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EARTH STORY: NATURAL FIBRES AND FILLERS

NPE 2024 COMPOUNDING EXHIBITOR PREVIEW

WIRE AND CABLE ● 3D PRINTING COMPOUNDS

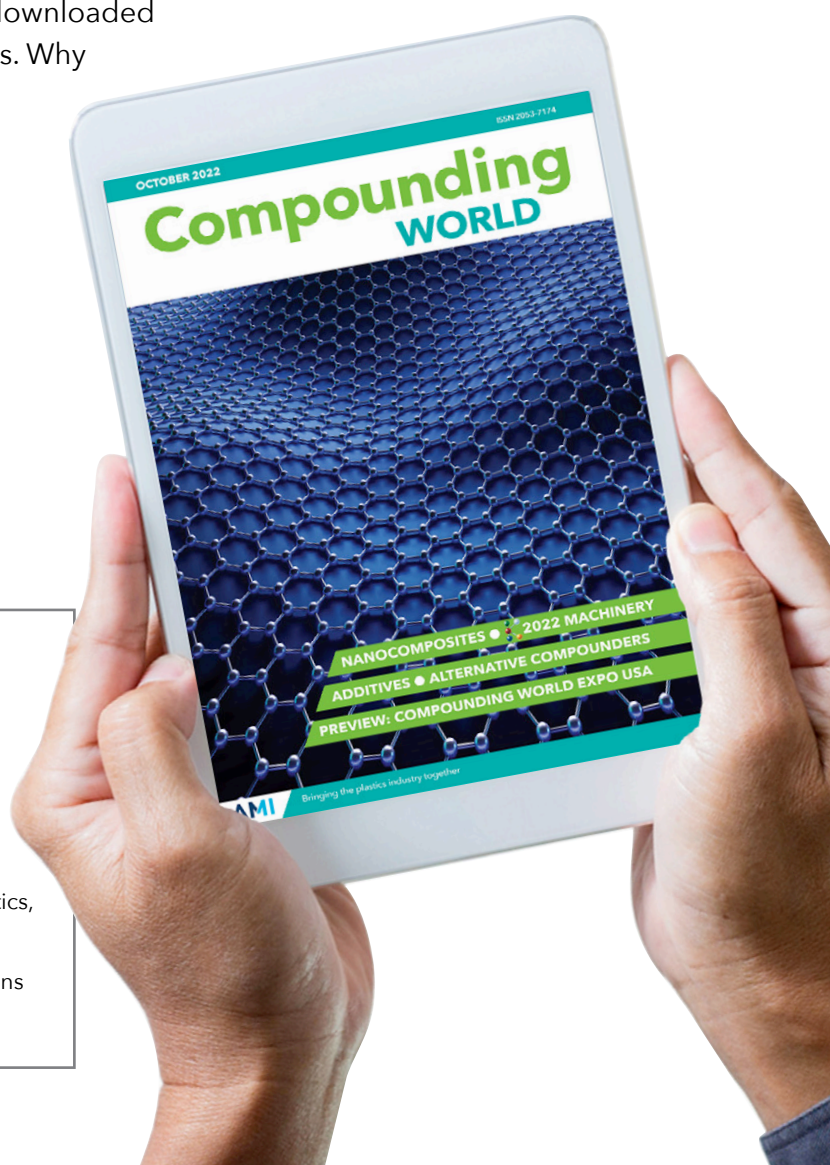
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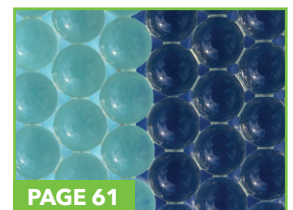
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Chemours' troubles pile up

In its full year 2023 results, troubled US chemical company Chemours reported net sales of \$6bn, down 11% year-on-year, as volumes fell 13%, which was partially offset by a 2% increase in prices. The company recorded a net loss of \$238m, while adjusted net income, which primarily excludes \$639m (\$764m pre-tax) in litigation settlement charges, was \$425m, compared to \$738m in 2022.

Three senior managers have also been stood down following an internal investigation by the company's Audit Committee. Mark Newman (CEO), Jonathan Lock (CFO) and Camela Wisel (Accounting Officer) were said to have

"engaged in efforts" in the fourth quarter of 2023 to delay payments to certain vendors and to accelerate the collection of receivables to meet cash flow targets. Chemours said: "The Audit Committee found that these individuals engaged in these efforts in part to meet free cash flow targets that the Company had communicated publicly, and which also would be part of a key metric for determining incentive compensation applicable to executive officers."

The company said the full-year sales decline was driven by a 21% drop in its Titanium Technologies business and a 11% drop in Advanced Performance



IMAGE: CHEMOURS

Denise Dignam has become the new CEO at Chemours

Materials, which was partially offset by an 8% increase in Thermal & Specialized Solutions.

"Chemours navigated a challenging year in 2023 that included prolonged destocking in certain key end markets, and these headwinds impacted our

overall financial performance," said new CEO Denise Dignam. "Over the course of the year, we realised meaningful cost savings from our Titanium Technologies Transformation Plan, continued our investments in growth markets in Thermal & Specialized Solutions and Advanced Performance Materials, and made significant progress resolving certain legacy issues."

Dignam was appointed CEO of Chemours in February when Mark Newman was placed on administrative leave.

The Audit Committee reported its findings on 27 March.

➤ www.chemours.com



IMAGE: AKVA

Borealis takes to the water

Above: The boat's hull uses mass balanced renewable material from Borealis

Borealis and AKVA group, a technology provider to the aquaculture industry, have constructed a Polarcirkel workboat hull using Borealis' portfolio of renewable polyolefins in what they say is a significant breakthrough for marine circularity. The boat, featuring a hull made

from BorSafe HE3490-LS-HW composed of 90% renewable content based on a Mass Balance approach, will be unveiled in Norway this spring.

"We're committed to supporting our customers to move away from traditional feedstock and to embrace

renewable materials," explains John Webster, Borealis Global Commercial Director Infrastructure. "The use of the Borneables in Polarcirkel affirms that high-performance standards can be met sustainably."

➤ www.borealisgroup.com
➤ www.akvagroup.com

Schenk rebrands as Qlar

German-headquartered bulk materials handling specialist Schenk Process is changing its name to Qlar on 13 May.

The rebrand derives from "the future is cirQlar" and indicates the company is extending its focus on digitally enabled and sustainable solutions, it said.

The Schenck Process brand, with its existing portfolio, will remain as a product brand under Qlar and will drive future innovations in the circular economy, it said.

➤ www.schenckprocess.com

New PC copolymer plant

Covestro has inaugurated a plant at its site in Antwerp, Belgium, that can produce polycarbonate copolymers on an industrial scale. The new platform technology, which the company developed itself, is based on a solvent-free melt process in combination with a new reactor concept. The investment is in the mid double-digit million euro range, and covers both a pilot and a production plant.

“Compared to pure polycarbonates, the copolymers open up new possibilities for us to integrate further functionalities and properties into our materials,” said Lily Wang, Global Head of the Engineering Plastics business unit.

These functions range from improved mechanical properties and a higher resistance against chemical attack, to enhanced flame retardancy. Covestro will focus first on materials for the electrical, electronics and healthcare industries, while future innovations might focus on mobility and other trends.

> www.covestro.com

Bold action needed for circularity, says EEA

A new report by the European Environment Agency (EEA) says achieving a circular economy will require further and more consistent action. The report, which analyses the EU's progress in the transition to a more circular economy and the policy push under the EU's Green Deal, examines and evaluates options whereby it can be further accelerated.

Europe's heavy reliance on natural resources comes with significant environmental and climate impacts. However, the EEA report claims this trend has stabilised in recent years. A modest decoupling of EU resource consumption from economic growth has been observed, with total use of materials dropping



IMAGE: EEA

slightly while EU gross domestic product (GDP) has increased.

The report also examines future actions, such as setting targets and promoting higher quality recycling to foster EU resource independence and lower imports. In addition to implementing eco-design principles, increasing circularity by

maximising the lifespan of products through reuse, repair, and remanufacturing, is also deemed critical.

According to the report, it is unlikely a significant reduction in waste generation can be achieved by 2030. Recycling has increased, but rates have stagnated in recent years.

> www.eea.europa.eu

New Trinseo flame-retardant

Trinseo has announced a new offering of flame-retardant Emerge PC 8600PV and 8600PR resins and Emerge PC/ABS 7360E65 resins, manufactured without the use of per- and polyfluoroalkyl substances (PFAS) or halogenated additives.

PFAS chemicals are commonly used for their flame-retardant properties and resistance to heat, oil, stain, grease, and water. The new products, suitable for applications in fields such as IT equipment, electronic and electrical products,

battery chargers, and voltage stabilisers, maintain those performance attributes while addressing growing regulatory pressure to reduce the use of PFASs.

The products will first be launched in the Asia-Pacific.

> www.trinseo.com

Mitsui Chemicals to close phenol plant

Mitsui Chemicals is to close the phenol plant at its Ichihara works in Chiba by 2026.

The company currently produces phenol at three locations; Ichihara, Takaishi in Osaka, and Shanghai in

China. Since 2022, however, a range of factors have made the business environment more difficult including falling domestic demand and a drastic oversupply because of new production facilities launched in other parts of Asia.

Mitsui Chemicals says it intends to maintain a steady supply of products to its customers by building a phenol chain with high capital efficiency and stable profitability.

> www.mitsuichemicals.com

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Depolymerisation pilot plant starts up in India

Recycler Novolooop and chemical manufacturer Aether have completed construction of a new depolymerisation pilot plant in Surat, India.

Novolooop says this marks the successful transition from batch reactions to an integrated and automated plant validating its Lifecycle depolymerisation technology, which transforms post-consumer polyethylene waste at a carbon footprint reduction of up to 91% when compared to conventional processes.

Miranda Wang, Co-founder and CEO of Novolooop, said: "After years of research, development, and engineering, we have built a radically innovative process and now our pilot plant is successfully demon-



Above: Key Novolooop and Aether Industries personnel and the pilot plant in Surat, India

strating this paradigm shift in technology."

The plant has passed equipment testing and solvent runs, and has achieved continuous operations using commercially-representative waste feedstock. Its primary objectives are to demonstrate the safe and reliable

operations of the integrated process, validate key equipment performance in an industrial environment, and achieve production of high purity products. It also produces ton-scale samples to enable off-take commitments with early customers.

> www.novolooop.com

> <https://aether.co.in>

Borealis to modify furnaces

Borealis is to invest €4.5m in modifying three of the ten cracker furnaces at its olefins unit in Porvoo, Finland.

The investment program, expected to be completed

in 2025, will mean that the Porvoo steam cracker, part of a highly integrated petrochemical complex, can increase the share of renewable and recycled raw materials used in its ethylene

and propylene production.

The company said that through strategic furnace modifications it can increase annual production to 120,000 tonnes.

> www.borealisgroup.com

Versalis takes over Italian compounder

Versalis has acquired Tecnofilm, a specialist compounder based in the Le Marche region of Italy.

Founded in 1972, Tecnofilm manufactures functionalised polyolefins and thermoplastic compounds based on plastics and elastomers mainly for the footwear and technical goods indus-

tries. It has expanded its product portfolio over the years to offer a wider range of compounds and functional polymers for various industrial applications and technical articles.

Adriano Alfani, CEO of Versalis, said: "The acquisition of Tecnofilm further strengthens Versalis' business

specialisation strategy. To this end, it offers the opportunity to expand and specialise our product portfolio by integrating downstream supply chain activities in elastomer-based compounding, particularly in the industrial applications and footwear sectors."

> www.versalis.eni.com

Dow and P&G study dissolution

Dow and Procter & Gamble have entered a joint development agreement (JDA) focusing on using dissolution technology to recycle a range of plastics with a focus on polyethylene (PE) and targeting post-household waste, especially rigids, flexible and multi-layer packaging.

The technology aims to deliver high quality post-consumer recycled polymer with a lower greenhouse gas emissions footprint than fossil-based PE. The partnership between Dow and P&G begins immediately and is expected to run until commercialisation.

"Our partnership with Dow helps P&G advance our objective to scale industry solutions as we help create a circular future where materials are recycled and remade instead of becoming waste,"

said Lee Ellen Drechsler, senior vice president of Corporate Research and Development at P&G.

P&G plans to use the material in packaging.

> www.dow.com



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New LCA study reveals the dark side of replacing plastics

Substituting plastics with alternative materials is worse for greenhouse gas (GHG) emissions in most cases, according to a study by the University of Sheffield in the UK.

Research into the environmental impact of plastic products versus non-plastic alternatives published in the journal *Environmental Science & Technology* has found that in 15 out of 16 applications examined, plastic products resulted in lower GHG emissions than their alternatives.

The study used life cycle assessments (LCAs) with varying focuses.

Sheffield University said: "Even when focusing solely on direct life-cycle emissions, plastics maintain their advantage in nine out of 14 applications. Factors such as lower energy intensity during production and the weight efficiency of plastics contribute to their reduced environmental footprint compared to alternatives like glass or metal."

"Not all alternative or recycled products are better for the environment than the products they replace," said Dr Fanran Meng, Assistant Professor in Sustainable Chemical

Engineering at the University of Sheffield.

He said environmental policymaking needs to be based on LCAs to make sure that GHG emissions are not unintentionally increased through a shift to more emission-intensive alternative materials.

He said: "Demand reduction, efficiency optimisation, lifetime extension and reuse/recycling, are win-win strategies to reduce emissions effectively. Solely focusing on switching to alternative materials is not."

> www.sheffield.ac.uk

New CEO at Chroma Color



IMAGE: CHROMA COLOR

Formulator and supplier of specialty colour and additive concentrates Chroma Color has appointed Joe Herres as Chief Executive Officer, starting in April. He replaces Shruti Singhal.

Herres said: "I am very excited to take the leadership role in a business I love in an organisation made up of incredibly dedicated and talented team members."

He has been the Vice President of Sales and Marketing at Chroma for the past 15 months. Herres said: "I see great opportunities to continue our journey with our customers in helping them grow their business which in turn strengthens Chroma's ability to partner even more effectively."

> www.chromacolors.com

India's Chini to produce PLA

Indian sugar producer Balrampur Chini Mills is to invest INR20bn (around €225m) to build an integrated plant for production of polylactic acid (PLA) bioplastics.

It claims the 75,000 tonnes/yr plant will be the country's first industrial scale bioplastics production capability when it starts production in 2027.

The company has not confirmed a location for the new facility but says it will be built on a greenfield site alongside one of its existing 10 sugar plants – it has a sugar cane crushing capacity of 80,000 tonnes a day – where it can take advantage of existing local infrastructure.

"We see the utilisation of sugar as a raw material in

PLA production as pivotal for a sustainable future," said the company's Executive Director Avantika Saraogi.

The company has appointed Stefan Barot to the role of President (Chemicals). He has more than 35-years in the global chemical and bioplastics industries including time at BASF.

> www.chini.com

Tosaf laser additives

Tosaf has released a new series of environmentally friendly laser additives offering versatile light and dark colour marking, ensuring transparency and improved cost-benefit ratio.

Laser marking is seen as an accurate and permanent marking method that can be carried out at high speeds, making it suitable for commercial use. It can create complex shapes and the marking itself is resistant to abrasion and scratching. It also eliminates the need for inks and the like which simplifies the recycling process. Laser marking technology is particularly well-suited for external applications such as pipes, profiles, and irrigation products.

> www.tosaf.com

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www.herbold.com www.coperion.com



IN BRIEF...

