

# Compounding WORLD

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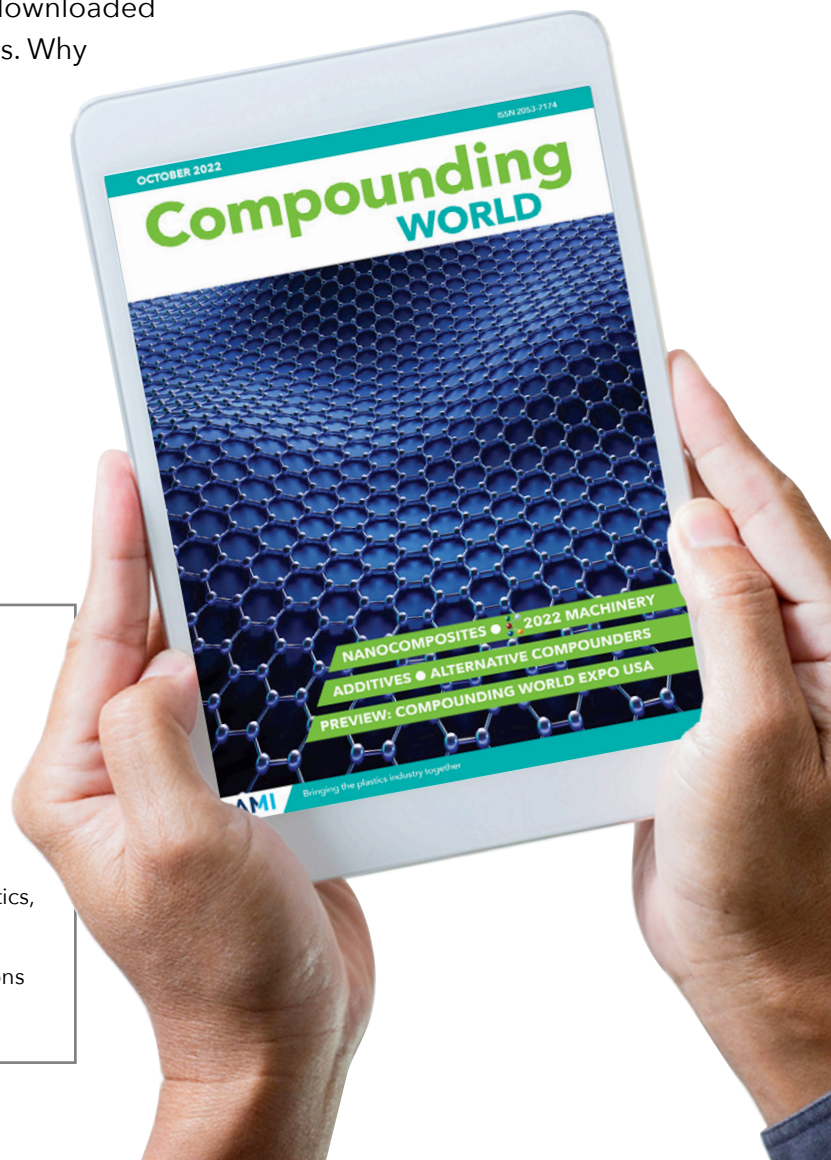
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# Compounding WORLD

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COVER PHOTO: SHUTTERSTOCK

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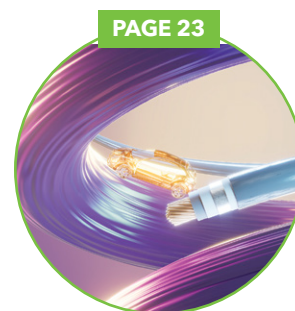
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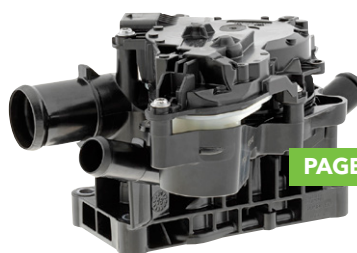
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## CONTACT US

# AMI

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

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### EDITORIAL

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

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

#### Contributing Editors

Mikell Knights - mikell.knights@amiplastics.com  
Jennifer Markarian - editorial@compoundingworld.com  
Mark Holmes - editorial@compoundingworld.com

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

### ADVERTISING

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

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

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

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

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

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# Insight Polymers adds compounding capacity

Tennessee, US-based Insight Polymers & Compounding, which offers product development, specialty compounding, masterbatches, and fully formulated compounds, has started up a new 40mm twin-screw extrusion line,

increasing its polymer processing and custom compounding capabilities.

Complementing the existing 16mm and 27mm extrusion lines at its King-sport facility, the custom-specified Leistritz ZSE-40-MAXX twin-screw extruder

is designed for versatile production.

According to Insight, it is capable of handling nanomaterials and high aspect ratio reinforcements under both conventional thermoplastic processing and reactive extrusion (REX) conditions.

"With this new capability we can extend the range of composite materials with higher concentrations and better dispersion of reinforcements and functional additives," said Jeremy Lizotte, Insight Polymers Director of Innovation. "Plus, it improves our ability to do the reactive processing and mechanochemistry essential to meet customers' evolving performance criteria."

> <https://insightpolymers.com>



IMAGE: INSIGHT POLYMERS & COMPOUNDING

**New line at Insight Polymers increases compounding capacity**

## Hromatka expands in Italy

The Swiss/Austrian Hromatka Group has expanded its distribution presence in central and southern Italy with the acquisition of the southern Italian family-owned company Sotac Tecnopolimeri.

Sotac specialises in distribution of engineering plastics such as PA, POM, ABS, PBT, PC, PC-ABS and PP compounds from manufacturers including Radici, Vamptech, Cossa Polimeri and Kolon.

In addition to bringing new brands to the Hromatka Group, Sotac will benefit from access to the product range from the group's compounder SAX Polymers.

> [www.hgmag.ch](http://www.hgmag.ch)

> [www.sotac.it](http://www.sotac.it)

## Techmer PM buys ACT

US specialty compounder Techmer PM is to acquire colour and additive compounder Advanced Color Technologies (ACT), which is based in Georgia and supplies specialty colourant and additive systems.

According to Techmer, the move will expand its position as an innovation leader in colours and additives for synthetic fibre production.

"By leveraging the combined experience and technologies of both organisations, we can provide our customers unparalleled support in achieving their product innovation and sustainability goals," said Russ Neuman, who founded ACT in 2013 and is to become Techmer PM's Vice President as part of the deal.

Advanced Color Technologies is being acquired from Dalton, Georgia-based Textile Rubber and Chemical Company, a diversified company with a strong polymer focus.

> [www.techmerpm.com](http://www.techmerpm.com)

## Conventus sets up subsidiary in Singapore

Conventus Polymers, a US-headquartered distributor of high-performance engineering thermoplastics, has established a subsidiary in Singapore.

The new operation will offer the company's broad portfolio of polymer products to processors and end users throughout south east Asia. The

expansion is part of the company's strategy to expand its activities into key geographic regions, with Singapore seen as the main business hub for south east Asia.

"Our business is growing quickly and with our extensive product portfolio of specialty engineering

plastics, we are firmly positioned as a strategic supplier," said John Jorgensen, President of Conventus Polymers. "This important move into Singapore signals our further commitment to local players along with key multinational OEMs."

> [www.conventuspolymers.com](http://www.conventuspolymers.com)

# Avient takes Syncure to Europe

Avient is extending production of its UL-certified Syncure silane cross linkable PE compounds to Europe in response to growing demand for cables for applications such as photovoltaic (PV) installations.

Previously manufactured only in the US, Syncure grades will in future also be manufactured at Avient locations in Spain and Belgium (it already produces other grafted XLPE products in Europe). "By

expanding the production of Syncure formulations to Europe, we can improve supply security and help

reduce leads times for customers in the EMEA region and India.

Syncure XLPEs are UL-44,

UL-4703, and CSA 22.2 certified materials carrying FT2, FV1, and VW-1 flame retardant ratings. They are said to allow production of XLPE cables at high line speeds. All grades manufactured in Europe are both UL-certified and REACH-compliant.

> [www.avient.com](http://www.avient.com)

**Left: Avient is targeting growing European demand for renewable energy infrastructure**



IMAGE: AVIENT

## Toray adds more tow CF capacity

Toray Industries is to increase regular tow carbon fibre production capacity at its facilities at Spartanburg in the US and Gumi in Korea. The investments will increase its capacity by more than 20% to 35,000 tonnes/yr from 2025.

The company said the increased capacity is a direct response to forecast US and Korean demand for carbon fibre for pressure vessel applications fuelled by the ongoing development of clean energy initiatives based on hydrogen and natural gas, and other industrial applications.

Toray anticipates demand for regular tow carbon fibre to expand by up to 17% annually. Its new capacity targets high-strength carbon fibres up to 24,000 filaments per tow.

> [www.toray.com](http://www.toray.com)

## Orbia hit by Q2 challenges

Speciality chemical and building products company Orbia said it had experienced a "challenging" second quarter due to weak demand and pricing together with slowing global construction market activity.

Net revenues for Q2 2023 decreased 18% year-on-year to \$2.2bn, mainly due to lower sales in its Polymer Solutions and Building and

Infrastructure division, while EBITDA was down by 27% to \$444m. Polymer Solutions includes Alphagary and Vestolit and accounts for 30% of group revenues; Building and Infrastructure comprises Wavin and accounts for 32%.

Orbia CEO Sameer Bharadwaj said: "We have had a challenging first half of the year, driven by

continued market weakness, although we have seen sequential improvement in several of our businesses as compared to the end of 2022. We remain cautious regarding the second half of the year, and we will continue to manage our costs and margins with discipline while markets settle and recover."

> [www.orbia.com](http://www.orbia.com)

## Hexpol posts record result

Sweden's Hexpol Group posted what it described as its "best second quarter to date". Compared to the corresponding quarter in 2022, overall total sales increased by 1.2% to 5,727m SEK (\$539.7m), while adjusted EBITA increased 17% to 976m SEK (\$92m).

