heavy foreign materials, such as metals, stones and glass, to protect downstream units including the cutting mill and friction washer. To minimise loss of PP, there is integrated upward flow by means of a pump. The heavy-duty cutting mill undertakes wet chopping of the PP bottles, shredded to 30 mm. As a result of high friction, the mill achieves a good cleaning effect and, due to water addition, shows low wear on the blades, housing and screen. The rotor has replaceable knife supports and the wear plates are ex-



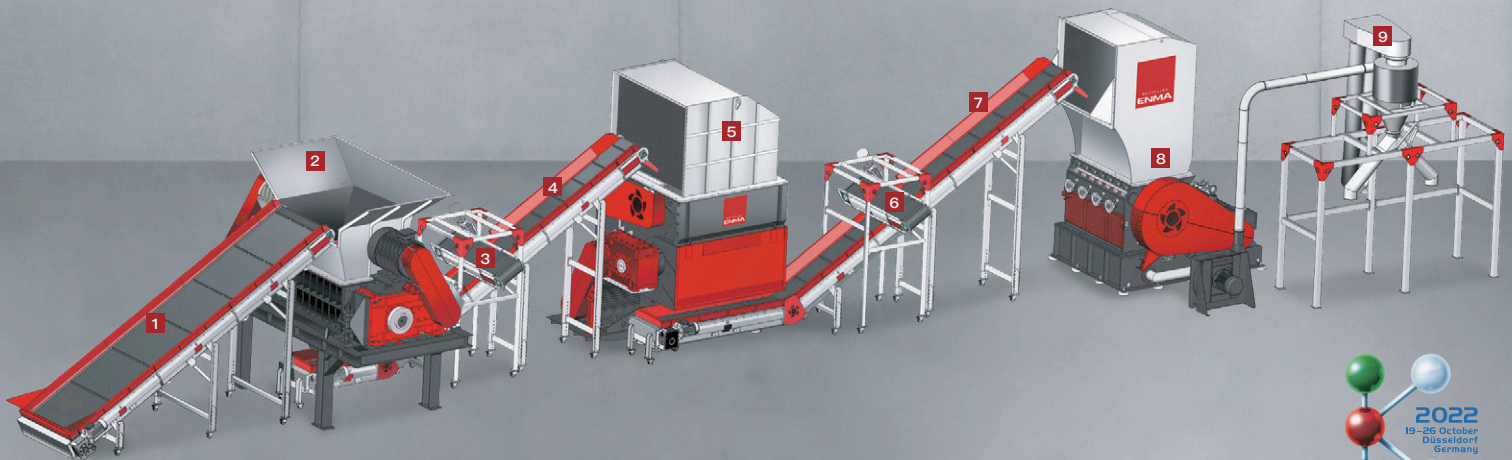
Left: Coarse material separator, friction washer and wet cutting mill from Herbold Meckesheim

changeable. Combined with the optimal accessibility, this makes the machine completely protected against wear, says the company.

During the next step, the friction washer intensively cleans the PP flakes. In the process, it separates dirty water as well as fine particles and paper fibres and conveys the product further to the separation tank. The rotor of the washer requires little maintenance due to exchangeable wear plates. In the separation tank – using water as the medium for density separation – the flakes are transported as

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8 EnMa G series granulator

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IMAGE: HERBOLD MECKESHEIM



Above: PP flakes in Herbold Meckesheim's washing plant are transported as floating material with a dewatering screw to the downstream mechanical dryer

floating material with a dewatering screw to the downstream mechanical dryer. Particles with a density above 1 g per cm³, such as PVC or PET, are discharged by a chain scraper conveyor.

A mechanical dryer removes moisture from the washed PP flakes, as well as residual impurities such as paper fibres. Embedded in a hot-dip galvanised housing, the machine is equipped with pneumatically operated mechanical cleaning with a rinsing appliance for the screen surface and exchangeable wear plates on the rotor blades. Pneumatic conveying takes the material to the air classifier, which has a zig-zag channel for sifting out light materials such as foils, textiles, fibres and dust.

Finally, a double big bag station is available for bagging where two products - light materials and cleaned PP flakes - are pneumatically packed. The entire plant is controlled automatically with a touch screen panel. Fluctuations in the material are handled by targeted control of the plant components, guaranteeing maximum performance. The smart and automatic control system ensures an efficient operation with low manpower requirements.

Stadler and Krones have collaborated in the design and installation of a new sorting and washing plant for Kunststoff Recycling Grünstadt (KRG), a German recycling company serving the plastics processing industry. The facility for processing post-consumer HDPE and PP packaging waste is the first of its kind in the country. The companies say that it closes the plastics circular economy loop with its output of extremely high quality recyclates that can be used again in the same packaging applications - including those requiring food grade material. The plant was designed to produce approximately 30,000 tpa of recyclates that can be returned to the manufacturing cycle.

With its new plant, KRG aims to produce high-quality recyclates capable of meeting the demands of branded goods companies and the fast-moving

consumer goods (FMCG) sector. This would not be possible by following the common practice in HDPE and PP post-consumer packaging recycling, which produces low-quality, dark colour recyclates that can only be used in lower applications.

To achieve the desired result, the pre-sorted materials coming from light packaging plants are first processed through the sorting line designed and installed by Stadler. With a capacity of approximately 10 tonnes/hour, the line operates in two different modes depending on the material being fed - one for PP materials and another for HDPE. The input materials are screened to eliminate fines, metals are separated using an over belt magnet and eddy current, and light film is extracted by an air sorter.

Seven near-infrared (NIR) sorters separate the remaining material into six product fractions separated by colour. Part of the output materials is fed immediately into two Krones lines, located in the same hall, while the rest is baled and stored for later processing.

In the Krones lines, each with a capacity of 2 tonnes/hour, the pre-sorted material is ground into flakes and pre-rinsed before being processed in its hot-washing system. Final rinsing and sorting, according to colour and polymer, complete the process to produce clean flakes of the high-quality required for recycling into the original packaging applications.