As demand for food packaging continues to increase, Japanese chemical manufacturer **Kuraray** is investing \$410m at an 18,000 tonnes/yr plant on Jurong Island, Singapore, to produce its Eval EVOH barrier resin. The new plant will start production at the end of 2026 and meet expected annual demand growth of 5-6% taking global capacity to 130,000 tonnes/yr.

www.kuraray.com

SABIC has signed a memorandum of understanding with **Pashupati** aimed at developing recycling opportunities in India. Pashupati brings expertise in mechanical and chemical waste processing while Sabic will focus on marketing and sales of recycled products.

www.sabic.com

<https://pashupatigrp.com>

Borealis has received two Letters of No Objection (LNOs) from the US Food & Drug Administration (FDA) allowing its Borcycle M post-consumer recycled plastics to be used in food-grade packaging in countries covered by FDA governance.

www.borealisgroup.com

LyondellBasell adds to masterbatch test work

LyondellBasell (LYB) has extended its masterbatch development capabilities with the addition of a Karo 5.0 lab stretching machine from Brückner Maschinenbau at its US tech centre in Akron, Ohio.

The new machine will enable the polyolefins company to troubleshoot and test masterbatch solutions for diverse oriented film applications with greater accuracy and efficiency, create a closer match to masterbatch materials in real-world production processes, and improve the speed-to-market process by allowing customers to quickly identify and select the optimal masterbatch for their needs.

"The Karo 5.0 represents a significant investment in our



IMAGE: LYONDELLBASELL

Above: Testing is already underway for a variety of applications including protective films and food packaging

research and development capabilities," said Tiago Piccoli, LYB Director of APS PAD for Consumer & Industrial Markets in the Americas. "This advanced technology will allow us to accelerate the development of new and improved masterbatch solutions,

ultimately helping our customers bring their products to market faster and with greater confidence."

The company said testing is already underway for a variety of applications including protective films and food packaging.

➤ www.lyondellbasell.com

Celanese adds Chinese compounder

Celanese has expanded its supply network in Asia with the qualification of a new specialty compounder in China for its Santoprene TPV.

Ivo Oerlemans, Santoprene global business leader, said: "As the world evolves,

Celanese understands the importance of producing high-quality, consistent parts to drive long term success through continuous innovation. We are looking forward to supporting the China market through local

sourcing, strengthening supply security and improving flexibility with enhanced capabilities for custom compounding."

Santoprene products are available as of Q2 2024.

➤ www.celanese.com

UBQ Materials and Teknor Apex sign deal

UBQ Materials has announced an expansion of its partnership with compounding solutions provider Teknor Apex to expedite product development leveraging UBQ's sustainable product portfolio to help customers across the value chain to

meet multiple sustainability objectives.

"Our expanded partnership with Teknor Apex perfectly reflects the purpose of our UBQ Partner Ecosystem Program, which seeks to develop collaborative, mutually beneficial relationships with compounders,

manufacturers, distributors and retailers, and connecting these partners together along the value chain," said Patricia Mishic O'Brien, Chief Commercial Officer of UBQ Materials.

➤ www.ubqmaterials.com

➤ www.teknorapex.com

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SECURE YOUR PLACE TODAY

Polymers reinforced and functionalised with bio-based materials are growing more popular. Jennifer Markarian reports on performance-enhancing additives based on lignin, hemp, cellulose and other natural products

Earth story: innovations in natural fibres and fillers

Fibres and particles sourced from wood and plant by-products or waste, as well as from agricultural crops, have long been used as fillers and reinforcements in thermoplastic compounds. They have often been called wood-plastic composites or natural fibre composites and now are sometimes called biocomposites. Today's pressure to reduce product carbon footprint by using renewably-sourced materials is fuelling further development of these "natural" fibres and fillers.

Ford, for example, has conducted research on natural fillers for automotive plastics for decades and has brought multiple projects to commercial use. The latest research project by Ford engineers in Cologne, Germany is the COMPOLive project, which sourced waste material from olive groves in Andalusia, Spain. A compound made from 40% olive tree fibres and 60% recycled PP was used to

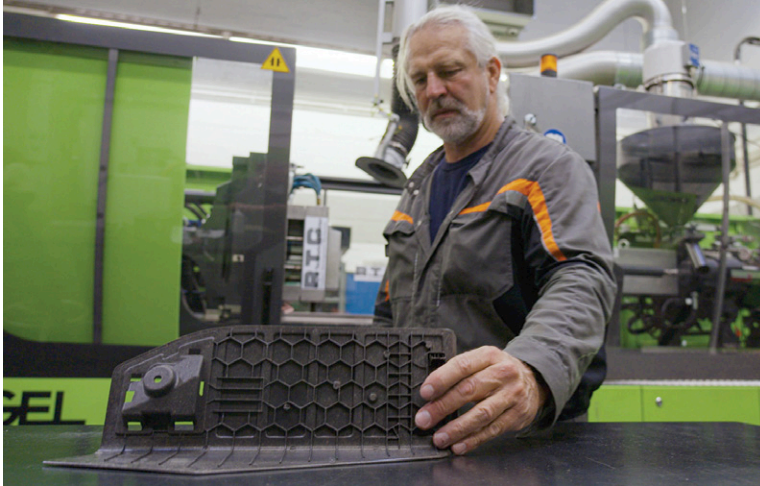
injection mould a footrest for the Ford Focus that reportedly worked well once optimised.

Heartland Industries, headquartered in Detroit, Michigan, US has begun producing commercial quantities of its Imperium product, an engineered hemp-fibre, carbon-negative additive for reducing carbon footprint of thermoplastics and other materials. The company's first industrial-scale processing facility is now in operation, located in Michigan. The operation went live in time for its first large-scale hemp harvest in 2023.

Heartland produced approximately 5m lbs of Imperium filler to fulfill commercial contracts for the coming year. The company is planning rapid scaleup from this first facility - in 2023 the company had contracted with farmers for 2,100 acres of hemp farmland and in 2024 expect a harvest of 14,000 acres across four states (Michigan, Ohio, Tennessee

Main image:
Lignin is used to make UPM BioMotion renewable functional fillers

IMAGE: FORD



Above: As part of the COMPOlive research project, a compound made from 40% olive tree fibres and 60% recycled PP was used to injection mould a footrest for the Ford Focus

and Illinois). “We are planning for additional processing to manufacture our hemp masterbatch from the harvested material,” says John Ely, Heartland’s Chief Marketing Officer. “Our goal is to have all hemp locally sourced (within 150 miles) of any of our processing facilities to streamline logistics.”

While the company was initially producing the additive in powder form, Imperium is now provided primarily as a functionalised, highly loaded (approximately 98% hemp fibre) masterbatch pellet that is much easier to handle in plastics part processing. Ely says that the fibre has successfully completed trials in PP and HDPE, and testing is underway in other polymers such as PVC and polyamides, which could go into automotive or building and construction applications. Initial results in higher temperature polymers (such as polyamides), have been very promising. A common challenge with natural products is that they tend to be less consistent than synthetic ones; Heartland, however, has successfully developed proprietary methods to ensure what the company says is absolute consistency in their additives.

Challenges

Heartland’s initial focus was automotive suppliers. “Vehicles use many different polymers with different requirements, such as conductivity or heat or chemical resistance, so we researched many different formulations that met those needs,” says Ely. “Today, in addition to developing compounds for automotive components, we’ve found that our materials work well in things like industrial packaging, which will open up even more markets for lower carbon polymers.”

AJ Pasquale, Co-founder and Director of Operations at Tennessee-based **Insight Polymers & Compounding**, sees growing interest in natural fibres and fillers as a means of increasing bio-based content in plastic parts for a wide range of

applications, from disposable PLA-based cutlery to automotive interior components. The custom compounder has worked with many types of fillers and fibres in multiple resin types.

“The biggest challenges with [many] natural fibres are moisture, odour, and colour,” says Pasquale. “These materials typically must be dried prior to compounding, but even then can have residual moisture content up to 1%. Pulling a vacuum on the compounding extruder can help to reduce this moisture, as well as reducing the volatile components that cause odour and even colour in some cases.”

Additives can also be used to mitigate negative effects. For example, odours can be trapped with additives designed for that purpose or masked with scents such as vanillin. Impact modifiers can counteract the property degradation that can result from residual moisture in compounds made with moisture-sensitive polymers such as PLA. Bleaching additives can whiten the typically brown colour of natural fibres and fillers. The ideal end-use, however, is one that can tolerate some odour or brown colour, rather than spending the energy and cost to make them odourless and clear, suggests Pasquale.

Another challenge with most natural materials is an inherent degree of variability in properties and composition. “Added to this natural variability in raw material is variation between different vendors,” says Jeremy Lizotte, Co-founder and Director of Innovation at Insight Polymers. “Many biomaterials are new to the market and there is a lack of consistency even in one type of material. If you develop a product and process around a specific vendor, it might not translate to another vendor’s biomaterial.”

Some of these issues are part of the “growing pains” of a new industry, which may normalise as the industry matures and develops more standardisation and economies of scale, adds Pasquale. Meanwhile, variability can be recognised as a risk that compounding and formulation techniques can attempt to mitigate.

Cellulose nanofibres

Norwegian research organisation **RISE PFI** has been working to improve the reinforcement of polyolefins with nanocellulose to make biocomposites, particularly for 3D-printed and injection moulded products. Nanocellulose - also called cellulose nanofibres (CNFs) - is produced from pulps with varying lignin content, utilising refining, grinding and high-pressure homogenisation processes. Notably, the lignin content in the pulp fibres significantly influences the morphology of the resulting fibrillated materials, says Gary Chinga

Carrasco, lead scientist for the Biopolymers and Biocomposites area at RISE PFI.

CNFs offer strong potential as reinforcements for thermoplastics, yet their hydrophilic nature has historically hindered their widespread use. "Traditional methods for reducing the hydrophilicity of these materials have been labour-intensive and mostly relied on organic solvents catalysed by acids," says Nanci Ehman, postdoctoral researcher at RISE PFI. "In response, recent research performed by RISE PFI introduces a one-pot acetylation technique in an aqueous alkaline medium, improving the process."

Acetylated CNFs have been compounded into HDPE biocomposites, and mechanical testing of the biocomposites shows a substantial enhancement in strength from 19 MPa for neat HDPE to more than 30 MPa for the biocomposites, says Ehman. Improvements have also been observed in melt-flow index (MFI) and elongation at break, as well as in resistance to water absorption over time.

"With RISE PFI's expertise and support, the current research paves the way for the broader adoption of cellulose-based reinforcements in thermoplastics, and thus wider application in various industries," concludes Chinga Carrasco.

In addition to CNFs, RISE PFI has helped develop biocomposites that incorporate thermo-mechanical pulp (TMP) fibres, in a collaboration with Norwegian company **Norske Skog Saugbrugs**.

"Our CEBICO products, based on TMP wood fibre and polymers such as recycled PP [rPP] or PLA, have seen a sharp activity increase in 2023 with several customer trials

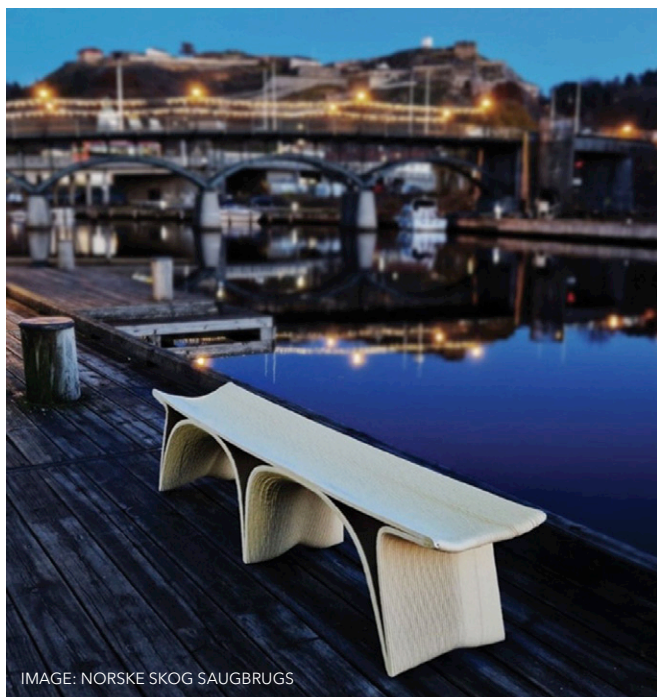


IMAGE: NORSKE SKOG SAUGBRUGS

Above: Circlab's 3D printed bench uses rPP composite from Norske Skog Saugbrugs that incorporates thermo-mechanical pulp fibres

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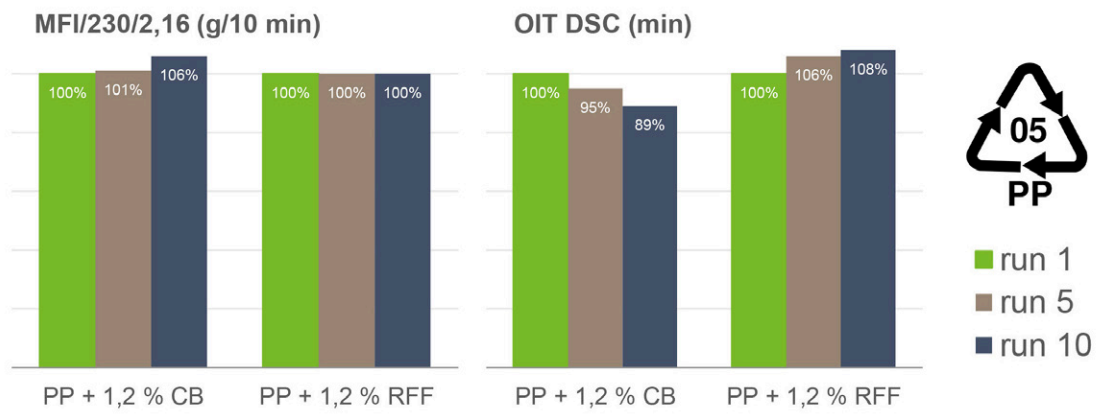
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PP filled with 1.2% RFF from UPM
 Biochemicals has demonstrated thermal stability through 10 extruder passes to simulate recycling



- PP filled with 1,2 wt.-% RFF shows excellent thermal stability: no degradation of the polymer and even increasing oxidation induction time (OIT)
- Colour of RFF filled PP was stable during the recycling loops

Source: UPM

and sales,” says Dag Molteberg, Chief Scientist at Norske Skog Saugbrugs.

The company has a pilot compounding plant with capacity of approximately 300 tonnes/year and produces natural fibre biocomposites to replace conventional plastics in injection moulding, 3D printing and extrusion. For example, the company has recently developed a biocomposite for 3D-printing based on rPP and PLA with up to 60% TMP, in partnership with Circlab of Sweden. The company’s efforts to replace TPU has resulted in a soft rPP with wood fibre with a 70% reduction in CO₂ footprint. The rPP composite was used to injection mould frisbees by Alfa Discs.

Bio-based carbon

UPM Biochemicals (part of Finland-headquartered forestry company UPM) is constructing a biorefinery in Leuna, Germany that will produce wood-based biochemicals, such as renewable glycols, industrial sugars, and lignin. Lignin is used to make UPM BioMotion Renewable Functional Fillers (RFF), which the company describes as an innovative material class designed to increase sustainability of rubber and plastic end-use applications. Startup is planned for the end of 2024.

“RFF is made from responsibly sourced hardwood from regional, sustainably managed forests and features a negative carbon footprint considering cradle-to-gate boundaries and biogenic carbon. Renewable raw materials accumulate carbon during plant growth, by sequestration of carbon dioxide from air,” says Florian Diehl, Director Sales & Marketing, RFF Business at UPM Biochemicals.

RFF contains 100% bio-based carbon content, measured using the ASTM D6866 test method. RFF has been certified by DIN Certco for industrial, home,

and soil composting according to EN 13432, with unlimited use quantity in the final product. It has demonstrated conformity according to DIN EN ISO 224031 for biodegradability in the marine environment. The company plans to apply for food-contact approvals after start-up of the pilot plant.

RFF’s low material density (1.3 g/cm³) is a benefit for plastic applications, especially at high filler loadings. It has been demonstrated in various polymers, such as PE, PP, PBAT, PLA, ABS, PA and others, at loadings up to 40%. RFF can be used as an alternative black pigment to carbon black; it achieves black colouring with a slightly reddish and yellowish tone and is detectable in near infrared (NIR) sortation equipment in recycling facilities.