Compounding sales increased by 1% during the quarter compared to 2022, with sales reaching 5,354m SEK (\$504.5m) including

positive currency effects of 363m SEK (\$34.2m). Adjusted for these, sales amounted to 4,991m SEK (\$470.3).

The company said sales to automotive-related customers showed an improvement, although varied across geographies. It said sales to customers within building and construction were significantly lower in virtually all markets, while it also saw lower sales to consumer-related end

customer segments.

"The uncertainty going forward remains high," said President and CEO Georg Brunstam. "However, we believe that our strong customer focus in combination with our geographical closeness to our customers gives us continued opportunities to deal with the disruptions and further strengthen the market position."

> [www.hexpol.com](http://www.hexpol.com)

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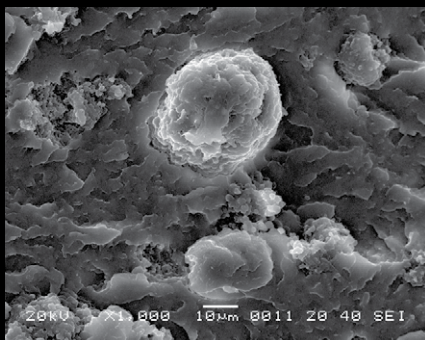


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# Coperion to deliver ZSK chemical recycling system

Coperion is to supply a ZSK Mc<sup>18</sup> twin screw extruder for a Plastics2Chemicals (P2C) plant that Belgian waste management company Indaver is building in Antwerp to convert 30,000 tonnes/yr of end-of-life plastics.

Coperion says the ZSK extruder plays a central role in the P2C depolymerisation process by preparing the waste plastic prior to feeding into the reactor. The contract includes supply of the ZSK extruder, plus Coperion K-Tron gravimetric feeders, vacuum unit, closing valve, and other peripherals.

The P2C process breaks polymers into shorter carbon chains or monomers. Polyolefins can be converted to naphtha and wax while polystyrenes can be split into monomers for reuse as raw material.

> [www.coperion.com](http://www.coperion.com)

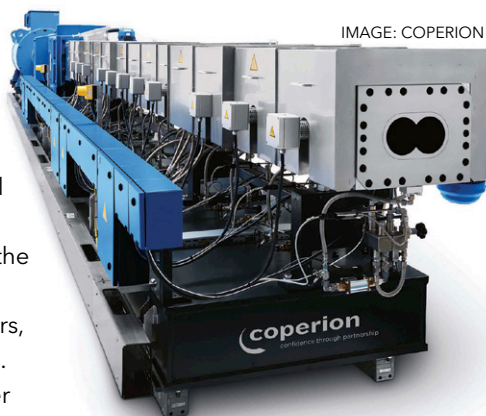


IMAGE: COPERION

**Coperion's ZSK extruder will prepare plastics waste for chemical processing**

## Chemours, DuPont and Corteva agree PFAS settlement in US

Chemours, DuPont and Corteva have reached an **agreement in principle** to resolve all PFAS-related drinking water system pollution claims of a defined class of US public water systems (including systems with a current detection of PFAS1 at any level and those that are currently

required to monitor for the presence of PFAS under EPA monitoring rules or other applicable laws).

The agreement would see the companies collectively contribute a total of \$1.185bn to a settlement fund, with contribution rates consistent with a binding Memorandum of Under-

standing reached in January 2021. That will see Chemours contributing 50 percent and DuPont and Corteva the remaining 50%.

Upon finalisation of a definitive agreement, expected within the second quarter of 2023, the settlement will be subject to final court approval.

### IN BRIEF...

Titanium dioxide and specialty materials company **Chemours** announced net sales for Q2 of 2023 of \$1.6bn, down 14% year-on-year. Adjusted EBITDA was \$324m, down 32%. The Titanium Technologies business saw sales drop 27% to \$707m and EBITDA drop 60% to \$87m. It will close its TiO<sub>2</sub> plant at Kuan Yin, Taiwan, saying the decision is part of a comprehensive strategy to optimise its manufacturing circuit.

[www.chemours.com](http://www.chemours.com)

EU27 chemical production is expected to decline by about 8% in 2023 compared to the previous year with no imminent recovery of chemical demand in Europe likely, according to industry group **Cefic**. "The EU chemical industry is facing a perfect storm," said Marco Mensink, Cefic Director General. "The combination of high energy prices, lack of global demand and the US IRA means there is simply no business case for investing in Europe now."

<https://cefic.org>

## Braskem ups bio-PE capacity at Triunfo



Brazilian petrochemical company Braskem has completed an \$87m investment in its bio-based ethylene plant at its Triunfo complex at Rio Grande do Sul in Brazil, lifting its operating capacity by 30% to 260,000 tonnes/yr. The bio-based ethylene will be used to produce the company's I'm green line of bio-based PE.

"The expansion of bio-based ethylene capacity reinforces Braskem's commitment to sustainable development and innovation and proves the success of the strategy we engaged in thirteen years ago, when we launched the world's first bio-based polyethylene production at industrial scale," said Walmir Soller, O/P VP for Europe and Asia responsible for the I'm green bio-based business globally.

> [www.braskem.com](http://www.braskem.com)



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# Sirmax ups focus on FR products

Italian compounder Sirmax is responding to North American demand for fire resistant products by dedicating a line to production of flame retardant PP compounds at its plant at Anderson in Indiana, US.

"Over the past year, sales and market demand for flame retardant compounds have increased dramatically, so we have made the decision to dedicate one of our five production lines to this family of materials," said Lorenzo Ferro, Country Manager of Sirmax North America.

The Anderson site, which produces mineral and glass



**Compounder sees growing US demand for flame retardant PP compounds**

reinforced technical PP compounds from virgin, recycled and bio-based feedstocks and has a capacity of 45,000 tonnes/yr,

has already developed several FR PP grades that meet what it describes as growing local demand.

Sirmax reports consider-

able interest in FR grades from the automotive sector, where moves toward electric vehicles is leading car manufacturers to consider materials with improved fire safety characteristics. Other application sectors are said to include household appliances such as stoves and washers, as well as water heater casings and power tools.

The company said interest in specialty self-extinguishing materials is increasing globally; it said it has also recently increased capacity at its production plants in Poland.

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

## IN BRIEF...

The **European Commission** announced last month it is to maintain long-standing anti-dumping duties of up to 19.9% on continuous glass fibre products from certain Chinese producers. The **move** is the latest extension of duties that have been in place since 2011. <https://commission.europa.eu/>

Koinos Capital is the new majority owner of **Ultrabatch**, acquiring a majority stake in the Italian additive producer from founders Pietro Csergo and Andrea Moretti. The company, which produces anti-block, antioxidant, anti-static and antifog masterbatches, reported sales of more than €30m for 2022. [www.ultrabatch.it](http://www.ultrabatch.it)

## SABIC launches Noryl PCR grades

SABIC has introduced a number of new Noryl modified polyphenylene ether (PPE) grades formulated with 25% or more post-consumer mechanically-recycled content. They include unfilled and glass reinforced versions.

The PCR technology has been validated through several grades, including Noryl NH5120RC3 resin. This contains 30% PCR content, which helps lower its global warming potential (GWP) by 10% over the incumbent fossil-based grade. It is offers

halogen-free flame retardance (UL94 V1 at 1.5mm) and is pitched at applications such as HVAC enclosures.

"Developing PPE-based engineering resins with high percentages of recycled material is not trivial and poses a range of technical challenges," said Luc Govaerts, Technology

Director, Specialties, at SABIC. "Depending on application requirements, customers may be able to replace incumbent, fossil-based Noryl grades with our new PCR-based technology and achieve desired performance while reducing their carbon footprint."

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



IMAGE: SABIC

## FRX Innovations losses mount

Sustainable flame-retardant developer FRX Innovations posted an operating loss for 2022 of \$6.7m on revenues of \$3.1m. Net losses

reached \$14.2m. It says the below-estimates result was in part due to market weakness resulting from Russia's war in the Ukraine

and post-COVID effects, which has prompted customers to run inventory down.

➤ [www.frx-innovations.com](http://www.frx-innovations.com)

# MKV to toll recycled PPS for Toray

German high performance plastics recycler MKV Kunststoffgranulate is to produce a recycled glass fibre reinforced polyphenylene sulphide (PPS) resin for distribution by Toray Resins Europe (TREU) under a tolling arrangement.

The compounds –which will be marketed as Ecouse Torelina – will be produced from post-industrial injection moulding waste and will offer a 50% recycled content. The grades are said to retain at least 90% of the mechanical strength of the original injection moulding materials.

According to plastics testing and research institution SKZ, the new grades can deliver a carbon footprint around 45% lower than that of original PPS.

Glass fibre-reinforced PPS offers very good flame resistance, long-term durability and chemical resistance and is suitable for a wide range of performance applications, including parts for electric vehicles and other automobiles, electrical and electronic equipment, and water-related parts.

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

➤ [www.mkv-kunststoff.com](http://www.mkv-kunststoff.com)

IMAGE: SUNCOAL INDUSTRIES



## UPM acquires SunCoal

Wood-based chemical and filler producer UPM Biochemicals has acquired SunCoal Industries, a German company that has developed technologies for enhancing the performance of renewable raw materials.

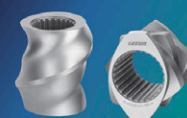
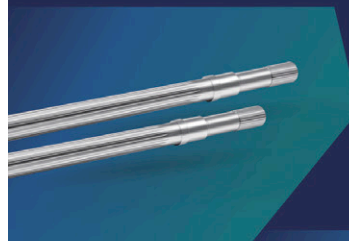
UPM said the deal will allow it to integrate SunCoal technologies into the production of its BioMotion Renewable Functional Fillers (RFF), one of the products to be produced at UPM Biochemical's biorefinery currently under construction at Leuna in Germany.