"This plant makes a big step in advanced quality of the recycled material, which can go to challenging applications where reduced odours and even food grade qualities need to be achieved," says Michael Auburger, Product Manager Recycling Solutions at Krones. "HDPE and PP packaging can be recycled for the same application again, so that, for example a HDPE shampoo bottle or PP margarine pot will have a second life as a bottle, pot or lid. This was only done for PET bottles until now."



IMAGE: KRG

Right: Stadler and Krones have collaborated in the design and installation of a new sorting and washing plant for Kunststoff Recycling Grünstadt, a German recycling company

Pla.to Technology has developed a solution for bottle-to-bottle recycling of detergent bottles made of HDPE, incorporating a water-saving washing process. The clients for this project were Beiersdorf and the Fraunhofer Institute for Process Engineering and Packaging (IVV). The company says that used shampoo and shower gel bottles have been almost entirely reprocessed without any loss of quality in a water-saving process at the Pla.to technical facility in Görlitz, Germany. The rHDPE granulate obtained from bimodal HDPE was completely reintroduced into the production cycle, producing new detergent bottles solely from recycled granulate that meet the quality standards of new products. With this development, Pla.to says that it offers the technology for a closed HDPE cycle - without the addition of virgin granulate necessary in other processes. "Our solution is a sustainable and water-saving method to fully recycle HDPE in large quantities," says Managing Director Heinz Schnettler.

The company adds that HDPE is very suitable for numerous applications due to its high stability and tensile strength. In the detergent industry, bottles are typically manufactured by extrusion blow moulding and have a label attached. The cap is



IMAGE: PLA.TO TECHNOLOGY

usually made of PP. In its in-house demonstration centre, Pla.to has reprocessed the used bottles using its own equipment. Before recycling, they are first sorted by colour with the caps and crushed using a granulator. A dry cleaner then removes residual ingredients inside the bottles without any wastewater. Stubborn contaminants are first soaked and then removed from the plastic using friction

Left: With the help of a dry cleaner, contaminants such as paper labels and residual contents are defibred by high acceleration and impact forces, says Pla.to Technology. The system operates without wastewater

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IMAGE: AMUT



Above: Amut supplied the post-consumer PET bottle sorting and washing line at the Albury facility in Australia

and hot water. The label adhesive is then removed, and the material is mechanically and thermally dried. Finally, the air stream of the zig-zag separator separates the bottles and caps from label particles according to their bulk density.

To isolate the HDPE from the other components for reuse at the end, the PP is separated using NIR technology. After compounding, it is regranulated into rHDPE and can be directly reused to produce new bottles. In the project, Pla.to was able to produce 20,000 bottles through this method for recycling rHDPE. These bottles have passed all the necessary tests. They are dimensionally accurate, stable, odourless and have no imperfections such as specks or inclusions. Just like containers made from virgin material, they can be labelled and close tightly with a newly applied PP cap. "This proves that HDPE can be fully, efficiently and sustainably recycled with low wastewater on an industrial scale," says Schnettler.

Amut Recycling Technology has been selected for Australia's largest post-consumer PE recycling plant, which includes two washing lines. Amut and its Ecotech division have been awarded a contract to design and supply the plastics recycling plant, which will convert locally collected kerbside materials into high quality food grade rHDPE and rPP resin. Amut is the turnkey supplier for the Pact Group and Cleanaway's Choir project, comprising a new plastic waste recycling plant in Victoria (which trades as Circular Plastic Australia), plus the two washing lines.

Amut says it has been "chosen for his unique position as a company in the plastic waste recycling field able to supply turnkey plants including the front-end section for the best sorting solution and hi-tech washing plants (patented process) to achieve high purity on final flakes".

The Victoria plant will treat a stream of mixed plastic bottles in different polymers and colours, pots, trays and non-packaging plastics, ferrous and non-ferrous materials. It is expected to process

20,000-24,000 tpa of waste. Sorted plastics streams will include valuable materials, such as natural colour HDPE containers, coloured HDPE containers and PP containers.

These materials, stored in separate buffers, will be automatically dosed to two washing lines. The first one with an output of 2,000 kg/hour is dedicated to natural colour HDPE containers, while the second with the same output is dedicated to coloured HDPE or PP containers. Both washing lines, if needed, are capable of processing natural colour HDPE for food grade applications.

Amut says that its washing lines are equipped with the best technical solutions to guarantee high purity of the final PE flakes and in particular the removal of organic and inorganic contaminants and separation of labels and glue. In addition, a double stage friction washing system will complete the delivery, as it did for the country's largest PET recycling facility in Albury, where Amut supplied the post-consumer PET bottle sorting and washing line, along with the final polymer and colour flake detector. These highly automated washing lines ensure extremely low operational costs with reduced power and water consumption.

Amut has also supplied Viridor with the UK's largest multi-polymer plastic recycling plant. The facility in Avonmouth is powered by the energy produced at Viridor's energy recovery facility, which is integrated with the plant. Amut's Ecotech division designed and developed a custom-engineered plastic recovery facility integrated with a highly efficient washing plant. The turnkey facility processes 90,000 tpa of waste composed of PET, HDPE and PP bottles to produce prime quality and high purity flakes and granules to be sold for food grade and commercial end use.

According to Piergianni Milani, Amut Group's President, the company's R&D department has developed recycling plants that minimise water and energy consumption and chemicals usage. The customised, automated washing lines reduce freshwater usage to 1.1 litre for each kg of high purity flakes of PET, HDPE and PP, due to its friction washer unit.

CLICK ON THE LINKS FOR MORE INFORMATION:

- www.sorema.it
- <http://cadeldeinking.com>
- <https://schd.toyoinkgroup.com>
- www.herbold.com
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Manufacturers are becoming more confident about incorporating recycled plastics in electronic devices, appliances and car components.