UPM has been expanding its distribution network for RFF in plastics, which now includes Lehmann & Voss for the UK; Krahn Chemie Deutschland for the DACH region; Azelis for Italy, France, Turkey, and Benelux; Algol Chemicals in the Nordic and Baltic countries; Omya in Eastern Europe and Iberia; Kato Sansho in Japan; and Kangshin in South Korea.

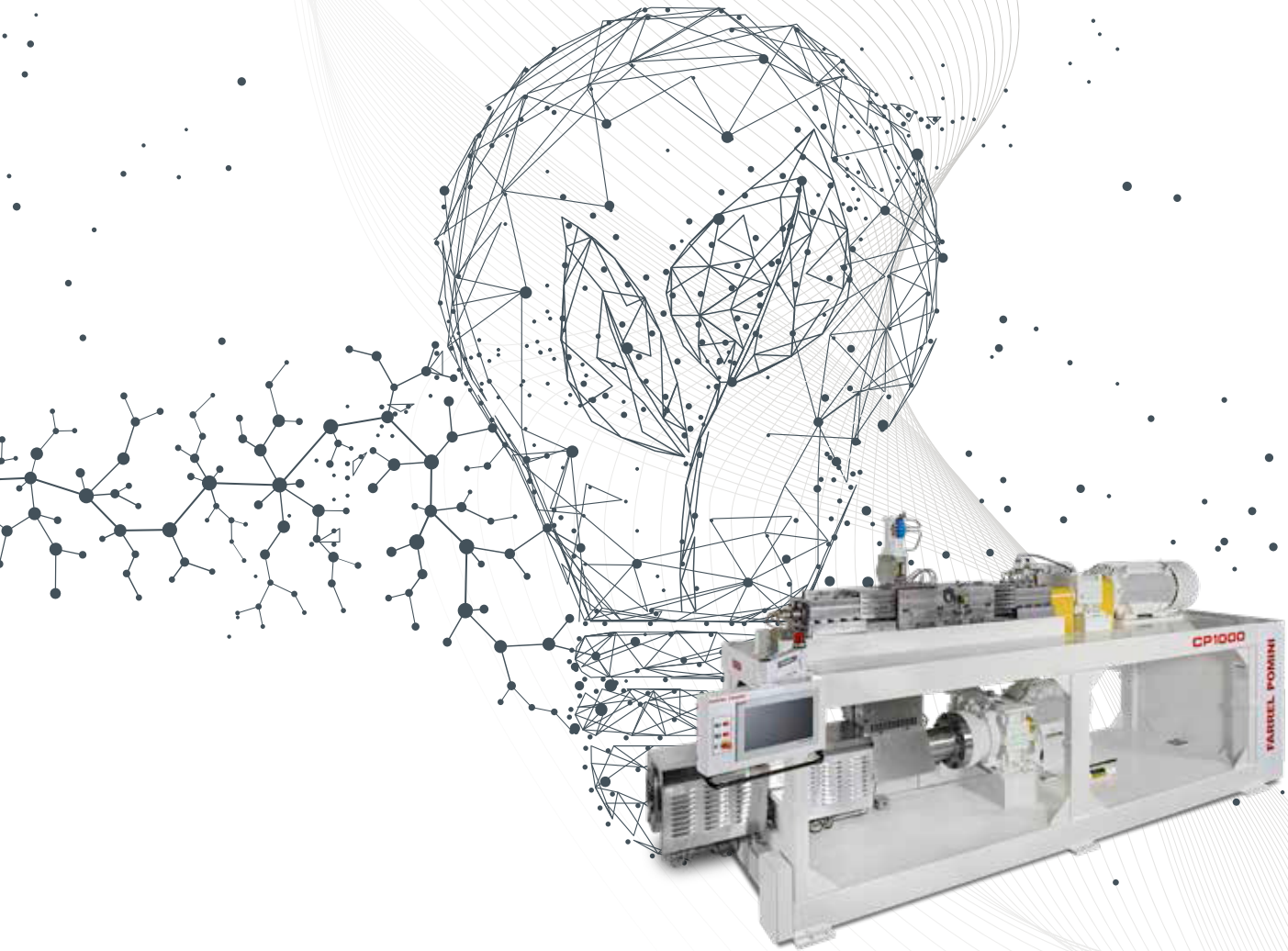
Black fillers

Dama BioPlastics, based in Denver, Colorado, US, has launched DamaBlack, a carbon-negative filler made from forestry and plant-waste biomass. “Each type of feedstock produces a different type of carbon,” says Cole Gibbs, Founder and CEO of Dama BioPlastics. Different grades are suited for various materials (such as concrete, rubber, or thermoplastics) and are available as powder or in a pelletised masterbatch.

In thermoplastics, DamaBlack can replace fillers such as carbon black. In a vehicle bumper, for example, the filler is a one-to-one, drop-in replace-

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Right: PLA reinforced with 30% lignin increases flexural and tensile modulus by approximately 30% compared to uncompounded PLA, says Krauss Maffei



ment for carbon black, where it provides the same dark black colour and UV-resistance, with no differences in processing of the compound, says Gibbs. In other applications that need higher thermal resistance, such as a battery housing, a different type of DamaBlack carbon is used at a higher loading (up to 40%). The company is collaborating with European electric vehicle maker Polestar on a long-term project that intends to produce a completely carbon-neutral vehicle by

2030. DamaBlack is being evaluated in tyres, weatherstripping, and in a UV-coating layer on injection-moulded interior trim parts.

In addition to durable automotive components, the company is working with producers of single-use plastics, such as packaging or compostable cutlery. The filler is also being tested for 3D-printing filaments. Gibbs says that a wide range of polymers, including polyolefins and bioplastics, such as PLA and PHA, have shown good results.

“We are currently making 6,500 [US] tons/yr and planning for a second location,” says Gibbs. “We are collecting biomass within 150 miles of our facility to keep their carbon footprint low.”

New Polymer Systems (NPS), based in Delaware, US, developed its NeroPlast bio-renewable lignocellulosic biochar as a weight-saving filler for thermoplastics. NeroPlast is available as a highly concentrated masterbatch, and it is sufficiently temperature stable for processing with all thermoplastic resins, says Joe Roesler, cofounder of NPS. The deeply pyrolysed biochar is hydrophobic, which makes it more compatible with polymers and longer-lasting than hydrophilic natural fillers, says Roesler.

NPS recently entered into a manufacturing and

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Right: Fence posts are made of natural fibre reinforced plastics in a project involving Neste, LyondellBasell, Biofibre and Naftex

licensing agreement with **Green Carbon Solutions** (GCS) for the production of its NeroPlast fillers and masterbatches. GCS is a Florida-based maker of high-purity biochar and is scaling up to supply various industries with its biocarbons. NPS will continue to focus on the marketing and development of its products.

Bioregion Technology (BRT), located in Oregon in the US, has launched TruBlack, created from lignocellulosic biomass from agricultural waste. The company says that a novel carbonisation process is used to turn tightly controlled biomass input into a high-quality bio-derived carbon. BRT partnered with **Nagase** to sell and distribute the additive globally. The bio-based additive is available in a TruBlack TPA IR grade for use as a NIR-reflective black pigment and in a TruBlack TPA ESD grade for use in electrostatic dissipative applications.

PLA and lignin

KraussMaffei Extrusion in Laatzen, Germany, recently partnered with **Synergy Horizon Poland** to adapt a compounding extruder to compound Synergy Horizon’s lignin powder into PLA to produce a fully bio-based reinforced thermoplastic.

Synergy Horizon has developed a method to make a free-flowing lignin powder from hydrolysis lignin, which is a waste byproduct from wood processing in the paper and bioethanol industries. that is typically incinerated. The company now uses its process to manufacture lignin powder commercially.

To compound the lignin powder into PLA, Krauss Maffei adapted its ZE Blue Power 28 laboratory extruder. “We have specially adapted the screw configuration to the lignin with heavy-sensitive mixing elements, operated at a low temperature of 160° C maximum, and use both a 6 D-long filling zone and side degassing,” says Lars Darnedde, Process Engineering Development and Project Manager at KraussMaffei Extrusion. The partners were able to incorporate up to 30% lignin into a PLA matrix in both the laboratory extruder and a small ZE Blue Power 42 production compounder.

Darnedde says that the lignin acts as a reinforcement and increases flexural and tensile modulus by approximately 30% compared to uncompounded PLA. The lignin also exhibits natural antioxidant properties and has no odour. He adds that the lignin enhances biodegradability, and the compounds demonstrated a biodegradation rate of more than 90% in 99 days.

Natural fibre plastic composites in construction applications, particularly those made with bio-based or renewably-sourced polymers, are long-lifetime



IMAGE: NAFTEX

applications that can provide carbon storage, says **Neste**, which produces feedstock from bio-based waste and residues for polymer production. For example, Neste’s feedstock is used by **LyondellBasell** to make CirculenRenew C14 PP with measurable bio-based content, and Germany’s **Biofibre** compounds this PP with natural fibres to make its new BioSustra compounds for extrusion into products, including fence posts manufactured by **Naftex**.

“We have been using natural fibre residues from organic farming for quite a long time. The fibres stem from sources in close proximity to our production site and do not compete with food or feed production,” says Jörg Dörrstein, Managing Director of Biofibre. The company reports that an LCA study created by GreenSurvey for Biofibre confirms that the amount of carbon removed from the atmosphere by the biomass exceeds supply chain emissions from logistics and manufacturing of the reinforced plastics granules.

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The expanding use of 3D printing has led to development of reinforced materials. Chris Saunders looks at this and other emerging trends in 3D print compounds



IMAGE: CRP TECHNOLOGY

Shaping new materials to applications

3D printing, or additive manufacturing (AM), has benefited a broad range of industries by enabling the rapid prototyping and small-volume production of complex geometries. Plastic compounds have become a cornerstone of this development, not just because of their versatility, affordability, and ease of processing, but because they offer such a vast array of properties which can be tweaked as necessary, making them suitable for numerous applications.

Even though it is still considered a niche technology and will not replace mass production methods such as injection moulding or blow moulding anytime soon, 3D printing is growing at a steady pace. Polylactic acid (PLA) is a material commonly used, its ease of use making it ideal for hobbyists printing at home. The material is also widely used for prototyping in the automotive industry, as well as for home décor and furniture applications. With the right compounding technique and mix of ingredients, PLA can be enhanced to improve a final application's heat resistance, impact resistance, durability, dimen-

sional stability, and biodegradability, to name just a few areas.

Seda Cantekin, Global Market Segment Leader at PLA compound producer **TotalEnergies Corbion**, said: "We continuously work with value chain partners, end users, and machine manufacturers, to follow the latest trends and respond to our partners' needs. From our perspective, high-speed printing is the latest trend in 3D printing. If high-speed printing resins/filaments become the industry standard, they can add value to the industry such as faster lead times, less material consumption, and less CO₂ emissions. We as a company build up strategic partnerships to follow these developments closely and provide solutions using our PLA resins. Applications containing recycled PLA are also becoming increasingly popular among printers."

US-based **Insight Polymers & Compounding** sees four themes in polymer development, some of which extend to 3D printing compounds. The first is the drive towards sustainability. 3D printing compounds are evolving on a similar track to

Main image:
Polyamide tube produced using Wind-form selective laser sintering technology from CRP Technology

IMAGE: INSIGHT



Above: Cat models printed using black PETG. The cat on the right incorporated Insight TCA112 Low Gloss PETG Masterbatch

polymers, with the development of basic materials such as PLA and PETG, a recyclable polymer that lends itself well to recycled parts, it said. In 2023, Insight Polymers installed an 18 mm extrusion line to enable work with sustainable and biomass-derived fibres, fillers, and composites, and this year launched PETG & PLA Low Gloss masterbatches.

Functional parts

A second emerging theme is the movement towards developing polymers for metal replacement. The third theme is 3D printing moving beyond prototypes to complete, functional finished articles. "To make this transition, we had to deal with factors that didn't seem quite as important before," said Jeremy Lizotte, Insight Polymers' Co-founder and Director of Innovation. "These factors were the aesthetics, such as low-gloss, colour effects, and surface characteristics. Because the polymer must provide long-term functionality necessary for a finished product rather than a prototype, high-temperature performance, long-term aesthetic qualities, and long-term performance characteristics, are all more important."

The fourth theme relates to the growth in size of 3D printed parts. In the past, most 3D printing was of relatively small objects. As they got larger, the importance of dimensional stability became more significant.

The company said it is also working on ultra-high viscosity PET glass fibre compound for Big Area Additive Manufacturing (BAAM). "As newer, advanced techniques of 3D printing are being developed, they need materials that match the process and vice versa," said AJ Pasquale, Co-founder and Director of Operations. "3D printing is evolving on the equipment and materials sides together."

Evonik has developed Infinam eCO, a PA12 powder for 3D printing which is said to substitute 100% of fossil feedstock with bio-based raw material by mass balance approach. This, the

company stated, amounts to a 74% reduction of CO₂ emissions compared to its Infinam Terra development grade.

Waste cooking oil, of which more than 15m tonnes is produced annually around the world, has been identified as an ingredient that can be used as a raw material for chemical production. By leveraging it in the production of Infinam eCO PA12, Evonik claims to have developed a material significantly more sustainable than its previous PA12 offerings. The company said that as well as exhibiting "excellent processability and stable mechanical properties" the new grade has a proven reusability rate of 100% of the structure support powder, with a refresh rate of 70/30 of used versus virgin material over several printing cycles.

"True circularity is key for being successful in the future," said Dominic Störkle, Head of the Additive Manufacturing Innovation Growth Field at Evonik. "Evonik has developed a formula for its PA12 powders to drive circular plastics economy in additive manufacturing. With the introduction of Infinam eCO PA12, we go far beyond chemistry to start closing the loop."

Industrial 3D printing requires materials that, as printed components, correspond to the performance level of injection-moulded parts. Powder bed processes such as laser sintering offer almost unlimited geometric freedom, necessary because many components originally designed for injection moulding have complex geometries.

Reinforced polyamide

Evonik said that unbound, very thin fibres or microscopic needles are risky to handle from an occupational safety perspective, and for this reason do not receive internal approval from industrial 3D printing processors. To combat this, in cooperation with Evonik, **Lehvoss** has developed a PA613 with compounded carbon fibre reinforcement. The base polymer PA613 was designed specifically for laser sintering and characterised by low moisture absorption, high temperature stability and, unlike PA6, high process stability in laser sintering. The fibre reinforcement consists of high-strength XCF fibres, which have previously been used in Luvo-com XCF products for injection moulding. Evonik said that when it comes to powder production, new approaches to particle technology were explored to preserve the fibre lengths in the individual particles as best as possible.

Printing the Luvosint PA613 9711 CF requires a build chamber temperature of 195°C, which makes standard laser sintering machines suitable for processing. "The fact that the first automotive

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Right: CRP Technology's Windform technology has been used for products in motor sports, such as this Nascar electrical enclosure from DCE

OEMs have already qualified for spare parts production shows that we are on the right track," said Marcus Rechner, Product Manager for Luvosint at the Lehvoss Group. "Nevertheless, in laser sintering, there still needs to be a willingness to innovate in order to develop even more industrially relevant materials, including machines optimised for this, in order to bring industrial 3D printing into series."

At the 27th Vehicles and Transportation Technology Innovation Meeting in Turin, Italy, in March, 3D printing service bureau **CRP Technology** further underlined the advantages of selective laser sintering in combination with thermoplastic composite materials from its Windform range. Windform is a polyamide-based material reinforced with glass fibre considered particularly suitable for applications where the material has to be able to flex for extended periods without risk of damage. Other benefits include lightweight design, resilient functionality across a broad temperature spectrum (-35°C to +191°C), superior mechanical performance encompassing high strength, impact resistance, thermal stability, liquid and moisture resistance, vibration damping, and corrosion resistance. The company said the material has also demonstrated outstanding electrical insulation performance, as confirmed by dielectric constant and dielectric strength tests which revealed a dielectric constant of approximately four and



IMAGE: CRP/DCE

withstanding peak voltages of at least 2.5 kV/mm. These results are significant for electrical applications, where maintaining a dielectric constant around four is crucial, especially in fully electric vehicles with high voltage. Windform products have been used in the supercar sector, offering solutions that satisfy the extreme requirements typical of high performance vehicles. Moreover, 3D printing solutions in Windform are being increasingly utilised in hybrid propulsion systems.