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

[www.compoundingworld.com](http://www.compoundingworld.com)

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# Expanding Plastics World Expo moves to Brussels for 2024

AMI – the publisher of *Compounding World* – has announced that its next Plastics World Expos will take place at the Brussels Expo in Belgium on 11-12 September 2024. The move aims to build on the success of this year's European expos – which took place in Essen, Germany, in June – with the addition of a new focused exhibition and extra features.

At the June 2024 event, the well-established *Compounding World Expo* and *Plastics Recycling World Expo* will be joined by the *Plastics Extrusion World Expo*, which has already become a successful part of the AMI Plastics World Expos in Cleveland, Ohio, USA. It will be Europe's only focused tradeshow for extruders of film, sheet, pipe, profile and tubing.

Each expo will have its own dedicated conference theatre, plus there will be a new Learning Space theatre hosting educational presentations and training seminars. Another new feature for 2024 will be a Chemical Recycling Zone, which is being added to the *Plastics Recycling World Expo*.

This year's Plastics World Expos attracted 230 exhibitors and 3,385 visitors from 71 countries to Messe Essen on 14-15 June, making it the largest and most international AMI event held in Europe to date and building on the success of the European expos in 2018 and 2021.



IMAGE: APPLIED MARKET INFORMATION

## The 2024 Plastics World Expos bring a new location and more features

Florian Riedl, Director of Business Development at German plastics recycler APK, said: "It's my third time here at the *Plastics Recycling World Expo* and I can definitely recommend it. It's always a great place for collaboration."

Peter Imhof, Head of Sales at Swiss compounder Polycompound, said: "The favourite part of the show for me was the networking. This is the best event focusing on compounding. You have all you need in one place."

AMI Events Director Andy Beevers said: "We are delighted that our Plastics World Expos continue to expand in Europe and are looking forward to accelerating that growth in Brussels next year". He added that the

new Belgian location has been well received by exhibitors thanks to its excellent transport connections and proximity to key customers in Belgium, North Rhine-Westphalia, the Netherlands and Northern France.

Companies that have already booked stands for 2024 include B+B, Brabender, Coperion, Erema, Farrel Pomini, Gneuss, HPF The Mineral Engineers, ICMA San Giorgio, KraussMaffei, Leistritz, LKAB, NGR, Nordson, Pellenc ST, Polystar, Sesotec, Sikora, Sirmax, Sogapol, Starlinger, Weima and many more.

For further information, visit:

**[www.amiplastics.com/events/exhibitions](http://www.amiplastics.com/events/exhibitions)**

## Mega Polymers teams with Rainbow Colors

US plastics distributor Mega Polymers is expanding its compounding division through a partnership with colorant producer Rainbow Colors, combining the capabilities of both at a remodelled 11,500m<sup>2</sup> facility at Elgin in Illinois.

"This is a game changer," said Mega Polymers President Christine Haefelin. "It adds a world class ISO 9000 colour lab to our compounding department, opens new doors for our business, and allows us to serve our customers in ways

we never could before."

Tony Vescovi, VP of Operations at Rainbow Colors said: "As the landscape continues to change in the plastics industry, we are excited to increase our offerings of solutions to include recycling and

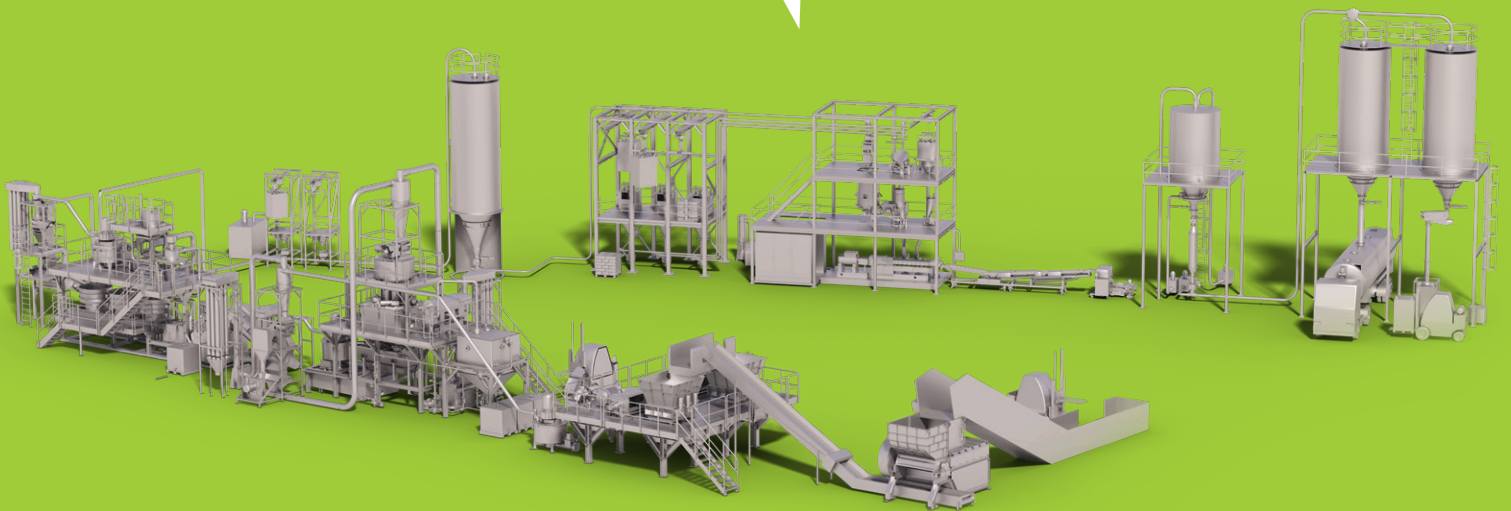
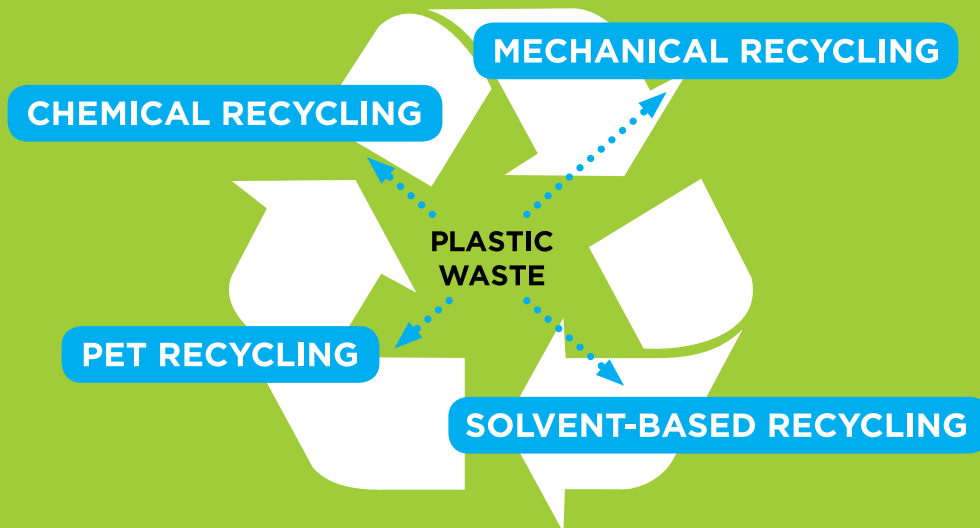
compounding offered at Mega Polymers. This partnership provides all our customers with new solutions to help create efficiency, repeatability, and a more sustainable footprint."

➤ **[www.megapolymers.com](http://www.megapolymers.com)**  
➤ **<http://rainbowcolorsinc.com>**

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# WPCs: building and beyond

*With carbon footprint and sustainability concerns on the rise, the appeal of wood plastic composites is now extending far beyond construction. Jennifer Markarian learns more*

Wood plastic composite (WPC) materials have been known as sustainable building materials – for their use of both recycled plastic and wood waste – since their inception around two decades ago. That remains the case today, with use of plastics containing waste wood fibre or particles now expanding beyond lumber and building materials to meet demands for carbon footprint reduction and use renewable materials.

WPC decking and part manufacturers continue to promote the sustainability aspect of their materials through consumer education. For example, the **Azek** company in the US, which manufactures TimberTech WPC decking and other products, organises community recycling. One of its latest partnerships involves collection of polyethylene “Clean Out Bags” from clothing reseller ThredUp. The post-consumer recycled bags, along with ThredUp’s post-industrial film

waste, will be processed at Azek’s vertically integrated polyethylene recycling facility in Wilmington, Ohio. “It is unique collaborations with innovative and like-minded companies such as ThredUp that will help us meet our goal of recycling 1bn pounds [around 450,000 tonnes] of material annually by the end of 2026,” says Jesse Singh, CEO of The AZEK Company.

With its claimed annual consumption of more than 400m pounds (180,000 tonnes) of plastic film waste, composite decking producer **Trex Company** is considered one of the largest recyclers of plastics film in North America. In addition to its large commercial recycling partners, the company has established the NexTrex Grassroots Movement to collect plastic waste from smaller organisations that are willing to serve as drop-off locations.

Each Grassroots partner is equipped with a baler for bundling and weighing recycled plastic

**Main image:**  
Interest in WPCs is moving beyond construction to markets such as household, automotive and cosmetics

IMAGE: TREX



**Above: WPCs have built a strong position in construction for their durability and performance**

material. "After 20-40 bales are compiled – 20,000-40,000 pounds [9-18 tonnes] of recycled plastic film – Trex will pick up and transport the material to its manufacturing facilities in Virginia or Nevada, where it will begin its new life as high-performance Trex composite decking," the company says.

Trex also organises an annual competition for students in school and community groups to collect and recycle polyethylene plastic film. "The goals of our Grassroots program are to engage more partners, establish more recycling outlets for consumer collection, and to increase overall accessibility to recycling by removing hurdles that prevent the organic growth of local plastic film recycling initiatives," says Stephanie Hicks, Materials Sourcing Manager for Trex Company.