David Eldridge surveys groups talking about their secondary material needs

Appetite grows in OEMs for recycled materials

Brands and manufacturers in the consumer electronics, domestic appliances, IT and automotive markets are pursuing their sustainability programmes by using recycled plastics in their new products. Applications for plastics in these sectors can be very demanding in terms of material properties, including strength and stiffness, but major groups are starting to accept that recycled plastics do not equate to inferior performance. A look round new products and projects shows OEMs are gradually introducing recycled plastics and they are being supported in these tentative first steps by recyclers, materials groups, technology companies and R&D partners.

Miele says it is increasingly relying on recyclates for its portfolio of domestic appliances and white goods. The group says it is implementing the principles of a circular economy by using recycled materials wherever this is possible without any reduction in quality levels. Its objective is to increase the volume of plastic recyclates it uses to 7,500 tonnes by 2025.

"Miele is at the beginning of a long journey which is not just about using recycled and recyclable materials in packaging but also in finished goods," says Christoph Wendker, Vice President Corporate Sustainability and Regulatory Affairs at Miele. In terms of WEEE metals, he says the use of

recyclates is already far advanced at Miele, and it is adopting the same approach for plastics "with great conviction".

The group has developed a floor module used on almost all its new tumble dryer models which achieves material savings of 30% by using a foam moulding process. Since 2021, recycled plastics have been used in the lid of this module. At its Bielefeld production plant in Germany, Miele is increasingly manufacturing vacuum cleaner accessories such as upholstery brushes, crevice nozzles, dusting brushes and special-purpose attachments from recyclate. The option of switching to recyclates is currently being examined for other

Main image: Logitech said it has beaten its target to incorporate post-consumer recycle in its Creativity and Productivity products



Left: The frame of the Miele Hygiene AirClean filter is made from 100% recycle on the entry-line Boost CX1 model



Above:
Logitech says
65% of all mice
and keyboard
units now
include PCR
plastics

accessories, including exhaust filters. The frame of the Hygiene AirClean filter on the new Boost CX1 vacuum cleaner is made from 100% recycle.

Sustainable packaging is another target area for Miele. It has, for example, converted its PowerDisk container for use with dishwashers to 100% recycled plastic.

Computer accessories group **Logitech** announced in February that it had exceeded its commitment to incorporate post-consumer recycled (PCR) plastics into products. Its Creativity and Productivity

portfolio uses PCR at scale, with 65% of all mice and keyboard units now including PCR plastic, beating its commitment made in 2020 to use 50% PCR. Logitech estimates 8,000 tonnes of virgin plastic was eliminated in its products in 2021.

"Now, all consumers have a breadth of choice when it comes to selecting mice and keyboards that are aligned with their sustainable lifestyle preferences," says Delphine Donne-Crock, General Manager of Creativity and Productivity at Logitech. "By using post-consumer recycled plastic as our preferred material at scale, we have been able to take meaningful action to make sustainable living easy for consumers as well as make a substantial impact towards decreasing our carbon footprint."

The percentage of recycled plastic in each Logitech product varies depending on the type, colour and material, ranging from 75% PCR content to 20% for technically complex and lighter colour products. It says that its development work with suppliers means there are now more than 30 colours in its product palette and its design goal is to maximize the percentage of recycled content in each product while ensuring high aesthetic appeal and durability tests are met.

German power tools company **Festool** is using materials supplied by **Wipag**, the recycling and compounding company owned by Otto Krahn Group. A component in industrial vacuum cleaners produced by Festool use Wipag's WIC PA 66 compound which is reinforced with secondary carbon fibre. As the vacuum cleaners handle large amounts of dust and chips a pre-separator is integrated in the suction module to boost suction capacity. Wipag says that after a detailed analysis, its WIC PA 66 compound with a carbon fibre content of 30% was chosen as the material for this component.

The secondary carbon fibre in the WIC compounds is sourced from lightweight component production waste and are reprocessed by Wipag

using a proprietary carbon recycling technology. The post-industrial fibre helps reduce the carbon footprint of applications and is a cost-effective alternative to virgin carbon fibre, says the company. The WIC compound used in the pre-separator of Festool vacuum cleaners is also electrically conductive which prevents voltage breakdowns caused by the rotation of the dust.

PA materials are common in electronic and automotive applications, but the source of waste raw material need not be those sectors. PA fibres can be recycled for use in technical applications and that is what **DSM** has done for smartphone applications for its customer **Samsung**. DSM's Akulon RePurposed PA 6 is being used in Samsung Galaxy S22 smartphones and Tab S8 tablets. The waste stream for the material is fishing nets collected along India's coastline which are reprocessed into a material with minimum 80% recycled PA 6. The material is incorporated into key components including the Galaxy S22 series' key bracket and inner cover of the S Pen, as well as Tab S8 series' inner support bracket.

Pranveer Singh Rathore, Materials R&D Manager at Samsung Electronics, says: "Through this open collaboration, which combined our technology with DSM's expertise, we successfully developed a solution that bridges the needs of the planet and our Galaxy users. The Galaxy S22 series and Tab S8 series help advance Samsung's sustainability vision, Galaxy for the Planet, which includes reducing our environmental footprint by incorporating recycled

Right: Wipag's
WIC PA 66
compound with
post-industrial
carbon fibre is
used in the
pre-separator
compatible
with Festool CT
suction mobiles



IMAGE: FESTOOL

materials in all new mobile products by 2025."

Fairphone is a Netherlands-based brand that was set up on ethical lines, so its phones, for example, have replaceable modules for main components in order to increase the product's lifetime. It also has a focus on sustainable materials and is using an increasing amount of recycled plastics. **Covestro** says fully and partly recycled thermoplastic polyurethanes (TPU) are used in the protective case of the Fairphone 3 and its successor, the Fairphone 4, and partly recycled polycarbonates are additionally used in the newer device.