"Windform materials were developed to address the everyday challenges faced by CRP's Motorsports clientele," said Franco Cevolini, CEO and Technical Director of CRP Technology. "Initially utilised for creating superior parts for wind tunnel tests, they have since become instrumental in producing race-ready components with unprecedented features. These remarkable results have propelled Windform composites to the forefront of advanced industry sectors such as automotive and aerospace. In recent years, the synergy between the expertise of CRP Technology as a leading 3D printing service bureau and the advanced solutions offered by Windform materials has paved the way for groundbreaking innovations in the supercar and hybrid propulsion sectors."

Windform is also being used to manufacture items as diverse as pipes, drones, and orthotics. In the latter sector, CRP worked in collaboration with

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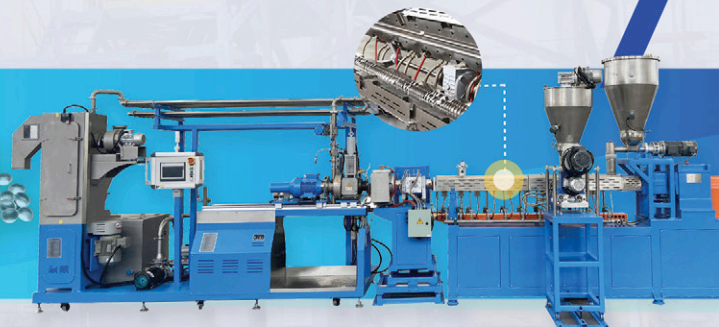
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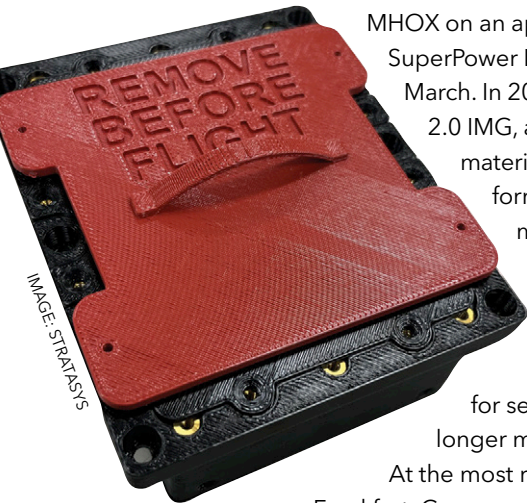
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MHOX on an application displayed at the SuperPower Design exhibition in Belgium in March. In 2023, CRP launched Windform XT 2.0 IMG, a high-performance composite material 100% recycled from Windform XT 2.0 industrial 3D printing material. Cevolini said: "For some time we at CRP Technology have been studying an alternative and total use of exhausted Windform powders for selective laser sintering that no longer meet our high quality standards."

At the most recent Formnext exhibition in Frankfurt, Germany, last November, **Evolve Additive Solutions**, a provider of industrial 3D printing solutions headquartered in Minnesota, US, announced the commercial launch of its new parts production service, STEP Parts Now. It claims this is the only additive manufacturing process on the market today that can deliver on the fidelity, surface finish, accuracy, and material properties required to reliably and repeatably print end-use parts at scale. Customers can now quote and order STEP parts directly from Evolve through a dedicated online portal which facilitates part ordering availability through Evolve's strategic partners and their STEP production centres in the US and Germany.

More accessible

"What we are launching with STEP Parts Now is much more than parts as a service," said Jeff Hanson, Evolve's Senior Vice President of Go-to-Market. "We are increasing accessibility to a newly identified technology category that finally delivers on past industry promises of materials, features, and scalability by additive manufacturing for true production."

In addition to its launch of STEP Parts Now, Evolve announced the commercial availability of two new materials: Nylon PA-11(A) and Gray ABS. The new Gray ABS material complements Evolve's existing Black ABS and exhibits mechanical properties within 10% of bulk injection moulded ABS while exhibiting structural colour contrast for fine features and textures, while PA-11(A) offers significant mechanical performance advantages over powder bed fusion PA-11, it said. Qualities including a superior elongation at break, higher impact strength, and a higher heat deflection temperature.

Recent developments indicate that the sky really is the limit for 3D printing technology. In March this year, **Stratasys** announced that it is providing 3D-printed materials for an upcoming lunar mission to test their performance on the surface of

the moon. The experiments are part of **Aegis Aerospace's** first Space Science & Technology Evaluation Facility mission (SSTEF-1), a commercial space testing service developed under NASA's Tipping Point program. For this moon mission, Stratasys will provide 3D-printed samples that will be brought to the lunar surface by an unmanned lander in a 3D-printed carrier made from ULTEM 9085 thermoplastic, a material also commonly used in commercial aircraft interiors.

To the moon and back

Three materials will be the focus of two different experiments. The first will assess the performance of a sample coupon part made with Stratasys' Antero 800NA FDM filament filled with tungsten. Antero 800NA is a high-performance PEKK-based thermoplastic with excellent mechanical properties, chemical resistance, and low outgassing characteristics. Adding tungsten is intended to provide shielding against harmful radiation such as gamma rays or x-rays.

The second experiment is designed to see how 3D-printed materials perform in space and will feature Antero 840CN03 FDM filament which has electrostatic discharge (ESD) properties for use with electronics. The experiment will also include a new ESD photopolymer manufactured by Stratasys' partner **Henkel** for use with Origin One 3D printers and designed for high-heat environments. This experiment will subject coupon samples of the 3D-printed materials to moon dust, low pressure, and rapid temperature swings.

"Additive manufacturing is an important technology for space missions where every ounce of weight matters and high performance is essential," said Chief Industrial Business Officer Rich Garrity. "This set of experiments will help us understand how to fully leverage 3D printing to keep people and equipment safe as we travel to the moon and beyond."

Aric Yackly, Product Manager at Stratasys, said: "The landscape of 3D-printed photopolymers is marked by diversity and functionality. Research and development efforts have led to the formulation of materials with enhanced temperature resistance, toughness, and specialised properties like flame retardancy and electrical insulation. This is reflected in various test results, showing these materials' improved resistance to stress and impact, as well as their ability to retain properties over time. The focus is now shifting towards customising materials for specific applications. Innovations are underway in areas like thermal conductivity, dimensional stability, and sustainable formulations. The goal is



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In a similar vein, Massachusetts-based **Markforged** has released Vega, an ultra-high performance filament designed for aerospace manufacturing on Markforged's FX20 printer which not only offers exceptional strength, but also is expected to bring customers substantial advantages in weight reduction, cost efficiency, and lead time savings. "Vega incorporates PEKK, a proven material in aerospace that possesses excellent strength and stiffness," said Shai Terem, CEO of Markforged. "We believe this material will set the standard in print quality for high temperature thermoplastics and expand the adoption of our FX20 printer."

The company said Vega builds upon Mark-

forged's material expertise and proven track record of engineering chopped carbon fibre-filled polymers that deliver strength, precision, and surface quality. With a smooth black matte surface finish, Vega offers an excellent finish for aesthetic aerospace parts. The new material resists warping and exhibits Flame, Smoke, and Toxicity (FST) resistance. Combined with Markforged's Continuous Fiber Reinforcement technology, Vega provides increased design flexibility, without sacrificing strength, which opens the door for new applications that were previously unreachable, said the company.

CLICK ON THE LINKS FOR MORE INFORMATION:

- > www.totalenergies-corbion.com
- > <https://insightpolymers.com>
- > <https://corporate.evonik.com>
- > www.lehvoss.de
- > www.crptechology.com
- > <https://evolveadditive.com>
- > www.stratasys.com
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IMAGE: MJ GAUTRAU / ASCC



Strong build: 3D printing with fibre composites

Bio-based fibres are being used in compounds for 3D printing building components and other demanding applications.

Jennifer Markarian finds out more

Main image: BioHome3D was 3D printed with bio-based materials in a US project

The **University of Maine’s Advanced Structures and Composites Center (ASCC)**, in a project with the US Department of Energy’s **Oak Ridge National Laboratory (ORNL)**, has developed a completely 3D-printed house made entirely with bio-based and recyclable materials.

The prototype BioHome3D was designed and manufactured as part of the Sustainable Materials & Manufacturing Alliance for Renewable Technologies (SM²ART) Program between the University of Maine and ORNL. The walls, floors, and roof were all printed from wood fibre-filled PLA pelletised compounds using the ASCC’s large-scale printer. The durable, amorphous PLA grade from NatureWorks was designed to have a low material shrink

rate to reduce warpage in large-format 3D printing.

The SM²ART program is investigating a range of material additives and functionalisations to increase the strength and overall performance of the resulting composite. For example, a recent publication by University of Maine researchers described cellulose nanofibres (CNF) that were modified at the surface with PMMA, which resulted in composites with higher tensile strength. The researchers said that the improvement was attributed to improved interfacial compatibility between the PMMA-modified CNF and the PLA matrix.

The house was unveiled on the University of Maine campus in late 2022. The prototype has sensors for thermal and environmental monitoring,

and the team is collecting data on how the materials perform over time in the Maine climate. The team says that they are currently looking at a range of possible improvements to optimise the materials.

ASCC says that the fully bio-based and 3D-printed home is unique, as other 3D-printed home designs use concrete walls on a conventional, concrete foundation with traditional wood roofing.

The SM²ART collaboration is actively researching bio-based, 3D-printed composites in a range of applications, including boat building and offshore wind components.

Particles and fibres

In a project at the German **Fraunhofer Institute for Wood Research (WKI)** in collaboration with the University of Stuttgart, the Laser Zentrum Hannover and industrial partners, researchers are using an extrusion-based 3D printing process (fused deposition modeling) for thermoplastics reinforced with natural fibres to manufacture interior construction components (façade elements, free-form furniture or partition walls).

As a demonstration, Fraunhofer WKI developed the material for a column displayed at last year's prestigious Biennale event in Venice, Italy. The material consisted of wood particles embedded in a matrix of PLA-blend. The Biennale Architettura 2023 was open from May to November.

The Fraunhofer WKI group is currently researching composites made with continuous natural fibre (including cellulose and flax) filaments for 3D printing. PLA filaments with diameters of 1.75 mm and 2.85 mm and fibres in the core were prepared using a twin-screw extruder with a specific die.

"The main challenge is to use fibres which have been well dried and to keep the filament diameter constant," says Arne Schirp, project leader at the Fraunhofer WKI. "At present, printing tests are being performed as part of a project with several partners that is coordinated by the University of



IMAGE: ANDREA FERRO PHOTOGRAPHY

Stuttgart. In addition, we have been working on fibre pretreatments, including fire-retardants, with promising results. Small-scale flammability tests (based on the UL94 procedure) showed V-0 classification for 4-mm thick printed samples. Inclusion of the fibres prevented burning dripping; the latter was observed with pure PLA."

Sweden's **Biofiber Tech** produces FibrAQ pellets using its patented technology to make wood fibres hydrophobic and more compatible with plastics. The company's FibrAQ compounds contain the wood fibres in virgin or recycled plastics (for example ABS, TPE, EVA) or in bio-based plastics. In a recent project funded by Sweden's Bioinnovation and in partnership with Research Institutes of Sweden (RISE), FibrAQ compounds made with plastic recycled from discarded fishing nets were used by sporting goods company Melker of Sweden to 3D-print a kayak.

Above:
Material for a 3D-printed column made from natural-fibre reinforced thermoplastic was developed at the Fraunhofer Institute for Wood Research

CLICK ON THE LINKS FOR MORE INFORMATION:

- > www.composites.umaine.edu
- > www.ornl.gov
- > www.wki.fraunhofer.de
- > www.biofibertech.com



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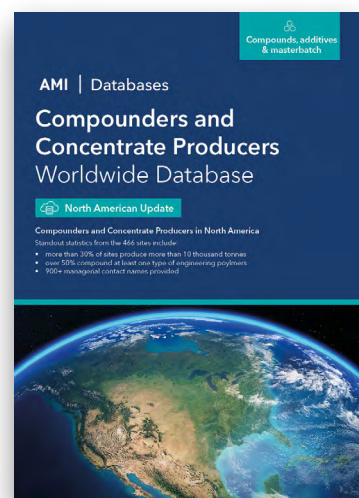
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NPE 2024: US show returns to action after six-year gap



IMAGE: OCC

The triennial NPE show, which was cancelled in 2021 due to Covid, returns with around 2,000 exhibitors. We preview some of the exhibits that are relevant to compounding companies

NPE, the huge plastics show for the North American market, returns after a six-year hiatus. It was cancelled in 2021 due to the Covid-19 pandemic.

This year's show, held on 6-10 May 2024 in Orlando, Florida, boasts around 1.1 million sq ft of exhibition space. The Plastics Industry Association, which organises NPE, expects to host around 2,000 exhibitors and welcome around 55,000 visitors.

"We look forward to welcoming our industry back to NPE 2024," said Matt Seaholm, president and CEO of the association. "With sustainability at the centre of everything produced at the show, attendees will witness new technologies and significant education opportunities to push us toward a more circular economy."

As well as the exhibition floor, the show has a number of presentations and briefings – focused on industries including packaging, automotive and construction. It also features six Technology Zones, which include: recycling & sustainability; materials

science; advanced manufacturing; and packaging.

The educational programme at NPE includes more than 100 sessions key industry topics such as workforce development, circularity and artificial intelligence. Three new 'Spark Stages' will present developments in innovation (such as electrification, UV blockers and engineering thermoplastics), sustainability and bottle technology.

There will also be two technical seminars in Spanish, aimed at attendees from Latin America. A keynote speech will be delivered by Michael Heinz, chairman and CEO of BASF.

Main image:
NPE, which returns to the Orange County Convention Center in Orlando, expects to welcome around 55,000 visitors

NPE 2024 - Key information

Dates: 6-10 May 2024

Venue: Orange County Convention Center, Orlando, Florida, USA

Opening hours: 9am to 5pm daily (until 3pm on final day)

Organiser: Plastics Industry Association

Website: www.npe.org

Right: PH25 pelletiser from Bay Plastics Machinery

At NPE 2024, **Ampacet** is placing the spotlight on its LIAD Smart line of colour automation systems, including self-cleaning feeders, automated centralised blenders and in-line colour correction. Two new LIAD Smart products will be demonstrated at its booth: the Spectro-Metric 6 and BlendSave Compact.

Dealing with colour inconsistency in PCR-containing materials, SpectroMetric 6 is a closed-loop automated system that combines advanced AI inline colour measurement technology with colour correction software to determine the appropriate pigments required to correct a colour in-line and automatically meter the pigments in real time.

The new LIAD Smart BlendSave Compact is a space-saving, automated resin management and blending system for new and existing operations. It can blend up to 40 raw materials while distributing individual recipes to any 10 machines for total accuracy of blends with zero contamination or human mistakes.

> www.ampacet.com

In the run-up to the NPE show, **Avient** said its highlights would include: the announcement of a new facility in Ohio; launch plans for a “groundbreaking” oxygen scavenger technology for PET packaging to enhance product preservation sustainably; a new non-PFAS process aid for extrusion; and a new, “super tough” nylon formulation in its recycled content portfolio.

The company said a series of technical seminars at its NPE customer centre would explore issues around carbon footprint reduction and sustainability strategies. This includes insights on steering through environmental standards, meeting consumer demands for more sustainable products, and developing innovative approaches to brand differentiation.