Trex also continues to expand its WPC decking offerings, most recently with two new colours in its Trex Transcend Lineage luxury line. The new shades, a creamy taupe called Carmel and a deep shade of mocha called Jasper, incorporate a heat-mitigating technology that keeps them cooler than other boards of comparable colours. Trex has also doubled its warranty for its high-end products to 50 years.

**Performance additives**

WPC compounds incorporate a range of additives to improve physical properties, appearance, durability, and weatherability. Compatibilisers and coupling agents, for example, are used to help bind wood fibres or particles to the thermoplastic. Denmark-based **Nordic Grafting Company**, which was founded in 2016 as an affiliate of Bjørn Thorsen, produces Acti-Tech compatibilisers for various applications, including a maleic anhydride (MAH)-functionalised product designed for WPC and natural-fibre compounds (NFCs). Most recently, it announced that its Acti-Tech compatibiliser 16MA11F is compliant with EU food regulation 10/2011 and is suitable for food-contact applications.

A new food-safe compatibiliser from US-based

**Right: Symbio masterbatch from Sappi Biotech contains wood-based cellulose fibres (page 20)**

**CAI Performance Additives**, ST-G-PP30LO, can also be used as a coupling agent for PP-based WPCs in food applications in North America, such as wood fibre-PP compounds used for production of cutlery. The additive is an MAH-grafted PP produced by a reactive batch process rather than extrusion. According to the company, this production method results in minimal heat history and low residual organic compounds, which also makes it suitable for applications needing low-VOCs, such as interior automotive parts.

The ST-G-PP30LO additive is said to display high hydrophobicity and anhydride reactivity, as well as low stickiness. According to the company, the MAH is adsorbed into the polymer's microporous structure. This microporous technology can be used with other polymers as well as other additives. CAI is the sole supplier in North America for this product, which is sourced from an Asian producer.

Mexico-based **AddiCo** says its grafted copolymer AddiCo 5901 (a PP grafted with styrene-co-glycidyl methacrylate [GMA]) has been evaluated in PP-cellulose fibre composites. The company reports that the additive improves melt uniformity and interfacial adhesion between the fibre and the PP, which improves physical properties. Its researchers have also evaluated the use of AddiCo 9080 (ethylene butyl acrylate grafted with styrene-co-GMA) in biopolymer-natural fibre composites and they report that the additive improved melt uniformity while maintaining impact properties. US-based AFI Global's **Addisperse** says it is partnering with AddiCo for possible US manufacturing.

Another characteristic of WPC that can benefit from improvement in some applications is static build-up, according to Japanese additive producer **Adeka**. It says that while WPC building materials are drawing attention for their eco-credentials and durability, appearance can be marred due to dust adhesion caused by static electrical charge. To

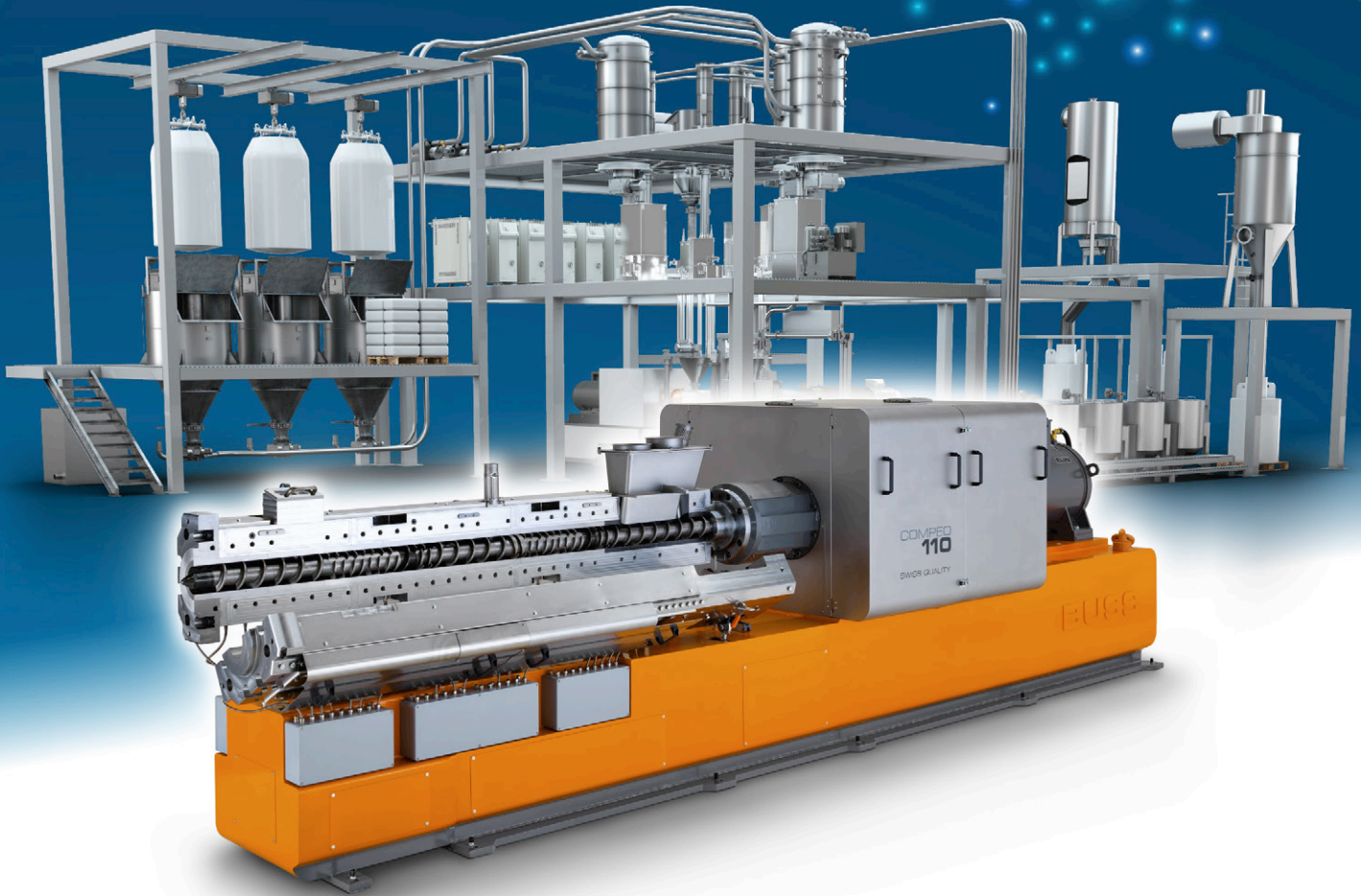


IMAGE: SAPPI BIOTECH



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**Right: The Basajaun project aims to produce a WPC-based alternative to high pressure laminates**

improve this issue, the addition of antistatic agents is one of the solutions.

Adeka has launched a new antistatic additive – ADK STAB AS-301E – that can overcome this. ADK STAB AS-301E is described as a permanent antistatic additive suitable for polyolefin (the company says antistatic agents for plastics are either primary types, such as surfactants, or permanent, such as hydrophilic polymers). Antistatic performance is generally represented by surface resistivity. Materials with a surface resistivity of  $10^{11-14}\Omega/\text{sq}$  can provide anti-dust performance; materials with a surface resistivity of  $10^{8-11}\Omega/\text{sq}$  provide anti-electrostatic discharge performance.

According to Adeka, the AS-301E additive offers anti-dust performance in polyolefins at a 5-10% loading and anti-electrostatic discharge performance at a 15-20% loading. It is said to provide very good efficiency when used in WPCs. For example, 10% of AS-301E can offer anti-dust level in HDPE-based WPCs containing 30-50% of wood flour (Figure 1). Antistatic performance is maintained even in low humidity conditions (20% RH), which it says confirms that WPCs additivated with AS-301-E will show high antidust performance in various environments.

**Compounding challenges**

Some of the challenges experienced when compounding wood fibres or powders arise from their sensitivity to heat and shear, as well as residual moisture. While twin-screw extruders are used for compounding highly filled compounds with low bulk density fillers, using equipment such as downstream side feeders and venting, continuous mixers can also be beneficial due to their use of lower temperatures and lower energy, says Slayton Altenburg, Application Specialist at TPEI. In addition, he says volatiles can escape more readily from a continuous mixer because the compound is



not under pressure.

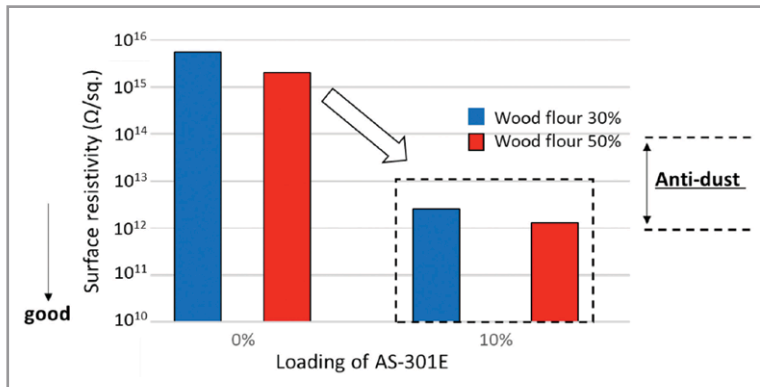
Italian twin screw extruder maker **Bausano**, which specialises in custom extrusion lines, has tested several twin screw extruder configurations for processing a variety of WPC and NFC formulations. The company says one project using the company’s MD series twin-screw extruder achieved an output of 100 kg/h when running formulations with 60-80% PLA and 20-40% sawn wood dust. Other projects have investigated recycled plastics – ABS derived from electronic waste in one test and LDPE bottle caps in another test – as the polymer component of the WPC.

Bausano notes that processing materials from renewable sources poses handling challenges and results in a limited thermal processing range. In addition, post-consumer recycled waste challenges include higher variability and greater risk of degraded material that can lead to negative changes in physical and mechanical properties.