Glass fibre-reinforced grades of the Covestro's Makrolon PCR PC portfolio offer a good solution for the heavily stressed centre frame of the Fairphone 4, says the materials company. "The increased stiffness and impact resistance are in line with Fairphone's modular design approach. Covestro thus also supports a mono-material approach in each case for the use of polycarbonates in the housing and TPU plastics in the protective cover to facilitate recycling of the smartphones at the end of their useful life," says Covestro.

Online electricals retailer, **AO**, which runs a fridge recycling operation in Telford, UK, says it is expanding the materials it is supplying to its customer **Volusion**, a ventilation technology group. AO has supplied Volusion with recycled high impact polystyrene (HIPS) from recycled fridges, collected from customers' homes, and is widening its supply to also include recycled acrylonitrile butadiene styrene (ABS). The rABS will be used to produce a range of parts including the fan chassis of the ventilation and components, with the HIPS continuing in the manufacture of the ducting

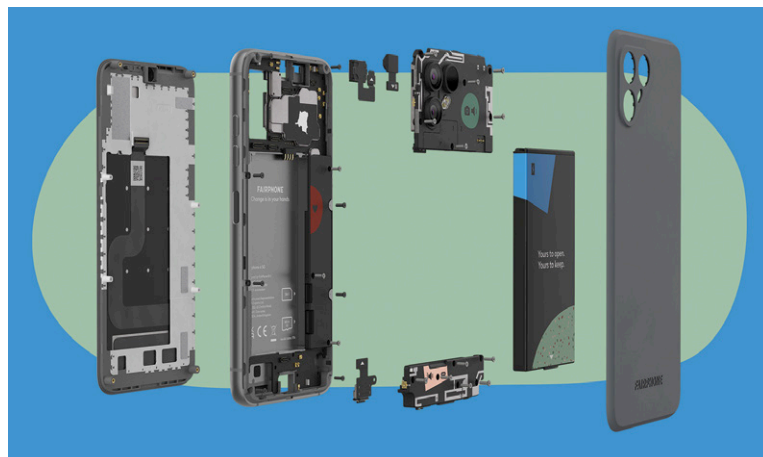


IMAGE: FAIRPHONE

accessories (also see feature in *Plastics Recycling World* July-August 2021 issue).

Lee Nurse, Business Development Director at Volusion Group, says: "We are really excited to have worked with AO to help us get this new source of recycled material into our facilities. Our procurement teams continue to drive our ambition for 90% of the plastic within our facilities to come from recycled sources, and even with the complexities of the global supply chain situation, we are still making great progress towards that goal."

Increasingly, manufacturers are working in R&D projects with industry partners to validate the use of recycled plastics in their products. **Bosch** and **Bosch-Siemens-Hausgeräte** have been involved in a project with **Fraunhofer Institute for Structural Durability and System Reliability (LBF)** in Germany to compare the performance of recycled plastics and virgin material in a demanding application, the base frame of dishwashers. The base, which weighs around 2 kg, forms the basic

Above: Partly recycled polycarbonates from Covestro are used in the new Fairphone 4, including a completely recycled TPU in the protective case

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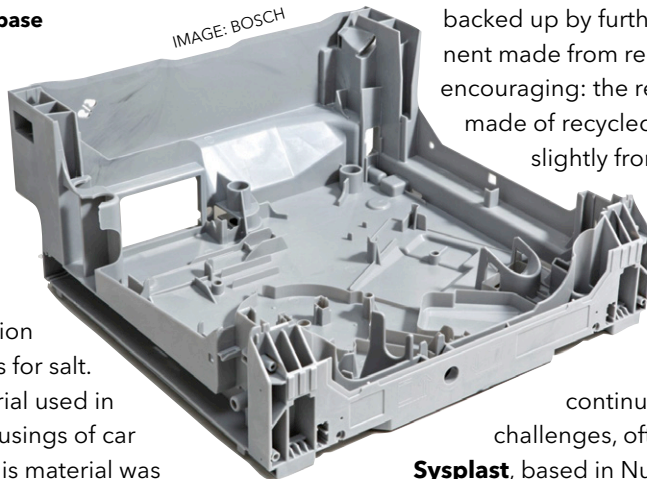
Right: Components in a Bosch dishwasher base showed similar performance when made with recycled material compared with virgin material, says Fraunhofer LBF

structure of the dishwasher, holding the side walls and housing components such as pumps, condition sensors and containers for salt.

The source of material used in the project was the housings of car starter batteries and this material was recycled and recompounded with additives to increase strength and improve optical properties. The researchers produced test specimens and tested them around 100,000 times with a defined force. Fraunhofer LBF says a finger-thick plastic post on the base plate of the dishwasher is mechanically stressed every time the dishwasher door is opened and closed and is the most demanding cyclically stressed area on the dishwasher base carrier. It says: "Assuming around 15 openings per day and a service life of the device of around 18 years, this equates to around 100,000 door openings per device life. Can a post made from recycled material withstand that?"

Dominik Spancken at Fraunhofer LBF says: "Although the recyclate has 15% lower strength, it has similar stiffness properties as the virgin plastic. Much more important, however, is the plastic deformability, in which both materials behave equally. In summary, it can be said: the recyclate can withstand the same stresses as new material."

The positive results from testing specimens were



backed up by further tests on the component made from recyclate. The results were encouraging: the resilience of the parts made of recycled material differed only slightly from parts made of virgin material, says Fraunhofer LBF.