> www.avient.com

Below: ZS-B 70 MEGAfeed side feeder from Coperion

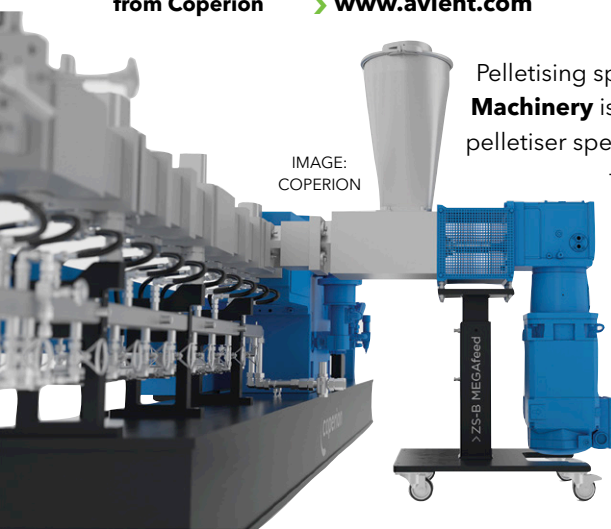


IMAGE: COPERION

Pelletising specialist **Bay Plastics Machinery** is demonstrating a new pelletiser specifically for pharmaceutical applications, as well as new feed roll material for strand pelletising.

The new PH25 pelletiser features construction with 316

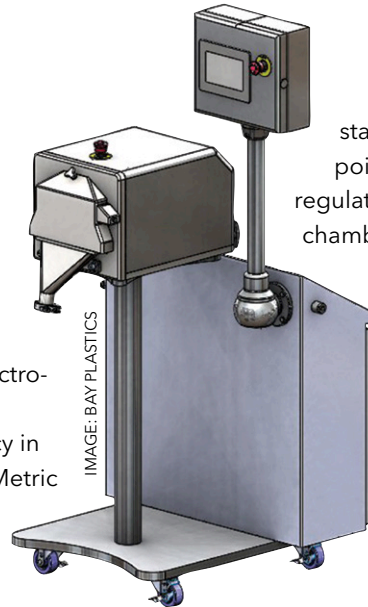


IMAGE: BAY PLASTICS

stainless steel at all material contact points to comply with pharmaceutical regulations. Most of the PH25’s cutting chamber parts are easily removable for cleaning and, if required, sterilised in an autoclave.

Other BPM products on show include: the AXM12 large micro pelletiser, the EVAK-06 and EVAK-12 mid-to-large dewatering machines, the WBX1008-10 mid-to-large water bath for cooling and the WBX0606-6 small-water bath.

> www.bayplasticsmachinery.com

CJ Biomaterials, a division of South Korea-based CJ CheilJedang, has introduced two PHA-based compounds developed for blown, cast, and MDO film applications. The company says PHACT CA1270P (clear) and PHACT CA1240PF (opaque) “mark a significant advancement in sustainable flexible packaging, offering excellent performance and environmental benefits”.

In testing, both compounds have demonstrated an “outstanding” balance between stiffness, strength, tear, and puncture resistance, ensuring durability in various packaging applications, it says.

> www.cjbiomaterials.com

Sustainability and innovation are key themes for **Clariant** at NPE, the company says. Its Licocare RBW Vita waxes are based on renewable bio-based rice bran wax feedstocks, a non-food raw material with at least 98% Renewable Carbon Index. It says they are a natural replacement to traditional coal-based montan waxes. Licocare RBWs are suited for polyamide, polyester, PVC, and other engineering polymers.

Clariant is also highlighting new stabilisers in its AddWorks portfolio. Among these are: AddWorks TFB 117 which helps to improve the quality of nylon fibres; and AddWorks AGC 970 G and 102 G for mulch and greenhouse films.

Among its flame retardant additives, Clariant is showing Exolit OP 1400 a high performance, halogen-free flame retardant designed for e-mobility charging at higher voltages.

> www.clariant.com

Coperion and **Herbold Meckesheim**, part of the Hillenbrand group, are jointly exhibiting at booth W1601. The two companies will show how they collaborate in the area of plastics recycling. On display will be a ZSK 58 Mc18 twin screw extruder configured for manufacturing high-quality PET

using recycled materials as well as the recently introduced ZS-B 70 MEGAfeed side feeder for lightweight fibre and flakes recycling, along with a Herbold Meckesheim HV70 plastcompactor.

Using the ZS-B 70 MEGAfeed side feeder, plastic recyclate with a bulk density starting as low as 20 kg/m³, can be reliably fed in large quantities into smaller sizes of Coperion's ZSK twin screw extruders and be concurrently recycled and compounded. The HV 70 plastcompactor is the most powerful of the series from Herbold Meckesheim. It processes the feedstock in continuous operation between a rotating and a fixed compactor disk, which are equipped with screwed-on and easily exchangeable kneading bars.

Also part of the Hillenbrand group of companies, **Schenck Process** (booth W1181) is showing the FPM MechaTron Flat Bottom (FB) feeder. With a bottom driven vertical agitator and an auxiliary agitator, the MechaTron FB is designed for hard to feed materials such as chopped polypropylene or PET plastic film when feeding to an extruder.

- > www.coperion.com
- > www.herbold.com
- > www.schenckprocessfpm.com



Effect pigment group **Eckart**, part of Altana Group, has a number of new products at NPE. STAPA AC Reflexal is a new range of aluminium pigments that can produce a chrome-like appearance with high levels of brightness and gloss. The special carrier enables very good compatibility with many polymers, says the company.

With its new NIR Silver pigment, Eckart says it has developed a pigment solution that is tailored

Left: NIR Silver pigment from Eckart enables automatic sorting for mechanical recycling

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IMAGE: GNEUSS



Above: Gneuss OMNI recycling system

to the needs of automatic sorting for mechanical recycling. NIR Silver are pigments specially optimised for their detectability by NIR technology.

LASERSAFE 020 is a new pigment for laser marking especially suited for bright marking on dark backgrounds. Very low pigment concentrations in the final application result in bright and high-contrast markings, the company says.

> www.eckart.net

At NPE, **Entek** will feature new twin-screw extrusion equipment and technology, new replacement wear parts with an interactive screw design display, and new material handling equipment.

Entek's HT line, which began with the introduction of the HT 72 machine in 2020, is being expanded with the development of the new HT 162 and HT 92. Twin-screw technology displays will include: vent flow sensor technology on a 103 mm twin-screw extruder barrel; VFT twin-screw compounding technology for increased output and improved product quality; and 37 mm QC3 stuffer, with mounting arm and 4 x 43 mm twin-screw extruder barrels.

In the material handling display, a vacuum loader and filter receiver from Entek Adaptive are designed for difficult to handle materials, focused on powders. The systems can be sized from 100 to over 40,000 pounds/hr depending on the customer's need.

> www.entek.com

Highlighting recycling at NPE, **Farrel Pomini** is showing a mechanical recycling system with a large feed hopper for irregularly shaped material, crammer options for low bulk density feeding, proprietary hard surface coatings for maximum wear, a patent-pending grooved mixer feed section and a vent capture system. The company says the Farrel Continuous Mixer also excels as the primary stage of pyrolysis-based chemical recycling

processes. A presentation will be featured on the stand showcasing the company's role in a patented pyrolysis process for plastics developed by Lummus Technology.

Farrel Pomini will also demonstrate its expertise in biodegradable plastics and recycled compounding at NPE. A presentation called "Novel biocomposites produced by the continuous compounding process" will discuss the company's development work with partners FPIInnovations, West Fraser, and Good Natured Products.

> www.farrel-pomini.com

Gneuss will show a complete OMNI recycling system featuring a Multi Rotation System (MRS) 130 extruder, a water ring pump vacuum system, a fully automatic melt filtration system RSFgenius 150 and an online viscometer VIS. This machine is designed for the processing of up to 1,000 kg/h of undried and uncrystallised polyester (PET) reclaim. The line on display in Orlando will be delivered to a customer in Peru after the show to process rPET into a thermoforming sheet.

> www.gneuss.com

Kraiburg TPE is highlighting new materials with recycled content during the show. Designed for exterior automotive applications, the RC/UV/AM series adheres to PP and has a post-industrial recycled content of 30-50%. These compounds are suitable for applications with UV resistance, help reduce the carbon footprint and are available in black. They can cover different hardness levels, from 65 to 90 Shore A.

The RC/FG/AM series is for automotive interior applications and adheres to PP. They offer a post-industrial recycled content of up to 40%. They are available in different degrees of hardness from 65 to 85 Shore A. The RC/PCR/AM series is available with a post-consumer recycled content of up to 44% and was developed for applications in the consumer and industry segment. They are available with possible hardness levels from 40 to 90 Shore A and are offered in grey. If necessary, they can be coloured according to customer requirements.

> www.kraiburg-tpe.com

Kraton will exhibit its CirKular+ product line of additives which it says enable recyclable design, promote mixed plastics reuse, and maximise post-consumer content. Its CirKular ReNew Series offers ISCC PLUS certified renewable solutions with up to 100% renewable content and a reduced carbon footprint.

> www.kraton.com

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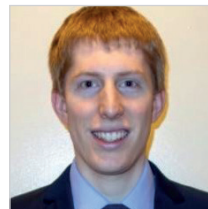
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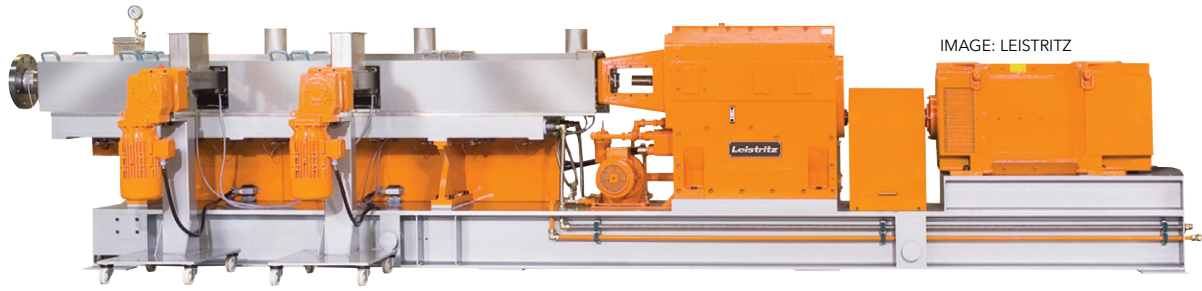


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**Left: ZSE-60
MAXX
co-rotating
twin screw
extruder from
Leistritz**

Visitors to **KraussMaffei's** NPE booth can experience the entire material cycle, going from a short-life medical blood vial to a long-life bottle opener. Starting with injection moulding on a PX 251-1400, moving on to the upcycling process and to the twin-screw extruder ZE 28 BluePower and then to the all-electric injection moulding machine PX 81-180, KraussMaffei said it is demonstrating everything from valuable utilisation of raw materials from disposable articles to production of premium quality components with a long service life.

The PX 251-1400 injection moulding machine produces 32 medical blood vials per shot from PP 9074 MED material supplied by ExxonMobil. After shredding, these vials serve as base material for the up-cycling process carried out on the ZE 28

BluePower twin-screw extruder. Various additives such as bonding agents and liquid pigments are added, mixed and homogenised. The resulting re-compound is transferred to the PX 81-180 injection moulding machine to produce bottle openers.

> www.kraussmaffei.com

A wide range of twin screw extruders and auxiliary equipment will be exhibited by **Leistritz**. A ZSE-60 MAXX co-rotating twin screw extruder features a modular design for barrels and screws that are rated for 425° C operation. Auxiliary equipment integrated with the ZSE-60 MAXX includes an LSB-side stuffer for downstream introduction of fillers into the process section and an LSA swing

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gate strand die with provision for filtration.

The ZSE-40 MAXX model in the co-rotating twin screw range, suited to colour concentrates and small lot production, has an AC water-cooled motor integrated into the machine design, which operates more quietly than air-cooled motors, and eliminates unwanted air flows in the plant. A ZSE-27 MAXX unit is also being shown.

The Leistritz ZSE-12 twin screw extruder is being exhibited for the first time at NPE. The extruder is suited for continuous operation and is designed for low rate and small batch processing. A ZSE-18 twin screw extruder for R&D uses is also being shown.

➤ www.leistritz.com

MAAG Group says it is a leader in the development of die plates for underwater pelletising systems for compounding and now with the acquisition of AMN, die plates for virgin polyolefin production can be provided.

The group will also exhibit the new PEARLO X Series pelletiser for throughputs of up to 40 t/hr. Its high level of automation allows start-up and shut-down at the push of a button, while wear-optimised cutting tools maximise production times while minimising downtimes and waste.

It will show melt filtration systems, such as the FSC flat screen changer for extrusion applications, which offers ultra compact design and optimised residence time. With the DFS-BF, its Duplex large area filtration systems are now backflush capable, due to the Divexpro valve. Another new product that MAAG will be presenting at NPE is the ContiNeo backflush screen changer.

➤ www.maag.com

Maguire Products is introducing its Tracker Monitoring and Reporting Software which is a web-based equipment and software solution giving users comprehensive monitoring and control capabilities for all Maguire WSB Blenders, MGF Feeders, ULTRA Dryers, and FlexBus Conveying Systems. Tracker provides real-time insights and secure data transmission for downloading data into a third-party database for reporting and analytics. This enables integration with ERP or other software systems for enhanced operational efficiency.

Tracker includes a Maguire MT Hub capable of connecting an unlimited number of Maguire units

using regional hubs, if necessary, over a customer's existing network. A software subscription includes secure encrypted cloud-based data storage, rolling software updates, and remote technical support after initial startup for 90 days.

➤ www.maguireproducts.com

At NPE, **Milliken** will unveil two new additives for polyolefins, Milliken UltraGuard 2.0 and Hyperform HPN 58ei. UltraGuard 2.0 builds on the group's longstanding line of tailored masterbatches for PE to improve barrier performance in HDPE and LLDPE by up to 70%, supporting more mono-material packaging options and material downgauging. Hyperform HPN 58ei enhances performance for PP sheets and thermoformed parts to deliver improved optical performance, isotropic shrinkage and regrind quality and is FDA-approved for food packaging.

Milliken's Millad NX 8000 platform, a PP clarifying agent, is another NPE highlight, showing

how it can help lower the energy consumption and cycle time during injection moulding, with UL-certified energy savings of up to 10%.

➤ www.milliken.com

MiVue, part of the ACS Group, will be showing expanded capabilities for its plant monitoring software for plastics processors at NPE. New features and modules that have been recently added include: Job Report Module for lot tracking and quality accountability; Material Usage Module to track manufacturing material assets and cost; Preventative Maintenance Module to ensure proper maintenance schedules are followed unique for each machine type; Overall layout and control improvement

based on customer input.

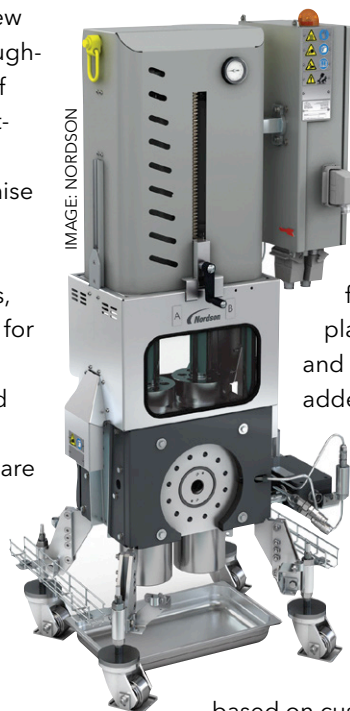
➤ www.mivue.com

Nordson's Polymer Processing Systems division is using NPE as a platform to promote its position as a leading global supplier of polymer and fluid coating die systems, pelletisers and melt delivery systems.

Making their US debut at NPE are the BKG HiCon K-SWE-HD/RS melt filter which helps film and sheet producers use more recycled materials, and the EDI Prodigy automated lip adjustment system for EDI extrusion and fluid coating dies.

➤ www.nordson.com

**Right: BKG
HiCon K-SWE-
HD/RS melt
filter from
Nordson**



Orion will showcase two new sustainable specialty carbon black grades suitable for wire-and-cable applications at NPE. Produced from end-of-life tyre pyrolysis oil, the new circular grades match the performance of regular, fossil-based specialty carbon black, the company says. Orion tests have shown they have the same conductivity properties, high purity level, jetness and tinting strength as regular specialty carbon blacks. Compliant with European and international food contact standards, the new circular blacks are also suitable for piping, film, fibre, packaging and automotive applications.