**Wood fillers**

Research is ongoing into new ways to use wood fibres or particles, particularly from waste or recycled wood sources. At the **Fraunhofer Institute for Wood Research** (Wilhelm-Klauditz-Institut, WKI), researchers are investigating the use of wood particles in bio-based plastics to create a bio-based, thermoplastic sheet for interior wall panels or furniture. The research is part of the European **Basajaun** project for sustainable building with wood and is operating under a grant from the EU’s Horizon 2020 programme.

The bio-composite sheet is envisioned as providing an alternative to high-pressure laminate (HPL) used as the surface layer of a plywood or



**Figure 1: Antistatic performance of PP/wood flour WPCs containing Adeka’s Addstab AS-301E permanent antistat additive**

Source: Adeka

other wood-based panel structure. HPL has high performance characteristics, but it may be over-engineered in some applications and is currently difficult to recycle, says Arne Schirp, Project Leader at WKI. A structure of plywood topped with the bio-composite sheet, however, could be easily recycled by grinding and reusing in a wood-plastic composite, for example. There would be no need to separate the top sheet from the plywood core prior to material recycling.

Schirp says the group is experimenting with between 20 and 50% (by weight) wood particle fillers compounded into PLA along with a flame retardant. The main challenge has been to integrate high levels of wood filler and sufficient flame retardant for good fire performance while maintaining processability. "If the total filler level gets too high, compounding becomes difficult," says Schirp.

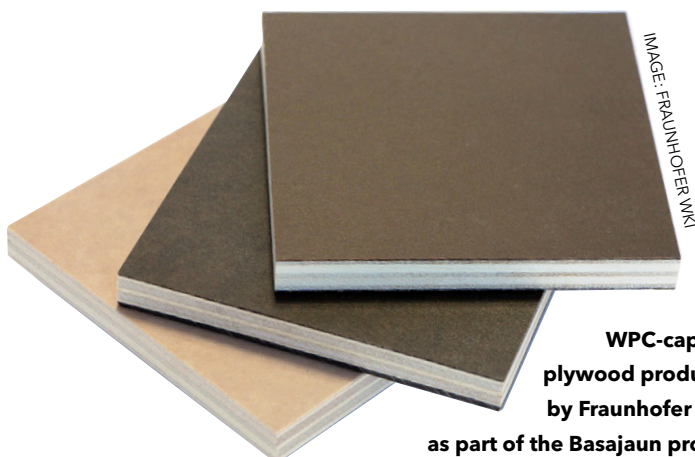
The wood filler is usually not dried before compounding, but appropriate compounding conditions and vacuum degassing in the twin-screw extruder have been used successfully without triggering hydrolysis of PLA.

PLA was chosen as a readily available and affordable bio-based plastic, but the researchers have also worked with other polymer matrices. Polyamides, HDPE, or PP – all available from bio-based sources – are potential options when higher heat resistance is needed, says Schirp. One of the next steps for the project is to experiment with colorants and ways to customise the appearance of the top layer.

Research carried out by a number of Norwegian companies in partnership with the **RISE PFI** research institute is finding some success in compounding of wood thermo-mechanical pulp (TMP) fibres into thermoplastic composites for flooring and other products. Some of the findings are covered [HERE](#) in the May 2023 edition of *Compounding World*.

Wood fibres are also being used as fillers in what some are calling biocomposite materials to indicate their bio-based composition. These materials are finding use in a wide range of applications beyond building and construction, including packaging and single-use as well as durable products.

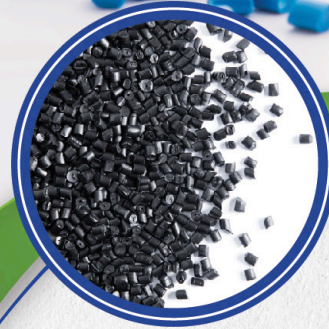
Activity is greatest in Europe, where European Union and country-specific regulations are driving change in plastic use. For example, Finland's **Sulapac** says its materials are



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**Right: A selection of premium cosmetics packaging produced in Sulapac's WPC biocomposites**

industrially compostable and produced from biopolymers and wood-based natural fibres, with a preference given to materials derived from second-generation (non-food feedstock) side streams. The company says its goal is to use 100% recycled or side-stream content in all its materials by 2025.

The company's latest introduction is Sulapac Luxe, a bio-based material developed as an alternative to ABS for luxury fragrance caps that can be processed on standard injection moulding equipment.

Sulapac has other biocomposite materials that are already being used in cosmetic jars, caps, and other packaging, as well as in thermoformed logistic trays and point-of-sale displays. These include its Flow 1.7 biocomposite, which was originally developed for extruded straws but can also be used in 3D printing. Sulapac says the Eco-Fil-A-Gehr Wood filament can be used for prototyping or creating point-of-sale structures.

Swedish start-up **Biofiber Tech** introduced FibrAQ in 2021, produced with patented technology that makes wood fibres hydrophobic and more compatible with plastics. The company says its aim is to help brand owners replace conventional fossil-based plastic to reduce carbon dioxide emissions.

Biofiber Tech says compounders can use FibrAQ to make wood-fibre based plastic compounds in conventional twin-screw extrusion compounding equipment. In 2022, it introduced a number of FibrAQ compounds, including FibrAQ 3D for 3D-printed products, FibrAQ ABS, and FibrAQ 100% Bio, which uses bioplastics and is compostable. The most recent addition to its product line is FibrAQ TPE compounds, which use FibrAQ wood fibers in EVA or TPU.

Another key player in the bio-based filler sector is **Sappi Biotech**. Its Sappi Symbio is a thermoplas-



IMAGE: SULAPAC

tic masterbatch containing functionalised cellulose fibres derived from managed European forests and plantations that are 100% FSC certified. The company says use of Symbio can reduce carbon footprint and material weight compared to using short glass fibres.

Sappi's Symbio ED90-PP contains 90% compatibilised cellulose in PP, which it says can be diluted to the desired cellulose content, in any colour, in a compounding process. Juul Cuijpers, Sappi Europe's Product Manager for Symbio, says that in standard twin-screw extrusion compounding, it is preferable to feed the material via a side feeder after having fed the polymer on the main feed allowing it to melt before the addition of Symbio.

The pellet masterbatch is easy to dose and easy to handle, achieving very good dispersion, and the cellulose has a consistent, high quality and purity level, Cuijpers says. The material can be used in a wide range of applications, including furniture, consumer electronics, automotive interior components, packaging, and kitchen items such as cutting boards. It is said to provide a natural and warm feel and to meet automotive industry requirements such as absence of undesired odour.

**Below: A WPC kayak being 3D-printed at the RISE Research Institute in Biofiber Tech's FibrAQ 3D compound**

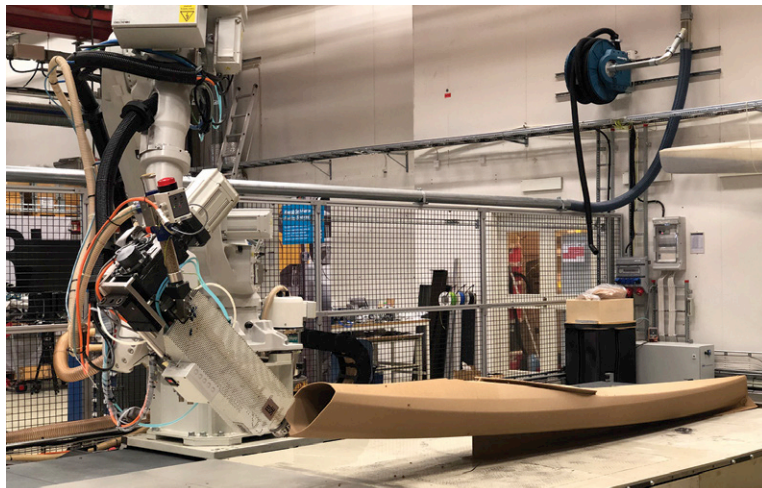


IMAGE: BIOFIBER TECH

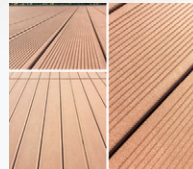
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# Developing plasticisers for the future of PVC



IMAGE: GRUPA AZOTY

## *The latest innovations in PVC plasticisers tackle health and environmental concerns while promising better cost and performance. Mikell Knights reports*

With traditional plasticisers continuing to face pressure over potential health and environmental concerns, alternatives continue to emerge for these essential additives for the flexible PVC industry. The latest developments include phthalate-alternative products – both bio-based and high molecular weight types – with many producers focusing on application-specific plasticisers that offer benefits ranging from improved toxicological profiles and reduced environmental impact, while simultaneously enhancing performance characteristics such as heat stability, mechanical properties, migration-resistance or efficiency.

Brazil-headquartered **Innoleics** continues to expand its portfolio of bio-based primary plasticisers with the development of two new general-purpose grades, already released into the Brazilian market, which have successfully replaced DINP and DOTP in plastisol formulations, according to Jacyr Quadros,

Director at Innoleics USA. The materials are now being made available internationally, with Innoleics USA providing local technical support in the North American market and Varteco Iberica in Europe.

The company's GPe 9 and GPe 10 grades are described as sustainable plasticisers for use in s-PVC (suspension grade) compounds and plastisols. They are manufactured using Innoleic's vegetable oil chemical modification technology, which the company says results in a phthalate-free primary plasticiser that does not display the compatibility issues that can occur with Epoxidated Soybean Oil (ESO) types. Innoleics says it subjects the soybean oil fatty acids to transesterification, epoxidation, and acylation to produce materials that offer improved compatibility with PVC and lower volatility, which helps in high performance applications.