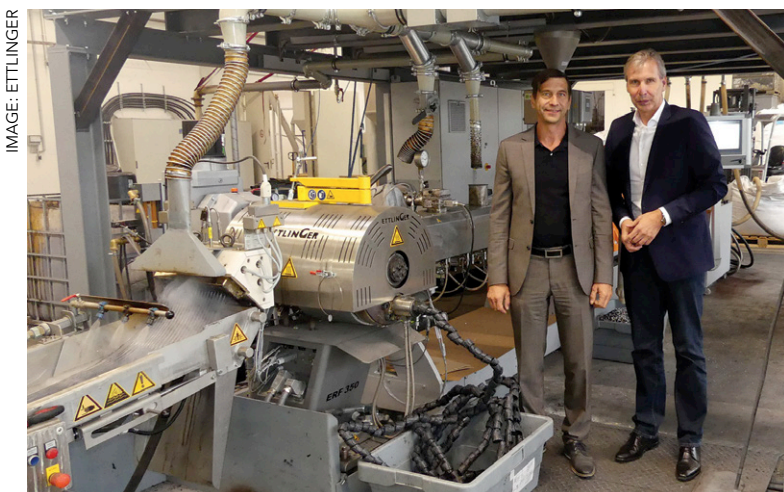
Recycling companies specialised in WEEE and waste automotive materials continue to address technical challenges, often helped by suppliers.

Sysplast, based in Nuremberg, Germany, has lengthy experience recycling technical plastics, having its origins in the 1970s as part of the Grundig group – it is now part of Energenta Group. Sysplast specialises in recycling styrenic materials such as PS, ABS and PC/ABS, arising from the electronics and automotive industries.

Melt filtration technology company **Ettlinger** (part of Maag) says it helped Sysplast in 2021 when it commissioned a Leistritz extruder and installed a self-cleaning ERF 350 high-performance filter on the line. The feed material is single-type regrind from the recycling of old electrical appliances and the processing of mixed post-industrial and post-consumer plastics. Most of the material comes from Energenta Recycling Solutions.

Udo Dobberke, Managing Director of Sysplast, says: "The electronics industry, including telecommunications, consumer electronics and the automotive industry, only accepts products whose processing and performance characteristics are on a par with new products." For this reason, the line's melt filter needs to have high filtration performance and reliable, continuous availability over long running times, which is what Ettlinger provided. "Screen blockages and filter changes bring fluctuations in production that we cannot afford. And because we produce recompounds for premium applications, the filter must reliably separate impurities with minimal melt loss."

Modified surfaces are relatively common in plastic electronic and automotive parts, leading to specific contamination challenges. Sysplast recycles electroplated plastics, mostly ABS, from the automotive industry and the sanitary and household goods sector. With its partner Fraunhofer Institute for Process Engineering and Packaging (IVV), the company has developed a process in which both the plastic and the metals are completely recycled. In this process, an Ettlinger ERF 350 has been reliably removing residual particles from the metallisation process from the melt since the end of 2021.



Above: At Sysplast, an Ettlinger high-performance ERF 350 melt filter separates impurities from the melt in a self-cleaning and largely maintenance-free process. Left: Udo Dobberke, Sysplast Managing Director; right: Karsten Bräunig, Ettlinger Sales Manager

Sysplast has started another project together with the Chair of Plastics Technology at the University of Erlangen, involving the recycling of painted, spray-coated and laminated car bumpers. The first tests have been completed successfully.

Dobberke is looking to expand Sysplast's activities and ramp up its development projects to an industrial scale. He says: "By the end of the decade, we want to achieve a fivefold increase in our current output of around 10,000 tpa and thus bring Sysplast into the top group of recyclers in this material group in the German-speaking region. A second new system will increase capacity by 17,000 tpa by the end of 2022. The upgrade of a decommissioned system will contribute an additional 1,500 tpa. Here too, Ettlinger melt filters will once again form part of the system."

Recent projects and collaborations in automotive show that momentum is gathering among important companies in the sector. Major injection moulder and Tier One supplier **Faurecia** has signed a Cooperation and Research Agreement with waste management and recycling group **Veolia** to jointly develop compounds for automotive interior modules produced in Europe, aiming to achieve an average of 30% of recycled content by 2025. Target applications include instrument panels, door panels and centre consoles.

Faurecia created a cross-company sustainable materials division in 2021 to develop and manufacture new materials. The division aims to offer a complete low-CO₂ cockpit and even CO₂ negative materials, in order to support customers' sustainability objectives.

Veolia has been supplying recycled PP compounds to the automotive industry in France for more than five years. This collaboration project with Faurecia will allow it to expand its automotive product range to vehicle interiors. Veolia aims to start production of the recycled compounds at its existing recycling sites in France starting from 2023.

Major materials producer **BASF** has revealed how it is helping a Veolia-related company in recycled automotive plastics. BASF has signed a cooperation agreement with **Zhejiang REEF Technology** to develop recycled compounds for applications used in the automotive sector, plus the packaging and consumer industries. The group is supplying its new IrgaCycle additives to REEF, which is a subsidiary of the Veolia Huafei Polymer



Left: BASF says its IrgaCycle additives improve the processing and long-term stability of recycled plastics strongly contaminated with paint, ink or adhesive residues, for example in exterior automotive part, such as bumpers

Technology joint venture in China.

REEF's core products include recycled PP, HDPE, ABS and PA. The IrgaCycle additives from

BASF are used to improve the

processing and long-term stability of recycled plastics strongly contaminated with paint, ink or adhesive residues, for example in exterior automotive part, such as bumpers.

Spanish research group **Aimplas** is a partner in a number of sustainable plastics programmes, including the LIFE CIRC-ELV Project. A new recovery process has been successfully implemented by Valencia-based Desguace Cortés, and involves separating the PP bumpers and PE fuel tanks of end-of-life vehicles, which are then recycled for reintroduction in the production cycle. Two recycled demo samples were developed in the project: one is a closed loop example of wheel liners produced by the Aragon firm SIGIT; and the other is an open loop example, in which pipes and pipe fittings were manufactured at a production plant in Portugal, near project partner ISOLAGO. The role of Aimplas in the project involved optimising the pre-treatment of bumpers and fuel tanks during recycling.