Orion will also present carbon blacks that improve performance by modifying rheology and imparting UV-resistance as well as conductivity characteristics. Marketed under PRINTEX, AROSPERSE and other brand names, these grades readily disperse in polymers and show very low levels of ionic contamination.

> www.orioncarbons.com

Promix Solutions will present various solutions for mixing, foaming and cooling for the plastics industry. The focus is on saving raw material costs, reducing the carbon footprint, increasing produc-

tion capacity and monitoring production quality, the company says.

The Promix Microcell Technology creates a microcellular foam structure in the polymer by adding atmospheric gases N₂ and CO₂. This reduces the product weight by 20-50%, leading to significant raw material savings.

The Visco-P inline viscometer is helpful in two ways. Firstly, the installed mixer module homogenises the polymer melt and secondly, it measures the actual viscosity under processing conditions and in real time, directly in the melt stream. There is no bypass and no material loss.

> www.promix-solutions.com

Riverdale Global is showing the RGS Riverdale Gravimetric System, a complete sealed delivery system for colour and additives. The system holds colour delivery tolerance within 0.1%, prevents over-colouring and reduces costs while maintaining target colour levels, says the company.

The touch screen interface now allows for quick access to process settings such as throughput, shot size, let down ratio, and weight per gallon. Current settings/recipes can easily be saved to reduce any

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<https://uk.linkedin.com/showcase/plasticsworld>



Above: Sirmax is highlighting its US-based recycling and PP compounding capabilities

input error. The system automatically adjusts to screw recovery time and extruder output and can automatically re-calibrate to new colour. Onscreen runtime graphical performance reporting allows real time information for precise metering rates.

> www.riverdaleglobal.com

SI Group will make its first NPE appearance at the 2024 show. Among the featured products will be: Evercycle, an additive designed to promote recycling and improve the recyclability of plastics; Weston 705, a high-performance stabiliser that enhances the durability and lifespan of plastic products; and Non-Dust Blends (NDB) Solutions, a proprietary process that offers a safer and cleaner work environment with significantly reduced dust exposure, waste, and cross-contamination.

> www.siigroup.com

At NPE, **Sikora** is showing its Purity Concept V system. The company is encouraging visitors to bring small quantities of opaque and amorphous pellets, flakes or plates to be inspected and analysed for impurities with the inspection and analysis system. The system is suitable for reproducible laboratory applications and detects black and coloured contaminants from a size of 50 µm as well as discolorations. The analysis takes less than a minute, including test certificate and HSV colour chart of the detected colour deviations.

> www.sikora.net

Sirmax North America will use NPE as a platform to highlight the successful integration of its US recycling and PP compounding facilities. It says its vertically integrated operation in Anderson, Indiana, reaffirms its commitment to sustainability and the circular economy.

Recently, the company received the UL Yellow Card HB certification for its recycle-content PP materials and is among the first companies to have

UL Yellow Card certified recycled-content materials, typically necessary to supply the home appliance and E&E markets. The company also offers a wide range of virgin UL yellow card certified materials, including flame retardants, for a wide range of markets.

> www.sirmax.com

Songwon is showing a variety of new stabiliser products at NPE. Enhancing hydrolytic stability, SONGNOX 9228 is a secondary diphosphite-based antioxidant that overcomes the limitations of conventional phosphite or phosphonite AO products by enhancing the resistance of polyolefins to oxidative corrosion, especially at high processing temperatures.

SONGNOX 9228 blends well with primary antioxidants and other stabilizers. As a modified version with a small fraction of tri-isopropanol amine, SONGNOX 9228T brings these valuable performance features to SONGWON's solid phosphite product range which the company says are ideal for masterbatch suppliers.

> www.songwon.com

Tolsa, the supplier of flame-retardant synergists and specialised additives for the wire and cable, construction, railway, transportation, and electronics industries, reports growing demand for its ADINS additives as a sustainable solution for the replacement of polytetrafluoroethylene (PTFE) as an anti-dripping mechanism for flame retardant formulations. Tolsa will highlight this emerging market trend and identify the latest applications at NPE 2024.

> www.tolsa.com

At the NPE show, **X-Rite** says it will demonstrate how colour measurement solutions drive sustainability across every stage of plastics production, from concept, prototyping, and final inspection by streamlining approval processes, optimising formulation and reducing waste. The company will have live demonstrations of connected solutions designed to help companies embrace an end-to-end digital workflow.

Among its portfolio is X-Rite Pantora appearance software to quickly and accurately create a digital twin of a physical material for 3D rendering and communicate the material data without shipping physical prototypes. In formulation, Color iMatch processes colour data to provide optimal initial colour matches, formulate colour using leftover or recycled materials, and optimise pigment costs.

> www.xrite.com

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The trend towards greater electrification is providing an opportunity for compounds that meet the tough requirements of wire and cable applications. By Chris Saunders

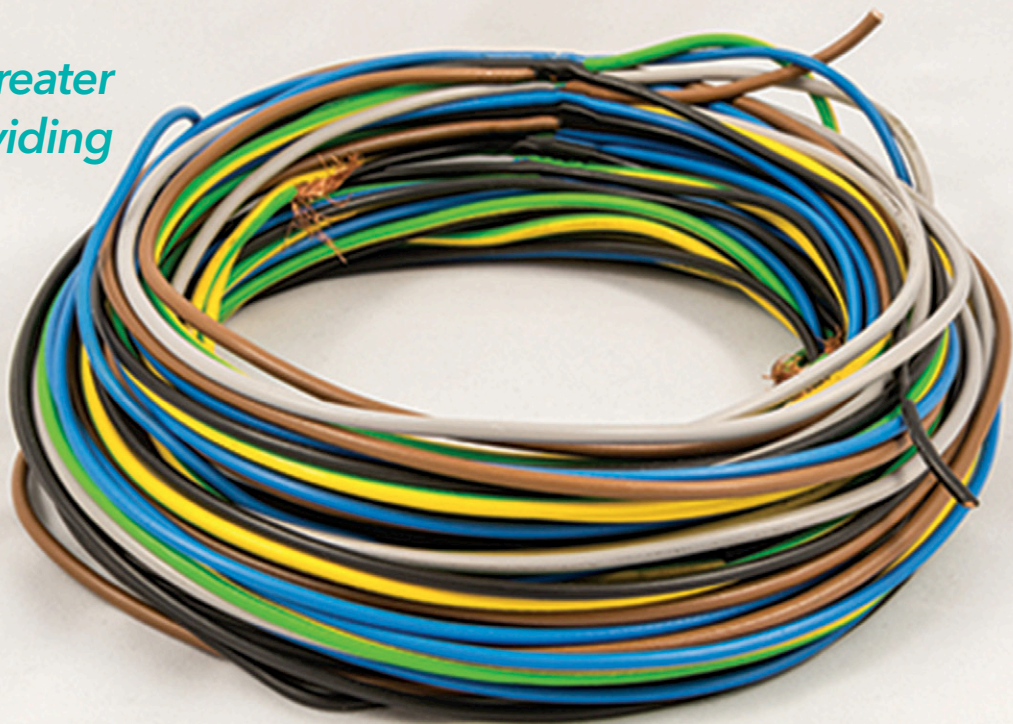


IMAGE: SHUTTERSTOCK/MARCO RUBINO

Unravelling the potential of wire and cable compounds

The wire and cable industry is under pressure to adapt to a wide array of demands from seemingly all quarters. Manufacturers are navigating a landscape marked by increasingly strict regulations on fire safety and growing calls for more sustainable materials, alongside the usual market forces constantly pushing for greater productivity and cost efficiency.

Polyolefin producer **Borealis** says it is working closely with customers to meet these challenges. Over the past year, it has launched two new PE flame-retardant grades for cable insulation and jacketing: FR6012, which meets the stringent ST12 material classification, thereby enabling high-and extra-high-voltage cables to be safely laid in exposed, overground locations, and Visico FR4452, a high-performing XLPE material for low-voltage building wire insulation.

The company is also supporting its customers in meeting their sustainability goals by launching a number of low-carbon-footprint materials including Borcycle ME7153SY, a circular jacketing solution for low-and medium-voltage cables. This fully formulated natural medium-density polyethylene (MDPE)

compound is the first cable jacketing solution based on Borealis' Borcycle M portfolio which contains 50% post-consumer recyclate, reducing CO₂e emissions during production. For customers wishing to lower their carbon footprint still further, Borealis offers the majority of its grades as Borneables, a portfolio of premium polyolefins produced with ISCC PLUS-certified renewable feedstock.

Borealis says it is also poised to introduce the next generation of its Borlink XLPE technology, optimised for power cables up to 275 kV. The advanced insulation system is based on the company's Supercure Technology and will offer best-in-class sustainability for HVAC cables. Its environmental benefits include a significant decrease in the CO₂e footprint during post-processing heat treatment, reduced methane emissions during crosslinking, and minimised use of additives. Productivity is set to improve as the technology facilitates faster processing, increased line speed, and longer run lengths ensuring a lower total cost of ownership and increased yearly throughput with the same assets.

"We are moving to a more electrified future

Main image:
Growing markets for wire and cables range from domestic applications to e-mobility

Right: Borcycle ME7153SY MDPE compound is the first cable jacketing solution based on Borealis' Borcycle M portfolio which contains 50% post-consumer recycle

where grids will play a key role in our efforts to address climate change," said Bart Verheule, Borealis Global Marketing Director Energy. "Borealis is contributing to this shift by developing high-performance compounds for the energy sector that make wire and cable applications, photovoltaics, and capacitor films, more sustainable and cost effective."

Additives producer **Huber Advanced Materials** says that as customers demand eco-friendly products, there has been a growing emphasis on reducing the environmental footprint in the entire manufacturing processes. Additionally, with the increasing adoption of electric vehicles and renewable energy systems, the demand for high-quality cables delivering safe operating conditions has surged. In response to these trends, Huber has introduced a range of products including a comprehensive range of flame-retardant additives tailored to meet the diverse needs of wire and cable applications. The portfolio includes high-purity alumina trihydrate (ATH), which comes in varying particle sizes and surface areas, along with standard, off the shelf, and customisable surface treatments

Sustainable trend

In a recent announcement, the company reported it has completed cradle-to-gate Life Cycle Analyses (LCAs) for more than 90% of its product portfolio, including its aluminium hydroxides, calcined aluminas, activated aluminas, and Vertex magnesium hydroxides. Examples of recent and ongoing sustainability projects include an investment into a modern natural gas-fired cogeneration plant at its site in Martinswerk, Germany, scheduled for start-up early 2025, and a solar array at its site in Marblehead, Illinois, US.

At NPE in Orlando, Florida, in May, **Orion** is set to introduce two new sustainable specialty carbon black grades suitable for wire-and-cable applications. Produced from end-of-life tyre pyrolysis oil,



IMAGE: BOREALIS

the company says tests show they have the same conductivity properties, high-purity level, jetness, and tinting strength as regular specialty carbon blacks. Compliant with European and international food contact standards, they are also suitable for piping, film, fibre, packaging, and automotive applications.

Orion said the new Printex kappa 100 BEADS feature exceptionally high cleanliness, purity, and conductivity in high-voltage (HV) electric transmission cables, while Printex kappa 100 acetylene conductive additive offers excellent dispersibility, extremely high cleanliness, and low sulphur impurities. "It imparts best-in-class high conductivity and excellent surface smoothness to conductor and insulation shields, making it ideal for use in HV cables," said Kevin Milks, Orion marketing manager, Polymers and Batteries.

Outside of the new additions, Orion offers a comprehensive portfolio of high-performance conductive additives. Marketed under the Printex, Hiblack, and Arospere brand names, the grades impart target conductivity to minimise dielectric stress between the conductor and cable insulation, improving cable service life by increasing conductivity characteristics and providing UV protection. In addition, they boost performance by modifying rheology and readily disperse in polymers, showing very low levels of ionic contamination.

To promote supply chain resilience and increase acetylene black availability, Orion is building what it says is the only plant in the US that will produce acetylene-based conductive additives. The facility in La Porte, Texas, is expected to begin operation during the first half of 2025.

"Our new plant will provide the North American wire-and-cable industry a consistent, domestically produced and available supply of acetylene-based conductive additives," said Jennifer Stroh, Orion's Director of Specialties Sales and Marketing, Americas. "We look forward to delivering custom solutions for all wire-and-cable applications, and in particular applying the attributes of Printex kappa 100 BEADS to the stringent requirements of high-voltage applications."



Below: Orion conductive additives boost polymer performance in wire and cable, injection moulding and other applications



IMAGE: ORION

5G ready

Another topical development impacting the wire and cable sector is the rollout of 5G networks, which requires significant upgrades to the existing telecommunications infrastructure, including the deployment of new types of cables capable of handling higher frequencies and data rates. **Dow** said industry experts are predicting that 5G connections will more than double by 2025, and relaying such massive amounts of data to devices will require millions of miles of new fibre optic cables, putting the wire and cable industry under significant pressure. Luckily, advancements in materials science have provided the means to design solutions that last longer, ease installation, improve performance, and provide greater reliability. Plus, with the introduction of small, mini, and micro fibre optic cables, systems can take up less space.

"As cables are becoming smaller and denser, telecommunications technology must advance to eliminate any compromise on quality," said Paul Brigandi, Senior Technical Services and Development Scientist, Wire and Cable, Dow Packaging and Specialty Plastics. "Dow's Axeleron FO 6321 BK is [an] all-in-one solution for longer fibre optics

cable lifecycle protection. Designed for micro cables up to 60% smaller, 70% lighter, and packed more densely into conduits, it delivers up to 25% less shrinkage compared to traditional jackets which helps reduce the stress on cables that often leads to increased fibre attenuation."

Joanna Giovanoli, Market Manager, Infrastructure, Dow Packaging & Specialty Plastics, said: "Modernising our telecommunications infrastructure to help address deficiencies and reliability in connectivity should begin with the right materials. Further, it'll require collaboration across the value chain from compounders to material providers to manufacturers."

Fibre optic cable jacketing is often made from polybutylene terephthalate (PBT) to make use of its good mechanical properties and resistance to heat and chemicals. For ease of installation, optical fibre cable producers use a colour codification system. Among its ELTech portfolio, **Ampacet** has developed a range of high performance colour masterbatches based on PBT carrier resin specifically designed for optical fibre cable PBT Jacketing. The company's standard ELTech portfolio for optical fibre cables includes 16 colours, complying with RAL



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colour references. Designed for use at low addition rate, these masterbatches provide high resistance to heat and light fading, as well as excellent opacity, and preservation of a high performing signal transmission, even at low wall thickness.

Camillo Cardelli, Head of Research at **Ipool**, a spin-off company of Pisa CNR's Istituto per I Processi Chimico Fisici in Italy, said: "The cable industry is one of the most innovative and competitive on a global scale, especially in relation to polymeric compounds. The most difficult challenges for halogen-free flame-retardant compounds are being able to produce cables to reach class B2ca d0 rating in EN 50399 fire test (as per CPR), with proven mechanical resistance to extreme temperatures, and the ability to reach a high speed of extrusion without causing high motor loading, a shark skin surface, porosity, or die droll. The cable must also be able to maintain its electrical properties in humid conditions and be resistant to oils and other aggressive chemicals, all while maintaining long term resistance at high temperatures and under oxidative and UV exposure."

This is no easy task, and Ipool says that in recent years it has helped many companies improve performance with a combination of traditional malleated LLDPE and Silmalink AR1028 silane coupling agent provided by **Silma Masterbatches**. This technology brings several benefits including increased production speed, improvement of electrical and mechanical properties after prolonged immersion in hot water, a reduction of the die droll, and improved crack resistance. This is considered a crucial

property to HFFR compounds used for sheathing armoured cables installed in hot conditions. By moving from 0.6% dosage to 1.2% dosage, Silmalink AR1028 transforms its core function from coupling agent to crosslinking agent, moving from thermoplastic HFFR to silane cross linkable XL-HFFR when used in combination with ambient curing catalyst AL2691 (or AL3025 in case of solar applications). XL-HFFR are specialty compounds used in building wires, automotive, and solar/ photovoltaic applications.