Both general purpose plasticisers are said to feature reduced plastisol gelation and fusion

**Main image: Plasticiser producers are developing new products with better toxicological, environmental and performance profiles**

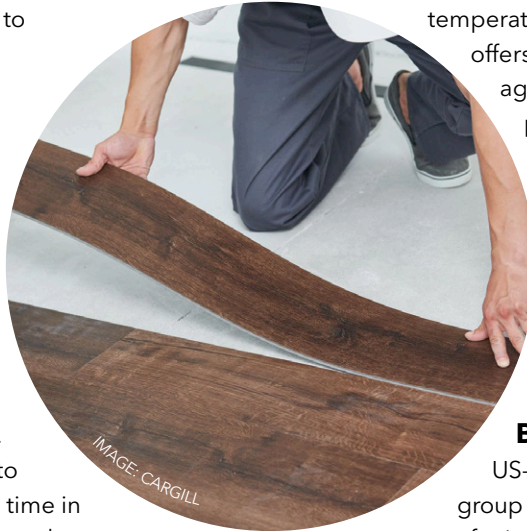
**Right: Cargill's Bioverobio-based plasticisers target flooring applications**

temperatures in comparison to competing general-purpose formulations, as well as improved thermal stabilisation due to their inherent epoxy groups. The company says the formulations allow for the complete replacement of ESO as a co-stabiliser, which it says simplifies the formulation and reduces raw material inventory and SKUs.

Both grades are claimed to provide an improved dry-up time in suspension PVC compounds and a reduced carbon footprint. The materials are also said to offer increased throughput, which can reduce unit manufacturing costs, and to allow lower oven temperatures which can reduce energy costs. When used as a replacement for petroleum-based GP plasticisers, Innoleics says the new grades can impart increased clarity and surface gloss to the finished product.

The company says GPe 9 is a slightly lower cost grade intended for use in applications where characteristics are not critical. It presents reasonable mass loss in comparison with petroleum-based general-purpose plasticisers but higher volatility is said to make it most suitable for less volatility-sensitive applications. In addition, the slightly higher viscosity aging may require formulation adjustments for plastisols, the company says.

GPe 10 is said to present good viscosity and oven aging performance, with improved low



temperature flexibility. Innoleics says it offers similar volatility and viscosity aging when compared to petroleum-based GP plasticisers, allowing it to provide similar service life in final products with little need for formulation adjustments. In addition, it has improved low-temperature flexibility.

**Bio-based solutions**

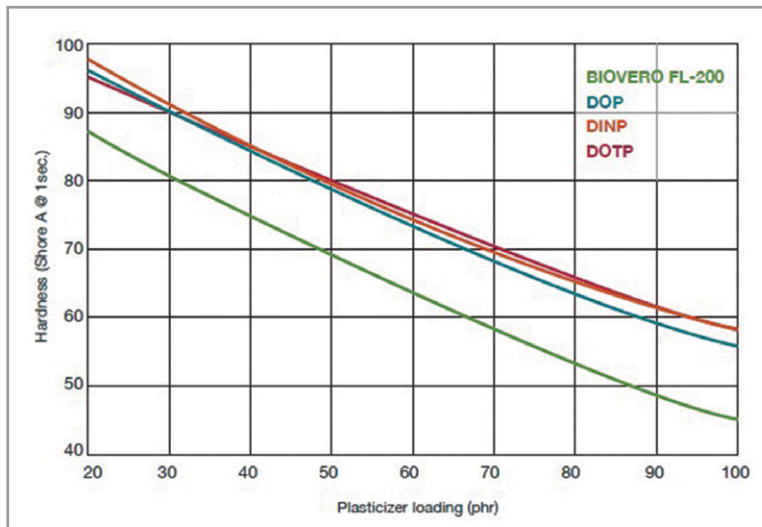
US-headquartered agri-products group **Cargill** is steadily making a name for itself in bio-based feedstocks through both technical innovation and acquisition. In 2021 it expanded its plasticisers group with the acquisition of Arkema's epoxides business, which included a manufacturing facility at Blooming Prairie, MN, US, specialising in epoxidised vegetable oils.

Epoxidised vegetable oils are key components in Cargill's own bio-based plasticisers and polyols. "Adding this capability will allow us to innovate across the polyol value chain, transforming our vegetable oil into highly functional compounds that bring benefits like flexibility, durability and heat stability to a wide range of industrial products," said Kurtis Miller, Managing Director of Cargill's bioindustrial business, when the purchase was announced.

The deal also included Arkema's Vikoflex and Vikolox family of epoxidised vegetable, soybean and linseed-oil grades, as well as the Vikopol epoxidised polybutene used as an adhesive and epoxy enhancer and Vikinol aliphatic diols. The materials are now incorporated into Cargill's Bioindustrial portfolio.

Cargill further expanded its bioindustrial solutions with its new Biovero bio-based plasticiser, which is designed primarily for extruded and calendered flooring products but can be used for a variety of other PVC manufacturing applications, including production of fabrics, wires, cables and plastic films and sheets.

The Biovero FL-200 grade is derived from feedstocks sourced from bio-based materials and is a non-phthalate plasticiser that can provide cost savings and performance benefits, according to Cargill. It is said to offer low extractability, can achieve required flexibility at lower loading levels, provides faster processing and line speeds, supports lower processing temperatures, and is more resistant to degradation from heat exposure (Figure 1). The company says the plant-based plasticiser can allow manufacturers to produce



**Figure 1: Efficiency curves for Biovero FL-200 compares with DOP, DINP, DOTP (samples aged at 50°C for 7 days; hardness normalised to 60 Shore A)**

Source: Cargill



goods more efficiently than using conventional plasticisers, while reducing energy, scrap, and material usage.

Japanese additives specialist **Adeka** launched its ADK Cyclcoaid bio-based plasticisers as environmentally friendly alternatives to fossil-based materials. The company says its ADK Cyclcoaid PNB series formulation for PVC uses 90% or more biomass raw materials yet exhibits equal or better performance compared to general-purpose plasticisers based on phthalates or dibasic esters in terms of oil resistance (resistance to oil extraction), heat aging stability and migration. ADK Cyclcoaid PNB received "Biomass Mark" labeling and certification from the Japan Organics Recycling Association.

Adeka also offers its ADK Cizer C series of linear or branched trimellitate plasticisers for PVC applications where high heat resistance, flexibility at low temperature and low volatility are required, while it says its ADK Cizer PN series of polymeric plasticisers for PVC offer very good oil resistance, anti-migration performance and extremely low volatility.

As the industry transitions toward sustainable additives, the aim is to strike a balance between green goals and the performance of PVC products, according to **Emery Oleochemicals**. Manufacturers need to consider intended use, end-user safety and environmental impact when formulating PVC products as the choice of plasticiser depends on the specific requirements of the application. Factors such as flexibility, temperature resistance, chemical resistance and regulatory compliance play a significant role in selection.

Migration characteristics are of particular importance in food packaging applica-

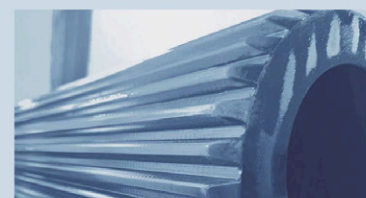
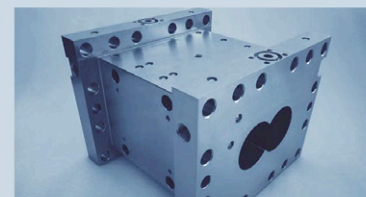
tions. EU Directive 10/2011 sets migration limits for substances approved for indirect food contact. Emery Oleochemicals says it has developed a portfolio of plasticisers with exceptionally low migration characteristics and adds that these are in compliance with Directive 10/2011. To meet the demanding requirements of this industry, it offers a full line of polymeric plasticisers over a viscosity range from 700 to 13,000 mPa\*s (20 °C) that have very low migration properties.

Emery Oleochemicals has developed several plasticisers for technical PVC applications. For roof membranes it offers Edenol 1233 Spezial, a polymeric plasticiser based on adipic acid that has a high viscosity and offers good resistance to extraction by oils, fats, grease, aliphatic hydrocarbons, and aqueous systems. Meanwhile, its Edenol 9789 polymeric plasticiser, which is based on azelaic acid, is said to offer low volatility and high temperature and weather resistance, making it suitable for use in cast films for the automotive industry.

Last year, Emery Oleochemicals announced the development of two 100% bio-based plasticisers – Edenol 2178 and 2192 – that can partially replace the monomeric plasticiser DOA. Shore hardness is said to be marginally compromised while extraction resistance is noticeably improved (Figure 2). The two plasticisers are said to show very good



**Emery's Edenol 9789 polymeric plasticiser offers the low volatility and durability required for cast films for the automotive industry**



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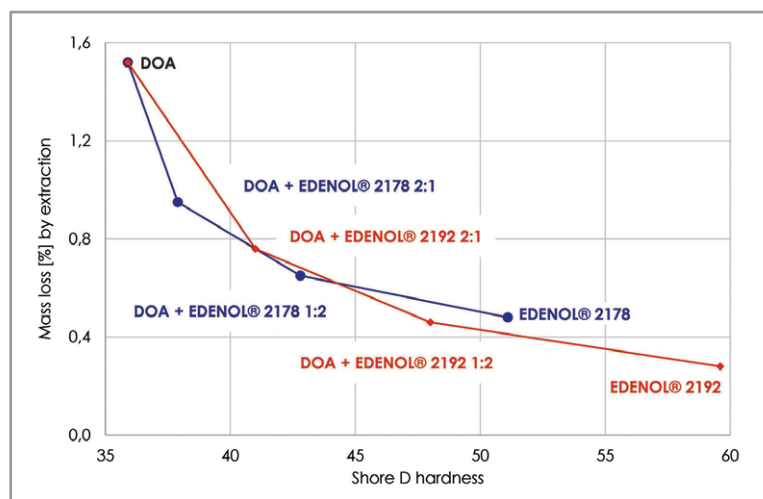
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**Figure 2: Impact on extraction resistance when replacing DOA with a blend of DOA and Edenol 2178 or 2192**

Source: Emery Oleochemicals

performance in both PVC and in bioplastic resins. They can be used as single plasticisers, in combination with each other, or in conjunction with other plasticisers. Both are biodegradable.

**Mass-balance approach**

Germany’s **BASF** has been using a biomass-balanced (BMB) approach for its Hexamoll DINCH BMB, Palatinol N BMB, Palatinol 10-P BMB and Plastomoll DOA BMB plasticisers since 2020. Further supporting its circular goals, the company recently expanded its BMB portfolio with Plastomoll DNA and the polymeric grades Palamoll 652, 654 and 656 in a BMB version.