CLICK ON THE LINKS FOR MORE INFORMATION:

- > www.miele.com
- > www.logitech.com
- > www.festool.com
- > www.wipag.com
- > www.dsm.com
- > www.samsung.com
- > www.fairphone.com
- > www.covestro.com
- > <https://ao-recycling.com>
- > www.volutiongroupplc.com
- > www.bosch.com
- > www.bsh-group.com
- > www.lbf.fraunhofer.de
- > www.sysplast.de
- > www.ettlinger.com
- > www.faurecia.com
- > www.veolia.com
- > www.basf.com
- > www.veohuafei.com
- > www.aimplas.es

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BOOK YOUR DISCOUNTED PLACE

Gearing up for K2022

It's that time again: K2022 kicks off in a few short months. In this special section, we look ahead to the global plastics industry's key event - and provide essential links to help you get the most from your visit

In just three months, the world's largest plastics show will open its doors. K2022 runs from 19-26 October 2022 in Dusseldorf, Germany.

The show will fill all 18 halls of the venue - with more than 3,000 exhibitors from over 60 countries expected to promote their raw materials, additives, semi-finished products, machinery, ancillary equipment and services to the plastics industry.

The previous K show in 2019 recorded 3,330 exhibitors from 63 countries on 177,000m² of net exhibition space. It also welcomed 224,116 trade visitors - of whom 73% came from outside Germany.

Sustainability is a growing concern within the plastics sector, so the circular economy will feature heavily at the show. As well as machinery - such as

equipment for processing, recycling and waste management - there will also be multiple examples of new materials - including bioplastics and formulations that contain higher levels of recyclate.

There is also a return for the Science Campus - which allows business to exchange ideas and information with academia - as well as two special events: 'Plastics shape the future', and the VDMA's Circular Economy Forum.

A further new element of the show is the Start-up Zone, which will showcase new and small companies in the plastics sector. This area, in Hall 8b, will feature companies that are less than 10 years old, have fewer than 100 employees and generate a turnover below €10m (US\$9.5m).

Plastics Recycling World magazine at the show

Plastics Recycling World will be exhibiting at K2022 on stand C11 in Hall 7. By paying a visit, you can find out more about all of our digital plastics magazines and apps.

The stand is run by our parent company AMI, which will be showcasing its latest industry directories and

market reports, and information on our many conferences including the Compounding World Expo 2022.

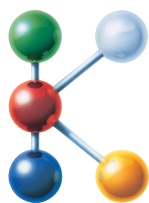
In the run up to the K2022 event, *Plastics Recycling World* will be publishing detailed previews of the innovations that will be on show.

Look out for our K Preview issues in

September and October. Follow the news on our @plasticsworld Twitter feed. We will review K2022 in detail in our November/December edition.

Exhibitors can send press releases to david.eldridge@amiplastics.com. Full details of our special coverage of K2022 are in our [media pack](#).

Dates: 19-26 October 2022 **Venue:** Dusseldorf Fairground, Dusseldorf, Germany
Hours: 10:00 to 18:30 daily **Organiser:** Messe Dusseldorf **Website:** www.k-online.de



knowledge is power

Use our selection of web links to make your visit to Dusseldorf - and K2022 - as productive and enjoyable as possible



IMAGE: SHUTTERSTOCK

BUY YOUR TICKETS

Save queueing - and money - by buying entry tickets in advance. A three-day ticket costs €120, while one-day tickets cost €55 when bought in advance. Order tickets by clicking [here](#). A catalogue is €25: buy a voucher online and exchange it at the show.



IMAGE: MESSE DUSSELDORF, CONSTANZE TILLMANN

GET K ON THE PHONE

Lots of useful K2022 data is now available on your smartphone or tablet - including exhibitor and product databases, exhibition plans, travel information, hotel listings, city guides and restaurant reviews - via the 'The K App'. To download the free app, visit the page [here](#), which has links to both the AppStore (for iPads and iPhones) and Google Play (for Android devices).

BOOK YOUR ACCOMMODATION

Dusseldorf accommodation fills up fast during K and the best options go early. Find out what's still available and make your reservation as soon as possible at the official [website](#).



IMAGE: SHUTTERSTOCK

CHECK OUT THE REST OF DUSSELDORF

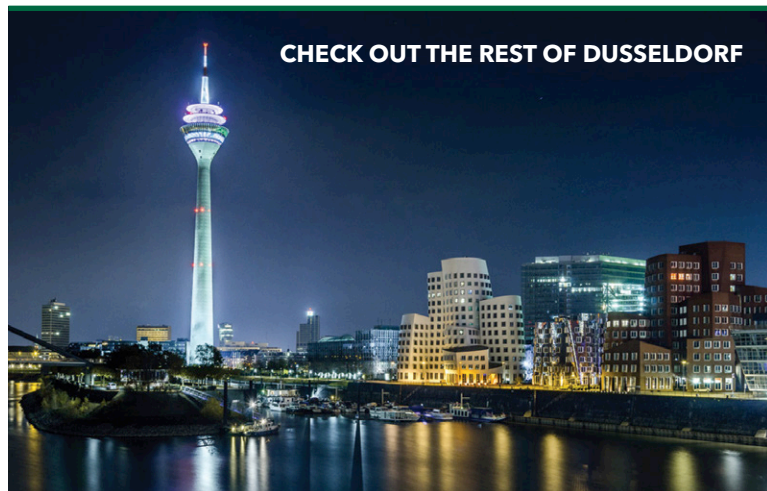


IMAGE: SHUTTERSTOCK

After a hard day at K2022 you will have earned some relaxation time. Make the most of your evenings in the city by checking out the restaurants, pubs, bars, culture and entertainment on offer. This official guide has useful listings, as well as guides to the sights and neighbourhoods: <http://bit.ly/DusseldorfGuide>

Also worth a look is the Wikitravel page on the city: <http://bit.ly/wikiguide>

And if the Altstadt and its 260 pubs get too crowded, try heading to the **Media Harbour**, for its modern architecture and venues, which include restaurants, bars and clubs.



IMAGE: SHUTTERSTOCK

ORGANISE YOUR TRAVEL

Dusseldorf is well connected and getting around the city is easy thanks to its excellent public transport network. There is one important change to note this year: your admission ticket to the show does not include free use of local transport, as it did in the past. Instead, visitors can travel using the **eezy app**, which is like an 'e-ticket'. Details on transport can be found [here](#).