Late last year, **Avient** announced the addition of a new grade to its ECCOH Low Smoke and Fume Non-Halogen Formulations portfolio. The new ECCOH 5983 Formulation has been developed to help prevent environmental stress cracking in low

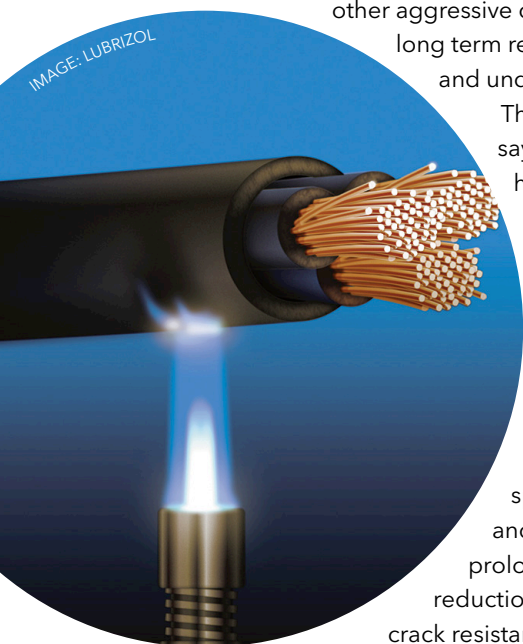
and medium-voltage armoured power cables, protecting power supply and avoiding costly damage. Cracking can occur when cables are installed under a high tensile stress, such as when bent around a radius or installed underground. Metal armouring is used as a preventative measure, but as environmental temperatures fluctuate the armouring and other materials expand and contract at different ratios. Cracks in the cable jacket can lead to damage to the insulation and conductors, which may result in short circuits and interrupted power supply. The new formulation can help prevent stress cracking by offering high tear strength and elongation at break over a temperature range of -25°C to 90°C. It surpasses all specifications associated with the BS 7655-6.1:1997 standard, including the most stringent LTS 1 classification, even for complex designs and armoured cables.

"The new ECCOH 5983 formulation was developed in response to the global cable market looking for a material for armoured cables that could withstand extensive temperature fluctuations without cracking," said Matt Mitchell, Director, Global Marketing, Specialty Engineered Materials at Avient.

Lubrizol Engineered Polymers uses a plasticiser-free technology that allows compounds to meet and even exceed expectations tied to industry standards and has developed a special portfolio for electric vehicle charging system cables. The new Estane TPU offering consists of three new grades: Estane EV 90AT2 NAT 02, EV 89AT9 NAT 04, and EV 85AT8 NAT 01. As the EV charging cable market grows, Lubrizol's Estane EV solutions are also expanding with Estane EV 89AT9 NAT 04 TPU which is compliant with global IEC 62893 and EN 50620 specifications.

Stricter regulations

Based on flame retardant properties without the use of halogens, the range continues to expand with the Estane ZHF TPU product series aimed at the general wire and cable market with Estane ZHF 93AM9 TPU NAT 02 being the latest addition. It achieves a UL temperature rating of 105°C, has high mechanicals and tear, and exhibits excellent processability and surface aesthetics. It can also pass the stringent UL1581 FT-1, VW-1, and UL 1061 cable-flame tests on medium-to-large diameter cables in drag chain, sensor, data cables, and others, and is UL-94 V0 rated and suitable for UL applications. Lubrizol said it will continue to develop solutions catering to demanding regulatory standards as stricter safety regulations come into force and will focus research efforts on developing advanced flame-retardant cable polymers



Above: Lubrizol Engineered Polymers has expanded its Estane TPU product family

with improved performance characteristics.

Additive company **Baerlocher** has introduced Baerolub AID polymer processing aids (PPAs) to help customers smoothly transition from per- and polyfluoroalkyl substances (PFAS). Baerlocher's new PPA for blown film, pipe, and wire-and-cable, are free of PFAS and siloxanes, are cost-competitive with existing and new PPA solutions, and compatible with other additives. The company says the PPAs deliver rapid melt fracture clearing for metallocene and Ziegler Natta LLDPE and high-density polyethylene (HDPE), equalling or surpassing clearing times of traditional PPAs containing PFAS. Because these new PPAs are soluble in the polymer matrix, they provide better haze performance and excellent control of frost line height.

"Current and evolving European Union and US Federal and state regulations are forcing the plastic industry to look for new alternatives to PFAS-based processing aids," said Chad Harlan, Strategic Business Unit Head, Baerlocher. "To meet this need, Baerlocher developed Baerolub AID PPAs featuring proprietary, PFAS-free chemistry, a breakthrough that has propelled us into a leading position in the PPA space."

Future world

According to LeeAnn Chen, Strategic Marketing Director at **Orbia's** Polymer Solutions business **Alphagary**, adhering to regulatory requirements, particularly in the realm of environmental standards and product safety, are crucial considerations in the wire and cable sector. She said, "Compliance with evolving regulations ensures product quality, safety, and environmental sustainability, which are increasingly prioritised by both regulators and consumers."

Increasing demand for data, video, and energy transmission is expected to continue driving growth, given the current proliferation of smart devices, cameras, and high-definition TVs. The advent of new category cables designed to



accommodate these diverse needs will likely gain traction as consumers and industries seek efficient, high-speed connectivity solutions.

Chen also pointed to the integration of artificial intelligence (AI) as being key in this rapidly expanding sector. "As AI grows and becomes embedded in all aspects of our lives, we see increased demand for innovative materials that bring power and now data in both indoor and outdoor environments. Industrial environments have always required electrical cables that are flexible and robust [but] with AI, we see demand for cables that bring data as well as power (such as Power over Ethernet - PoE cables requiring increased high temperature performance) into industrial environments for robotic and computer-controlled processes. Cables transmitting data are required to have the same robust attributes as electrical cables, as well as having excellent data transfer performance (speed and bandwidth)."

Another aspect destined to have a significant influence on the sector is renewable energy. "As our world moves toward more sustainable options and an upsurge in electrification, we are seeing increased demand for innovative materials in cables for renewable energy sources such wind

Above:
Keeping the lights on: growing cities have growing power needs



Linkflex'

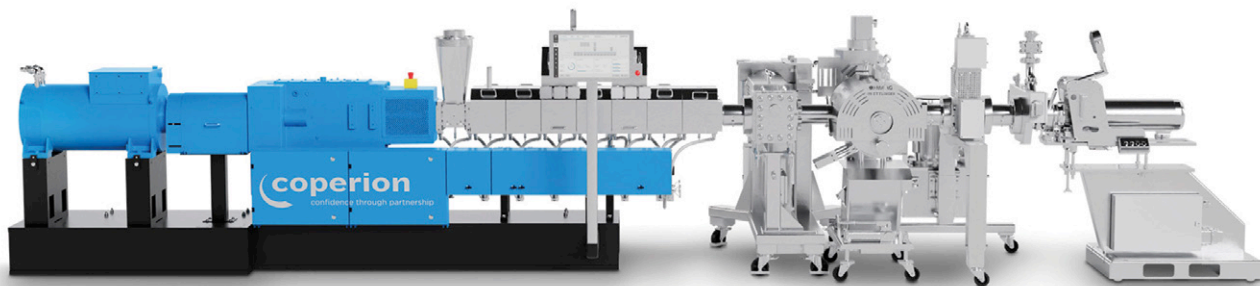
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IMAGE: COPERION



Coperion says its ZSK twin screw extruder is a flexible system for the production of different cable compounds

Coping with cable compounds

Coperion says its ZSK twin screw extruder represents a flexible and economical system for the production of different cable compounds, with high throughput rates, gentle product handling, and high energy efficiency being just three advantages of the series. In addition, the modular design of the process section allows for individual configuration for the varying

requirements of different types of cables. Beside the process section, all peripheral equipment can be adjusted according to the process needs giving manufacturers maximum flexibility.

Homogeneity of the cable compounds is considered vital when producing high quality products. The ZSK extruder is suited for this task as the superior mixing properties

effectively avoid agglomerations ensuring excellent dispersion of ingredients. Together with the high accuracy Coperion K-Tron feeders and reliable peripheral equipment Coperion offers complete systems that give manufacturers the means to produce high quality cables with the appropriate characteristics in at a good price/performance ratio.

turbine systems, solar/photovoltaic systems, and EV charging cables,” Chen said. “Materials for these applications must withstand tough outdoor environments and water immersion safety testing protocol, whilst maintaining flexibility and performance with a thinner jacketing wall. We have expanded our product portfolio, production capacity, and technical capabilities, to provide solutions to customer investing in infrastructure expansion. Our portfolio includes semi-conductive materials for power cables, halogen-free e-beam curable, as well as moisture curable crosslinking options for solar and other cables used in renewable energy platforms.”

In energy distribution, renewable energies are currently mapping out new grid systems linking various solar plants and windmills to distribution networks. To address this need, **Benvic** has launched two new additions to its Linkflex HF series, which contain halogen free, flame retarded, and low smoke zero halogen properties. Based on a polyolefin matrix, the Linkflex HF series complies with IEC60754-2 standard for low acidity emissions and behaviour during fire exposure has been optimised to allow cables to meet EN 50575 standard classes from Eca up to B2ca.

The new grades, HFS109 and HSF110, are

intended to cover applications from low to high voltage, as well as provide sheathing with excellent fire performance. The photovoltaic panel market is currently booming, and its connection to various distribution networks calls for a specific kind of cable. Inside the Linkflex HF range, a new crosslinked version HFX003 addresses this specific need with improved material resistance, and to help improve financial viability, Benvic says it is innovating a new generation of compounds that will avoid the bedding operation and lower costs.

CLICK ON THE LINKS FOR MORE INFORMATION:

- > www.borealisgroup.com
- > www.huberadvancedmaterials.com
- > www.orioncarbons.com
- > www.dow.com
- > www.ampacet.com
- > www.ipoolsrl.com
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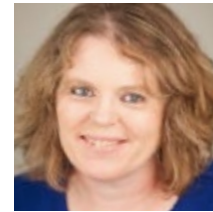
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Plastics Recycling World Expo

11-12 September 2024
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11-12 March 2025
Houston, TX

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17-18 September 2024
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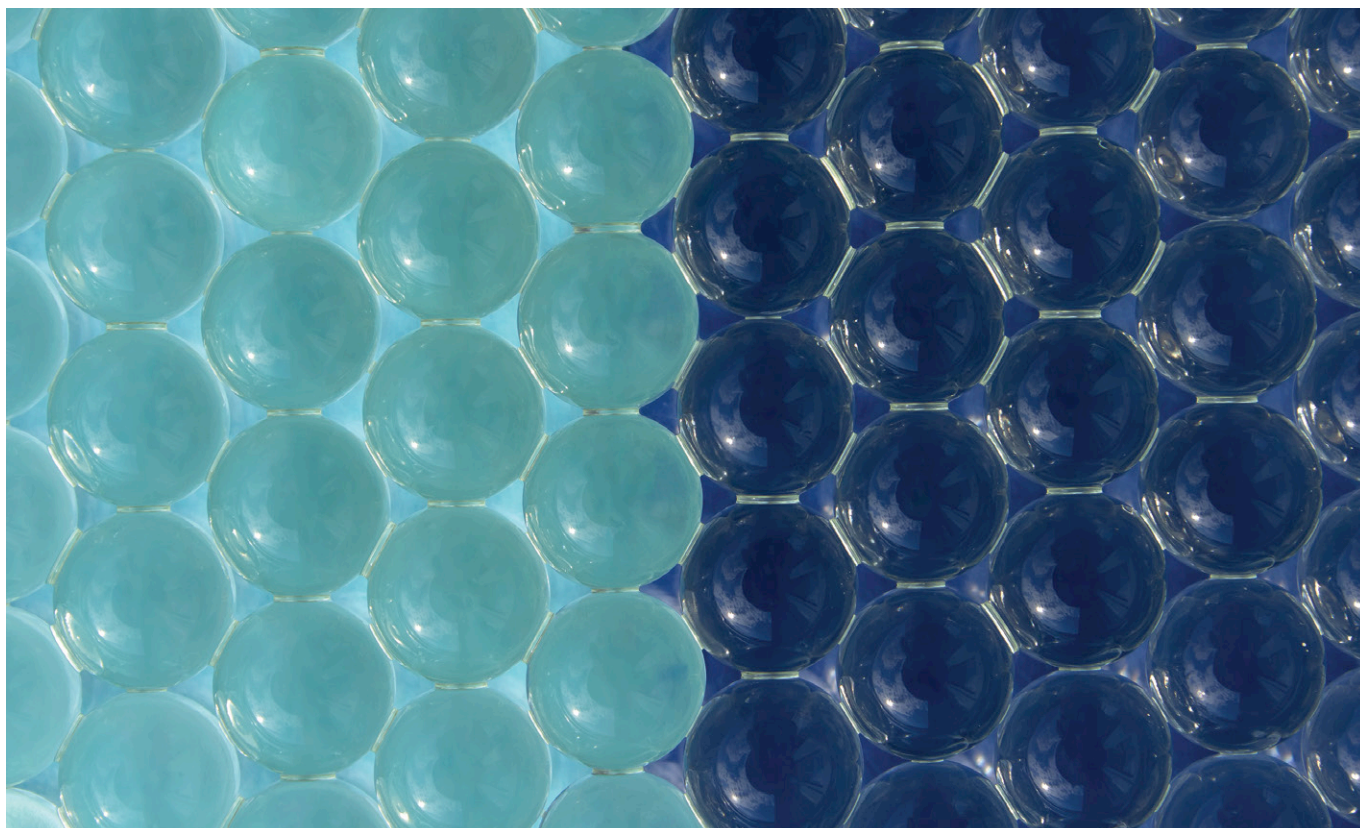


IMAGE: SHUTTERSTOCK/ALEXA_SPACE

Bringing together dissimilar materials

Innovative technologies improve performance of fillers and blends of dissimilar polymers, and enable compatibilisation of recycled materials, writes Jennifer Markarian

When combining two types of different polymers – as can occur in recycling of mixed plastics – or when adding an inorganic filler to an organic polymer, compatibilisers and coupling agents play a key role at the molecular interface to knit the dissimilar materials together and boost processing, mechanical properties and appearance. Innovations include new ways to use these additives as well as bio-based additives to meet the growing demand for renewably sourced materials.

Kenrich Petrochemicals' latest is Ken-React KR PTOA, a titanate coupling agent manufactured from pine-tree based oleic acid. Sal Monte, Kenrich President and Owner and inventor of the technology, said that the product was developed as a result of market pressure to use domestic, plant-derived

sustainable materials in polymeric compositions.

He said: "We chose the American pine tree as an oleic acid raw material source for our new titanate as it is widely available and eliminates any supply logistics concerns; comes from responsibly managed forests; is consistent in supply all year round; does not compete for land with food crops (non-edible); does not require land use change; is non-genetically modified (non-GMO); and is palm oil free."

Monte said that the additive currently has US EPA clearance to sample for R&D purposes.

The company's existing commercial plant-based titanate, Ken-React KR TTS, was invented by Monte 50 years ago and is based on isostearic acid derived from rapeseed, which is used widely to

**Main image:
Getting materials to mix is the focus for specialist additive companies**

produce cooking oil. The new, experimental titanate is expected to function similarly, although it is a different molecule.

Another titanate additive can be used to copolymerise PVC with other polymers. “The titanium catalysis effect of increasing polymer flow at lower temperatures allows for a wider range of plastics to be copolymerised, such as PVC with PC,” said Monte. The additive can also be used to copolymerise PVC with PE, nitrile rubber, and vinyl chloride-acrylonitrile copolymer for injection moulded, high-strength and large-size automotive interior trim parts.