“Customers are focusing on smart ways to reduce the carbon footprint in their formulations,” says Ellen Strubel, Head of Sales Plasticisers EMEA at BASF. The company says that using biomass-balanced versions of known plasticisers means customers can realise a reduced carbon footprint through the attribution of renewable raw materials within BASF’s integrated production system. Such plasticisers offer the same product features as their conventional counterparts, so they can be used and processed in the same way.

Calculation of the product carbon footprint (PCF) follows the “Together for Sustainability” methodology, in which BASF and several other chemical companies have agreed on a global guideline with the goal of assessing, auditing, and improving sustainability practices within their global supply chains. TÜV Rhineland has certified that BASF’s method to calculate cradle-to-gate product carbon footprint is in line with the relevant ISO standards and with the Greenhouse Gas Protocol Product Standard.

Prior to June of this year, BASF offered its

biomass balanced plasticisers only in accordance with the REDcert2 certification scheme. Since June, its biomass-balanced plasticisers are also certified to the ISCC Plus certification scheme.

Better meeting customers’ needs is the driver for expansion of the plasticiser product range at **Evonik Oxeno**, the company says. Its latest innovation in the sector is the specialty plasticiser Elatur TM, which has been developed for demanding applications such as high temperature cables, dashboards, car seating parts and high-quality interior fittings including steering wheel trim.

“The portfolio expansion is in line with our expansion strategy with the latest generation of isononanol (INA)-based plasticisers,” says Roland Pietz, Market Segment Head for Oxo-Alcohols and Plasticisers at Evonik Oxeno. He says the product launch strengthens Evonik’s business in the PVC plasticiser sector.

The Elatur TM introduction further extends Evonik’s Elatur product line, which comprises the Elatur DINCD and Elatur CH (DINCH) general purpose plasticisers for outdoor and indoor applications, and Elatur DPT fast gelling plasticiser. The company’s portfolio also includes Vestnol 9 (DINP), a high molecular weight universal plasticiser that the company says is suitable for almost any flexible PVC applications.

Evonik Oxeno’s ISCC Plus certification means it can use mass balance methods to offer grades that can be attributed as bio-based, circular, bio-circular, or reduced-footprint. The company also recently developed its myFlexino portal, providing customers with 24/7 access to relevant technical documents and supplementary information, including online sample request.

Poland’s Grupa Azoty has for some time focused its plasticiser developments and business on non-phthalate grades, introducing its first non-

**Right: BASF’s DINCH BMB plasticiser is being used in food jar closure sealing inserts by Technocap**



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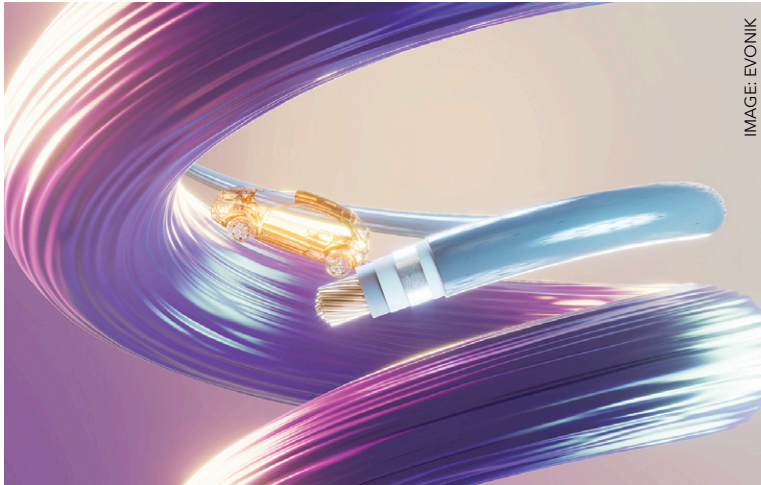


IMAGE: EVONIK

**Above: Elatur TM is the latest addition to the Evonik Oxeno plasticiser portfolio, pitched at high temperature cable and automotive applications**

phthalate product in 2011 and gradually expanding its offering which, since 2020, has been marketed under the **Oxoplast** name.

“We definitely don’t miss phthalates. Discontinuing their production was a measure that the company consciously took in view of the regulations coming into force back then, which continue to have a significant impact on the nature of the market,” says Maciej Budner, who heads up the Oxoplast Business Unit. “We are well aware that the path that Europe and the entire world are following, and will continue to follow, involves further restrictions on orthophthalates. So it was a natural course of action for us to set up a large plant for the production of DOTP [non-orthophthalate plasticiser].”

Last year, the company opened a second R&D centre at Kędzierzyn-Koźle in Poland. The 1,900m<sup>2</sup> facility represents an investment of around €8.7m and includes 10 research labs. The company says it will focus on extending its specialty product

portfolio with a special focus on development of bio-based and renewable products. The Oxoplast specialty plasticiser business unit, in particular, is expected to benefit from the extended capabilities.

Budner says the company is also focused on regional diversification. Two years ago it established storage capacity on the east coast of the US for 2-Ethylhexanol to serve its customers in the North American market. In 2022 it rented a second storage tank and now has capacity of 2,500 tonnes for 2-Ethylhexanol alcohol and 1,500 tons for Oxoviflex b plasticiser. He says the longer term goal is to deploy several thousand tons of both products annually in the US market.

“Without a doubt, we are operating in a difficult time, and being able to allocate volumes across logistics centers in different parts of the world is crucial to keep production and business management flowing,” Budner says. “While the operations we are undertaking are ambitious, given the opportunities offered by the US market, there is clearly much to strive for.”

**Business challenges**

Like all businesses, Grupa Azoty has also had to make operational changes to deal with the impacts of the Covid pandemic and, more recently, Russia’s invasion of Ukraine. “In recent years, we have experienced a demand and price boom, largely fueled by the Covid-19 pandemic,” Budner says. “Purchasing capacity and demand for products, largely the ones for which our products are used, have increased. Consequently, Segment Oxoplast recorded peak results in 2021. Foreseeing what 2022 would look like, we predicted a slowdown

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# FDA denies call for phthalate food ban

Last month, the US Food and Drug Administration (FDA) denied a **petition** calling on it to reconsider an earlier decision not to ban the use of eight ortho-phthalate plasticisers in food contact applications and not to revoke sanctioned uses for five.

The reconsideration petition had been filed by Washington, DC, US-based public interest legal group Earthjustice and referred to the FDA's earlier denial of a citizen petition submitted in 2016 by Earthjustice and a number of other groups, including the Center for Food Safety, Center for Environmental Health, Center for Science in the Public Interest, Consumer Federation of America, and the Natural Resources Defense Council.

That original petition had called on the agency to ban the use of eight ortho-phthalate plasticisers –DIBP, DBP, BBP, DCHP, DnHP, DIOP, DEHP and DiNP – in all food contact applications and to remove five prior-sanctioned uses for BPBG, DEP,

IMAGE: SHUTTERSTOCK



EPEG, DEHP and DIOP.

The FDA said in its **response** to the reconsideration petition that it had evaluated it and concluded that it did not provide a basis for modifying its original decision.

“Our response explains that we adequately considered relevant information and views contained in the administrative record when

responding to the original citizen petition,” it said. “Additionally, we have considered the information submitted in the reconsideration petition and other relevant information in the administrative record. The FDA’s decision to deny the original petition remains unchanged.”

- > [www.fda.gov](http://www.fda.gov)
- > [www.earthjustice.org](http://www.earthjustice.org)

from the middle of the year.”

However, Russia’s aggression intensified the challenge with spikes in gas prices at levels not seen previously. It also cut the company off from its supply of propylene in Ukraine. “This was the first and most challenging problem of last year. Within a month, we constructed an alternative system for securing the Oxoplast Business Unit in basic raw material and implemented a mechanism for short-term planning and operation that is flexible and adapted to the conditions we face,” Budner says.

The Pro-Environment Oxo portfolio of products from Sweden’s **Perstorp** includes plasticisers, polyols, acids, and alcohols made from mass balanced renewable or recycled raw materials. The company’s Pro-Environment products and mass balance method, as well as its greenhouse gas calculations, are ISCC Plus certified.

The company’s portfolio of plasticisers based on ISCC Plus certified renewable raw materials include its Pevalen Pro non-phthalate polyol ester material, which was launched in 2014 and is based on 8% or 36% renewable carbon content, and its Emoltene 100 Pro C10 general-purpose grade with 14%

renewable carbon content produced using biogas and launched in 2020.

Last year Perstorp announced the development of a partly bio-based 2-Ethylhexanol (2-EH). 2-EH is widely used in the production of plasticisers for flexible vinyl and acrylate applications, according to Magnus Hindsö, Business Manager for the company’s Pro-Environment OXO portfolio. The new 2-EH is chemically identical to its fossil-based counterpart but offers the benefit of a reduced carbon footprint and lower CO<sub>2</sub> emissions. The company says there is no trade-off in terms of performance and the grade can be used as a drop-in replacement in existing formulations.