GET ROUND THE EXHIBITORS

With more than 3,000 exhibitors to choose from and a total exhibition area of more than 170,000m², it makes sense to plan your time at the show before you head off. The good news is that you can search for participating companies by name and by product using the online K2022 database.

To search by company, click [here](#)

To search by products, click [here](#)

You can also locate companies using the interactive floorplan which can be found [here](#)



IMAGE: MESSE DUSSELDORF, CONSTANZE TILLMANN



IMAGE: DUSSELDORF TOURISMUS

SOAK UP SOME CULTURE

Dusseldorf is more than just K2022. As the capital of North Rhine-Westphalia, it is home to more than 100 galleries and museums. One celebration is for the artist Joseph Beuys, who spent much of his life in the city. While his centenary fell in 2021, there are still several ongoing events. These include: an augmented reality (AR) experience (at three separate locations); and, if you're feeling fit, a Beuys-themed cycle tour.

[Find out more here](#)

TRY SOME RETAIL THERAPY

If retail is your thing – and especially designer goods – then Dusseldorf will not disappoint. Königsallee – known as 'Kö' to locals – includes many of Europe's leading fashion names and is likened with London's Knightsbridge or New York's Fifth Avenue. However, neither of those locations can boast a setting to match the tree-lined, man-made 'river' that runs through this premium shopping district. Catch the flavour [here](#).



IMAGE: DUSSELDORF TOURISMUS, MARKUS LUGS



IMAGE: DUSSELDORF TOURISMUS, U. OTTE

DON'T FORGET THE ALTBIER!

Regular visitors will already know that Dusseldorf's local brew is the Altbier, a malty copper-coloured ale of around 4.5% strength produced using a special top-fermented lagering method. The name translates as 'old beer' but is actually derived from the Latin word 'altus', which means 'high' and refers to way the yeast rises during brewing. Try it out in one of the city's numerous brew-pubs. Details of these and a short history of Altbier can be found [here](#).

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Director Roll Coating
Business, Molecular
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*This discount cannot be used in conjunction with other offers. Offer ends September 9, 2022.

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Optimise your industry knowledge with these recommended market reports

MARKET REPORT: The European Waste Plastics Value Chain and Mechanical Recycling Industry

This is the second edition of AMI Consulting's report on the European mechanical plastics recycling industry. Expanding on the previous edition, the report will provide a comprehensive analysis of the market for recycled commodity polymers, with essential insights to understand trends, address industry challenges and assess future growth potential within the region.

[> Click to register your interest](#)

MARKET REPORT: Recycling of Flexible Polyolefin Films in Europe 2021

The study aims to quantify the market for flexible polyolefin recycling, analysing the supply and demand balance, along with an evaluation of current capacity in Europe. A detailed review of the end use applications for recycle is given, with an examination of potential future absorption. It is relevant to all those involved in the plastics industry value chain, from resin producer through to brand owners/end users of plastic products.

[> Click here for more info](#)

MARKET REPORT: Chemical Recycling, Global Status

This report defines and analyses three different forms of chemical recycling; solvent based purification (dissolution), depolymerisation and thermal processing. This authoritative report provides you with an independent quantitative analysis of the global chemical recycling industry status in 2020, it reviews the existing technologies and forecasts how the sector will develop over the next decade.

[> Click here for more info](#)

MARKET REPORT: Single use flexible plastic packaging in Europe - Regulatory context and market magnitude in the retail channel

This report navigates through the present European legislation and discusses the impact each will have on the consumption of single-use plastic packaging. With a specific focus on flexible plastic retail packaging, this report highlights the issues being raised by recent and upcoming regulatory instruments, the trends that are driving the market to change and solutions currently being deployed.

[> Click here for more info](#)

MARKET REPORT: The Global Plastics Recycling Industry 2020 - Capacities, Capabilities and Future Trends

This report details current trends and future recycle volume forecasts in a rapidly changing environmental sector. This quantification includes the supply and demand balance, with an evaluation of the current plastic recycling capacities by region. This is done in the context of the economic disruption taking place in the first half of 2020 due to the Covid-19 pandemic and its economic consequences across markets.

[> Click here for more info](#)

MARKET REPORT: Rigid Polyolefin Recycling in Europe - Capacity, technology and recycle usage

A deep-dive analysis of the European mechanical rigid polyolefin recycling industry (PP and PE). It quantifies recycling capacities, waste streams (municipal and commercial, production scrap, other), and actual recycle volumes of pellets, compounds, regrind and flakes. It provides context on sustainability drivers and how they shape innovations in the value chain including structural and format changes.

[> Click here for more info](#)

Download these new product brochures

COPERION: CHEMICAL RECYCLING



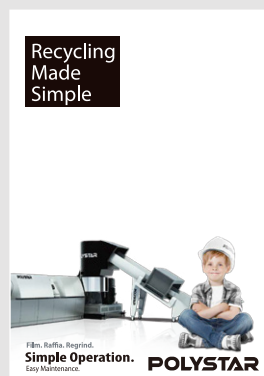
ZSK twin screw extruders.
For energy-efficient chemical
recycling of mixed plastic waste.

coperion

Chemical recycling promises a new way to handle certain end-of-life plastics. Learn how Coperion's high performance ZSK twin screw extruders can be effectively applied in this fast developing plastics processing sector.

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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.

CLICK HERE TO DOWNLOAD

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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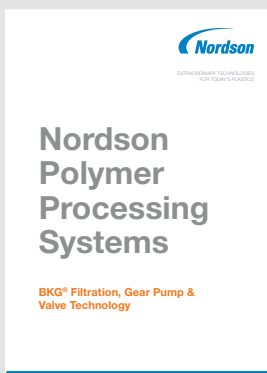
STRUKTOL: CREATIVE RECYCLING



Struktol Company of America offers a range of polymer additives designed to simplify the process of recycling plastics. Learn about its latest options for viscosity modification, odour control and compatibilisation.