Kenrich is using its Ken-React coupling agent to treat a sodium bicarbonate foaming agent to mimic the behaviour of azodicarbonamide as to the temperature and time duration of carbon dioxide release, resulting in improved foaming properties in thermoplastics such as LLDPE and PVC. The treated foaming agent is being evaluated as a functional substitute to azodicarbonamide foaming agents, which have been labeled as substances of very high concern in the EU.

Graphene work

Kenrich coupling agents are also being evaluated with graphene, which is a nano-scale, two-dimensional additive that is seeing increased use for enhancing properties in thermoplastics. Challenges with graphene, however, are that it needs to be exfoliated in the finished product to deliver performance. In general, nano-particles agglomerate, and mechanical shear energy alone in the polymer melt is not sufficient to obtain complete exfoliation, said Monte. Coupling agents are often used to help solve problems of agglomeration and dispersion.

Another challenge is that the graphene surface is non-reactive with silanes, which means the

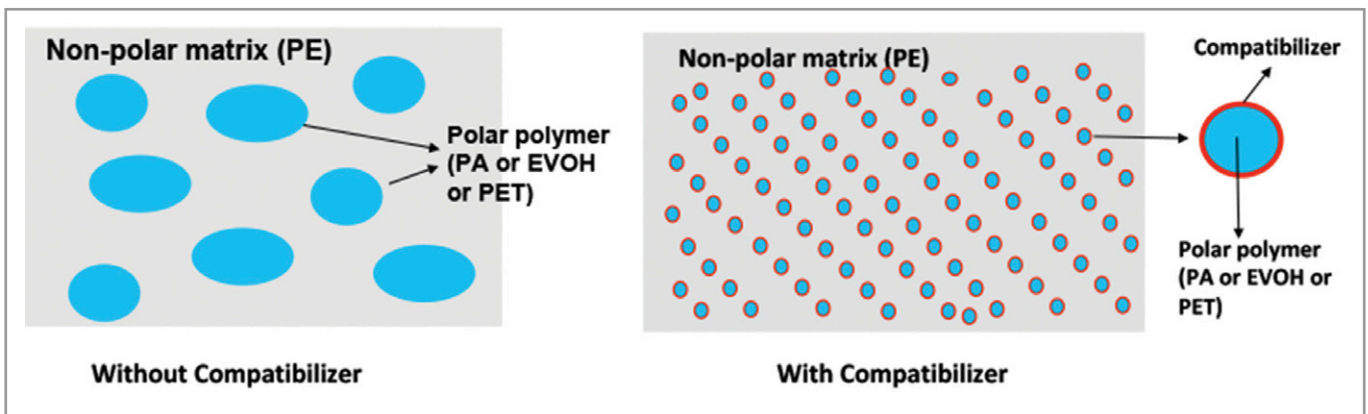
surface must be treated before it can be functionalised with silane-based coupling agents. Unlike silanes, however, the 1.5 nm titanates and zirconates from Kenrich form atomic monolayers on the carbon surface via proton coordination, in situ, helping exfoliation and preventing reagglomeration, said Monte.

“Reagglomeration is prevented by the interfacial organometallic monolayers,” he explained. In addition, the titanate or zirconate reacts with the polymer phase, forming covalent bonds between the graphene and the polymer, which allows stress transfer over the graphene-polymer interface, to improve impact strength and flexibility. Monte said that the bond has been shown to have long-term strength in aging tests.

“So much know-how goes into using this technology properly,” he said. There are different methods for appropriately coupling in situ, depending on the formulation of the compound, the polymer type, the equipment used, and other variables. Once the right level and processing conditions are identified for a given situation, the additive will perform, he said. “I predict that titanates and zirconates will be for graphene composites what silanes are for fiberglass composites,” he concluded.

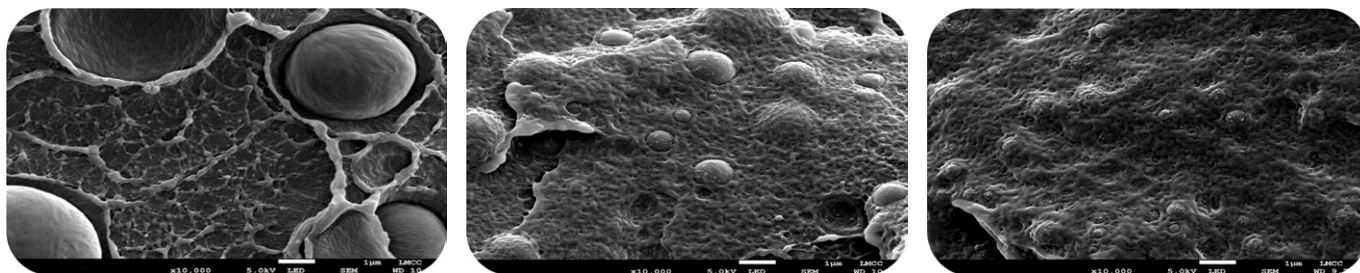
PLA and rPET

There is a need for bio-based and biodegradable additives for compounds with PLA or PLA-blends, said Tom Inch, Market Manager for Thermoplastic Additives at **BYK USA**, in a presentation at AMI’s Compounding World Expo in Cleveland, US, in November 2023. PLA (and other bio-based and biodegradable plastics) are expected to grow in use, and PLA needs additives to enhance its melt strength for plastics conversion processes and its flexibility and impact strength for end-use applications.



In a mixture of a small amount of polymer in a non-polar matrix, a compatibiliser increases interfacial adhesion between the non-polar matrix and the polar phase, reduces the particle size of the polar phase, and increases uniformity.

Source: Ingenia Polymers.



IMAGES: INTERFACE

Above: SEM images of 80/20 PE/PA6 blend, showing matrices with: no compatibiliser (left); PE-grafted-MAH (centre); Polarfin compatibiliser (right). Interface Polymers says that with the Polarfin additive, the PA particles are highly adhered, the PE/PA interface is stronger than the PE matrix itself, the PA particles reinforce/strengthen the PE

BYK's SCONA modifiers are grafted polymers that act as compatibilisers, coupling agents, and viscosity and toughness modifiers. The bio-based SCONA TPPL series additives are composed of grafted PLA, which makes the additives compatible with PLA and other polar, bio-based polymers. The maleic anhydride (MAH) grafted SCONA TPPL 1112 PA acts as a coupling agent to achieve adhesion between fillers and fibres with the polymer matrix and as a compatibiliser in polymer blends. SCONA TPPL 5112 PA, which is also an MAH-grafted polymer, has a lower viscosity and can also be used as a dispersing aid. SCONA TPPL 1214 PA, a glycidylmethacrylate (GMA)-grafted polymer, is a high-molecular-weight melt strength enhancer for PLA. SCONA TPPL 1310 PA, an acrylic acid (AA) grafted polymer, has been found to work synergistically with conventional melt strength enhancers (for example, epoxy oligomers) at low loading levels.

Recycled

BYK's latest product, SCONA TPPE 4214 PA, is based on PET functionalised with GMA. It is best used as a high-molecular-weight viscosity modifier, but it can also act as a compatibiliser or coupling agent. The additive helps mitigate the challenge of reduced intrinsic viscosity (IV) in recycled PET (rPET), which is caused by thermomechanical and hydrolytic degradation. A lower IV can result in insufficient melt stability, non-uniform rheological properties, and poor performance in injection moulding, said Inch. In particular, in foam moulding, low IV can result in large voids, an uneven bubbled surface, and yellow discoloration. The additive increases the IV value through reactive compounding, which improves melt stability and foam structure.

Interface Polymers is preparing to start its first production plant for its new Polarfin di-block polymer compatibilisers in Visakhapatnam, India. The compatibilisers have been designed to help reduce flow defects and gels in mixed or cross-

contaminated plastic recycling streams. In film packaging using post-consumer recycle (PCR), for example, the additive helps to create smooth and printable surfaces. The compatibilisers are used at low levels (often less than 1%) in combinations such as polyolefins (PP or PE) with polyamides (PA), PE or PP with EVOH, PE or PP with PET, and PE or PP with cellulose (a bio-based polymer).

Package and film producers are working to create recyclable solutions to replace conventional multi-layer, multi-material structures that were historically optimised for properties and lightweighting but not recycling. One option is to use one material (i.e. monomaterial PP or PE); companies are working to address the limitations of these structures, particularly with barrier properties.

Existing, multi-material barrier structures are also being tested for recyclability. For example, PE films with both PA and EVOH barrier layers were tested by the independent institute Cyclo-HTP and found to be compatible with recycling, **BASF** reported. The studies were conducted on co-extruded PE/PA6/EVOH high-barrier films and laminated PA6/PE films in household packaging waste. The laminated structures contain a compatibiliser that is added to help distribute the PA component in the PE matrix. In the coextruded structures, the tie layer (used to

Below: A broad portfolio of polyamide-containing packaging can now be certified as recycling compatible



IMAGE: BASF

Right: PE containing 20% PA6 without a compatibiliser (left image) and with Ingenia Polymers' INCIRCLE compatibiliser (right image)

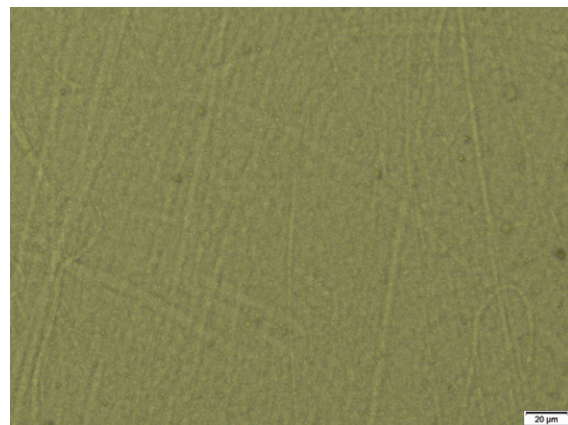
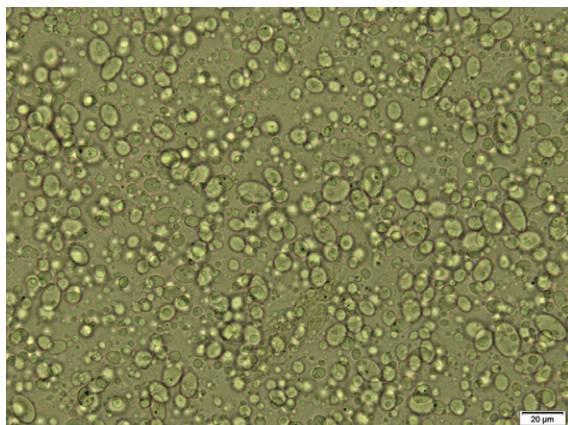


IMAGE: INGENIA POLYMERS

bond PA and PE) becomes an effective compatibiliser during the recycling process, BASF said.

"If additional functionalised polyethylene (PE-g-MAH) is also added as a compatibiliser during primary film production, the polyamide is even recognised as a valuable material in the polyethylene recyclate by Cyclos-HTP," said Matthias Zorn, Senior Manager Market Development Polyamides for extrusion applications at BASF.

"The results show that PE film waste streams containing PA can be processed without significant adjustments to the recycling process. The certification confirms the standard market practice of PA-containing film waste already being recycled by film manufacturers today," he said.

Dow's RecycleReady Technology, which contains the company's Retain compatibiliser, improves recyclability of multilayer films using polar polymers, such as EVOH or nylon, as barrier layers. Dow said that the additive helps reduce gels and improve clarity and mechanical properties.

SK Functional Polymer (SKFP) has evaluated some of its Lotader terpolymers and Orevac grafted polyolefins as compatibilisers to improve properties of blends of PE and EVOH from recycled multilayer oxygen barrier films. The most efficient compatibiliser was found to be the company's terpolymer of ethylene (89 wt%), butyl acrylate (6.5%) and maleic anhydride (3.8%). The terpolymer (SKFP's Lotader 4210) at loadings of 2 to 5 wt.% improved mechanical properties, such as dart impact puncture resistance, and optical properties (i.e. reduced gels).

Post-industrial

"We see increased development of film structures containing a latent compatibiliser for activation when the flexible packaging goes through the PE store drop-off recycling stream in the US," said Dale McCormick, Business Manager, Masterbatch for Flexible Packaging at **Ingenia Polymers**. "This allows for barrier structures [for example, with polyamide

and/or EVOH] to be recycled and brand owners to meet their sustainability goals, more specifically by using packaging that can be recycled."

McCormick also sees increased interest in the use of compatibilisers for in-house recycling of barrier film scrap, rather than sending the scrap to landfill or incineration. Ingenia's INCIRCLE IP1601 was introduced in October of 2023 to support this use. The company has successfully completed the third-party lab testing required by the US Association of Plastic Recyclers (APR) to receive recognition under the APR Design for Recyclability program.

"This product allows for film structures with higher levels of polyamide and EVOH to be recycled than was previously possible, due to the improved compatibilisation performance of INCIRCLE IP1601 over other products available in the market," said McCormick. The masterbatch can be used either as part of the film structure to enable future recycling, or it can be added during compounding of scrap film into recycled pellets.

Ingenia Polymers is developing additional compatibiliser grades for other systems (PE/PP) and evaluating the recycling of PE/PET lamination structures through compounding PE/PET scrap with Ingenia's INCIRCLE IP1601 to generate rPE/PET capable of meeting typical can liner specifications. "Early results are very promising and support further field trials. This is an exciting application, as there has been no option for recycling of PE/PET scrap produced during converting operations and the materials are either landfilled or incinerated in most cases," McCormick said.

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Compounding World March 2024

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The March-April 2024 issue of Injection World magazine reports on the fast pace of adoption of industrial robots in response to skills shortages, plus it contains features on caps and closures moulding and high-temperature materials.

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Plastics Recycling World March/April 2024

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

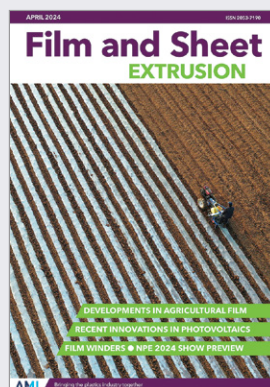
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2024	2-4 May	Replast Eurasia, Istanbul, Turkey	www.replasteurasia.com
	6-10 May	NPE 2024, Orlando, FL, USA	www.npe.org
	14-17 May	Elmia Polymer 2022, Jönköping, Sweden	https://www.elmia.se/en/polymer/
	15-18 May	Plastics & Rubber Thailand, Bangkok, Thailand	https://www.plasticsrubberthailand.com/
	21-24 May	Plastpol, Kielce, Poland	www.targikielce.pl/en/plastpol
	4-7 June	FIP, Lyon, France	www.f-i-p.com/en/index
	26-28 June	Central Asia Plast World, Almaty, Kazakhstan	https://plastworld.kz/?lang=en
	11-12 September	Compounding World Expo EU, Brussels, Belgium	https://eu.compoundingworldexpo.com/
	23-27 September	Colombiaplast, Bogota, Colombia	www.colombiaplast.com
	24-28 September	TaipeiPLAS 2022, Taipei, Taiwan	https://www.taipeiplas.com.tw/en/index.html
	8-11 October	Plastex, Brno, Czech Republic	www.bvv.cz/en/plastex/
	15-19 October	Fakuma, Friedrichshafen, Germany	www.fakuma-messe.de
13-14 November	Compounding World Expo US, Cleveland, OH, USA	https://na.compoundingworldexpo.com/	
4-7 December	PlastEurasia, Istanbul, Turkey	https://plasteurasia.com/en	


AMI CONFERENCES

14-15 May 2024	Masterbatch Europe, Vienna, Austria
15-16 May 2024	Polymers in Flooring, Hamburg, Germany
4-5 June 2024	Plastics in Electric Vehicles, Cologne, Germany
4-6 June 2024	Chemical Recycling Europe, Brussels, Belgium
11-12 June 2024	Polymers in Cables, Philadelphia, PA, USA
25-26 June 2024	Rigid Packaging, Cincinnati, OH, USA
23-24 July 2024	Polymers in Footwear Portland, OR, USA
17-18 Sept 2024	Bioplastics, Cincinnati, OH, USA

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