CLICK HERE TO DOWNLOAD

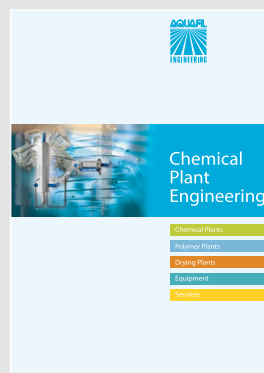
NORDSON: FILTRATION SYSTEMS



The BKG range of filtration systems and screen changers from Nordson Polymer Processing Systems are detailed in this six-page brochure which also features products from BKG's ranges in gear pump and valve technologies.

CLICK HERE TO DOWNLOAD

AQUAFIL: PLANT ENGINEERING



This 12-page brochure from Aquafil Engineering details its comprehensive range of chemical plant engineering capabilities, which include polyamide polymerisation, polyester condensation and polymer drying installations.

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

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AMI publishes five process-specific FREE plastics industry magazines. Simply click on the cover below to read each magazine. Or download the issue in the relevant Apple or Android app



Plastics Recycling World May/June 2022

The May-June edition of Plastics Recycling World has these features covering: Shredding advances lead to greater precision; What's new in compatibilisers; Processors can get more from in-house recycling.

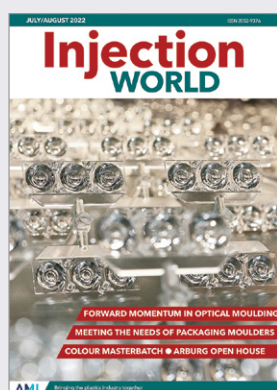
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Plastics Recycling World March/April 2022

The March/April edition of Plastics Recycling World takes a look at the challenging area of wind turbine blade recycling. It also explores the latest developments in melt filtration and additives for recycling and reviews the rPET market.

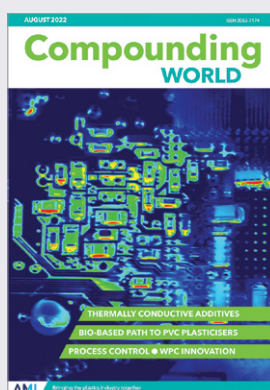
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Injection World July/August 2022

The Injection World July-August issue contains features covering optical injection moulding, new packaging developments and a colour masterbatch update, plus there is a review of Arburg Technology Days 2022 and a K2022 visitor guide.

[> CLICK HERE TO VIEW](#)



Compounding World August 2022

The August issue of Compounding World has a cover story on the use of thermally conductive compounds in a growing number of electronics components. Plus features on bio-based plasticisers, controls for compounding extruders, and WPCs.

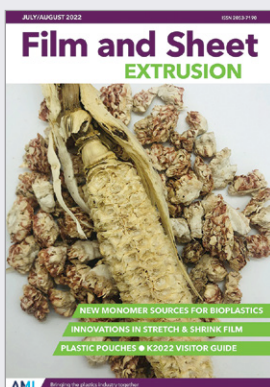
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Pipe and Profile July/August 2022

Pipe and Profile Extrusion's July-August edition has its main focus on PVC, with features on the progress made in PVC recycling and developments in PVC stabilisers. Plus a feature on the latest extruder technology and a Visitor Guide to K2022.

[> CLICK HERE TO VIEW](#)



Film and Sheet July/August 2022

The July/August edition of Film and Sheet Extrusion magazine looks at some of the latest developments in bio-based plastics and feedstocks. It also reviews innovations in stretch and shrink film and pouch packaging. Plus, a useful guide to planning your visit to K2022 in October.

[> CLICK HERE TO VIEW](#)

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Compounding
WORLD

Film and Sheet
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Pipe and Profile
EXTRUSION

Injection
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Plastics Recycling
WORLD

GLOBAL EXHIBITION GUIDE

2022	26-30 September	Colombiaplast, Bogota, Colombia	www.colombiaplast.org
	27-29 September	Fachpack 2022, Nuremburg, Germany	www.fachpack.de
	27 Sept-1 October	TaipeiPLAS 2022, Taipei, Taiwan	https://www.taipeiplas.com.tw/en/index.html
	4-7 October	Plastex, Brno, Czech Republic	www.bvv.cz/en/plastex/
	19-26 October	K2022, Dusseldorf, Germany	www.k-online.com
	9-10 November	Recycling World Expo USA, Cleveland, USA	https://na.plasticsrecyclingworldexpo.com
	1-3 December	Plast Print Pack West Africa, Accra, Ghana	www.ppp-westafrica.com
2023	17-19 January	Swiss Plastics Expo, Lucerne, Switzerland	https://swissplastics-cluster.ch/
	1-5 February	PlastIndia, New Delhi, India	www.plastindia.org
	17-20 April	Chinaplas 2023, Shenzhen, China	www.chinaplasonline.com
	30 May - 2 June	Equiplast, Barcelona, Spain	www.equiplast.com
	14-15 June	Recycling World Expo Europe, Essen, Germany	https://eu.plasticsrecyclingworldexpo.com
	5-8 September	Plast 2023, Milan, Italy	www.plastonline.org/en
	26-28 September	Interplas, Birmingham, UK	www.interplasuk.com
	17-21 October	Fakuma, Friedrichshafen, Germany	www.fakuma-messe.de


AMI CONFERENCES

16-17 August 2022	Agricultural Film, San Diego, CA, USA
13-15 September 2022	Plastics Recycling Technology, Vienna, Austria
20-21 September 2022	Single-Serve Capsules, Barcelona, Spain
29 Nov-1 Dec 2022	Polymers in Footwear, Virtual Summit
13-14 December 2022	Recycling Flexible Packaging, Cologne, Germany
30 Nov-1 Dec 2022	Stretch & Shrink Film, New Orleans, LA, US

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

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