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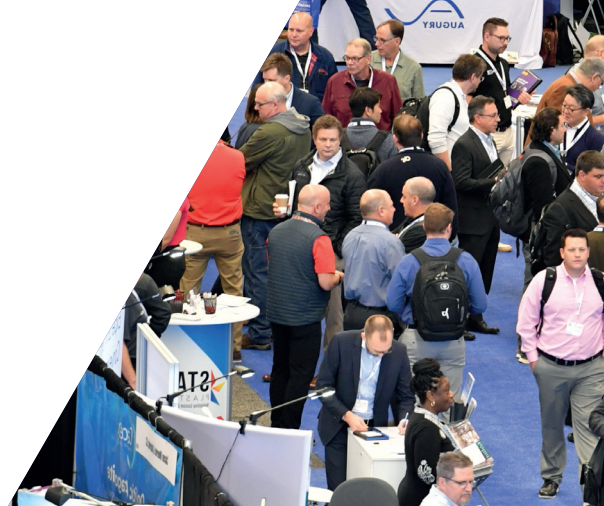
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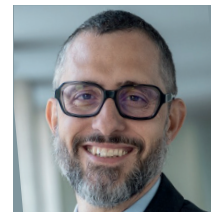
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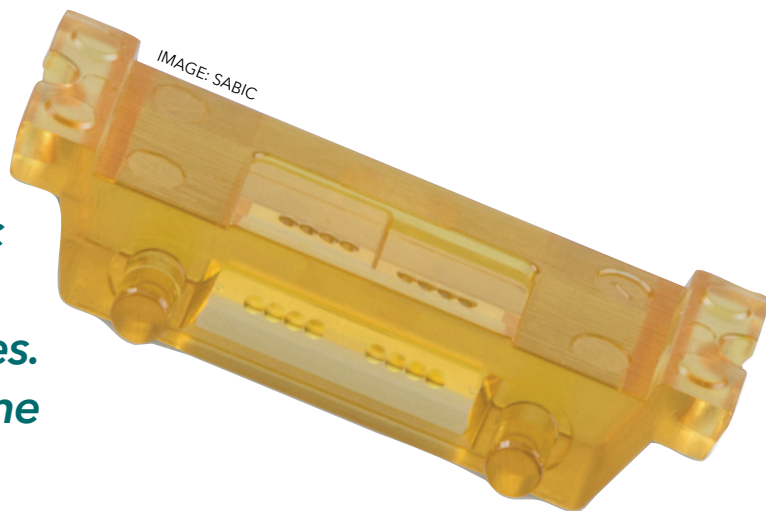
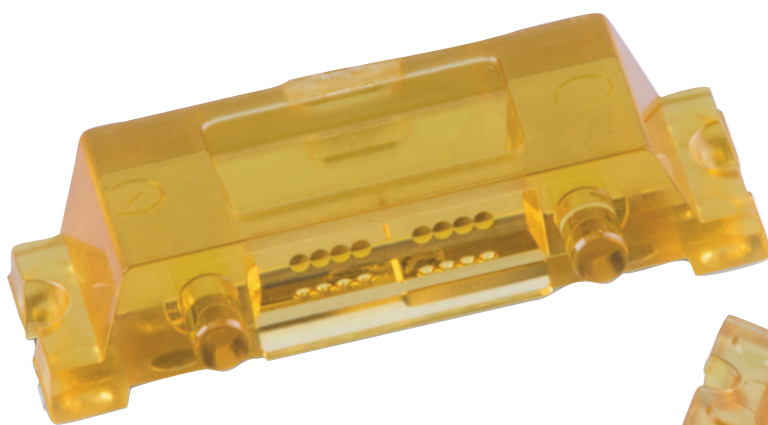
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*Automotive and electronics place high demands on plastic compounds; electric vehicles present even greater challenges. Chris Saunders reports on some of the latest solutions*

## Coping with the heat

High temperature plastics (HTPs) have been used in the electrical and electronic (E&E) and automotive industries, and in other demanding applications, for many years. However, the rapid development of the global EV market is presenting developers of high temperature plastics and compounds with new challenges – parts are often smaller, must resist higher temperatures for longer periods, and may also have to provide additional properties such as flame retardance or tracking resistance – and new opportunities.

US-headquartered specialty compounder **RTP Company** is focused on proliferating technologies commonly found in standard engineering compounds into high temperature alternatives. The result is a wide range of engineered materials that offer both performance and aesthetics in high temperature applications in various markets. The company uses additives to modify colour, surface finish, and to provide the scratch resistance that is important in applications where appearance is crucial.

Where static charge management is a requirement – as is the case for sensitive electronics – anti-static or static dissipative technologies can be compounded with high temperature resins. For example, PEEK resin can be modified with carbon fibre or carbon nanotubes to provide permanent

static dissipative and antistatic performance. This fills a gap in the electronics and semiconductor markets, where equipment, tooling, and fixtures need to be ESD-safe, but not conductive enough to allow flow of electric current.

“Standard reinforcements such as glass, minerals, and carbon fibre are still staples in high temperature thermoplastic compounds for high performance applications,” says Brett Weishalla, Senior Product Development Engineer at RTP. “But the cool thing about compounding is that we can provide a range of properties in one material, which is very helpful to moulders and product designers.”

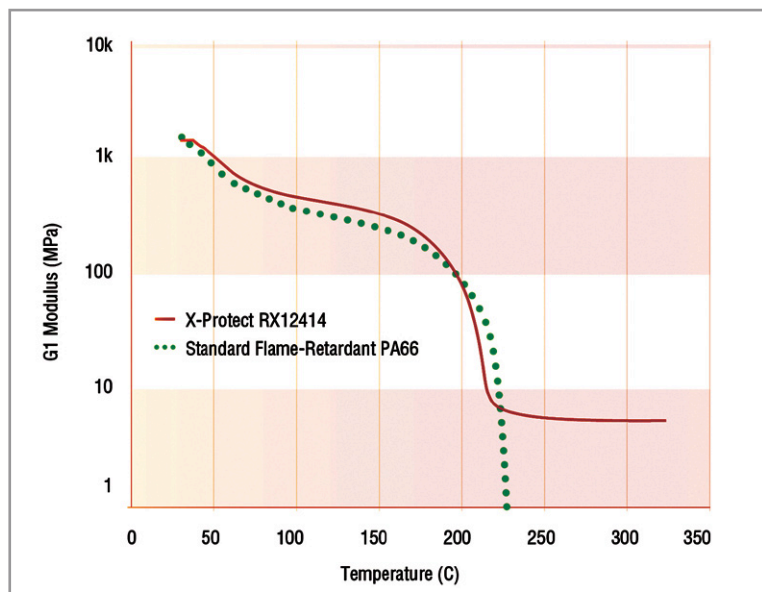
RTP also reports growth in HTP materials

**Main image:**  
**Optical interconnect lens produced by Nalux is made with SABIC's new ultra-high-heat, NIR-transparent Extem RH1016UCL resin**

**Additives and reinforcement materials are important in HTP compounds, says RTP**



IMAGE: RTP



Temperature performance of Ascend’s Starflam X-Protect FR PA66.

Source: Ascend Performance Materials

containing recyclate. “We’ve seen higher demand for sustainable options,” says Weishalla. “Our high temperature product portfolio continues to expand with more options containing recycled content.”

**Limiting development**

According to Buket Turan, Technical Marketing Manager at Turkish compounder **Eurotec Engineering Plastics**, high temperature resistance is one of the key performance parameters that limits use of plastics in sectors such as automotive and electronics. Developing compounds to overcome this limitation is a key part of its business and it currently offers polyphthalamide (PPA), polyphenylene sulphide (PPS), polyetheretherketone (PEEK) and polyaryl sulphones (PES, PPSU, PSU) under the Tecomid HT, Tecotron XS, Tecopeek PK and Tecotek ES, Tecotek EP and Tecotek EU brands.

PPA, PPS and PEEK are all used in automotive ignition components and underhood sensors, as well as in sockets and coils in electronic systems, where their high continuous use temperatures allow retention of mechanical properties. “Tecomid HT and Tecotron XS can provide continuous use temperatures up to 180°C and 210°C and Eurotec has many ready and proven grades for the automotive industry,” says Turan. “Tecomid HT NT40 GD40 BK009 XA61, a 40% glass fibre reinforced, flame retardant and heat stabilised PPA grade, is being currently used by a well-known automotive OEM for an inverter housing application where standard PBT and PET materials cannot provide the required continuous use temperature.”

Electric vehicles are providing further opportunities, Turan says, due to the need to meet demand-

ing mechanical and thermal performance requirements together with maintaining electrical properties. Eurotec has, for example, developed specific grades for electric motor applications.

Tecotek ES20 GR30 NL and Tecotek EP20 GR20 NL (20 and 30% glass fibre reinforced, natural PESU grades) are approved by several global OEMs use in rotor end caps. Tecotron XS20 GR40 BK009 (40% glass fibre reinforced, black PPS), Tecomid NT40 GD40 BK009 XA61 (40% glass fibre reinforced, flame retardant and heat stabilised PPS), and Tecomid NT40 GR30 BK009 XA61 (30% glass fibre reinforced, flame retardant and heat stabilised PPA) are said to be suitable for motor brush holders.

Some high performance polymers also offer inherently flame retardant behaviour, allowing them to meet stringent aviation standards such as OSU, NBS and FAR, which require low heat release, and low smoke and toxicity. Turan says Eurotec is one of the raw material suppliers to Turkish airlines and has a large product range intended for aviation industry applications. Polyaryl sulphones are preferable over PEEK due to their cost advantage and good flame behaviour. Turan says Eurotec has a number of suitable grades, including Tecotek ES20 WH100 HR 0A (white, low heat release PESU) and Tecotek EP20 WH100 HR 0C (white, low heat release PPSU). Both meet OSU heat release requirements with OSU 55/55 and OSU 65/65 ratings, respectively. Where higher service temperatures are required PEEK is the optimal material, withstanding up to 260°C.

Tecopeek grades also stand out for their usability in broader metal replacement applications due to their favourable combination of lightness, high thermal resistance and mechanical properties, Turan says. Tecopeek PK40 CR30 BK111 offers the rigidity and tensile strength required for applications such as gears, bearing rings and pump components. Tecopeek PK40 CR30 BK111 RT 0D, with a tensile strength of 23,500 MPa and 215 MPa, is tailored to high temperature duties involving exposure to constant wear, such as chain bushings in a textile machine.

**Safer performance**

Performance polyamide producer **Ascend Performance Materials’** Starflam X-Protect is a flame retardant PA66 designed to help automotive engineers advance both safety and performance, says the company. Typical applications include modules, barriers, high-voltage insulators, structural elements, vents and pressure relief valves.

Starflam X-Protect parts offer extreme heat resistance well beyond that of conventional flame-re-

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tardant engineering thermoplastics and provide mechanical stability at temperatures far above the melting point of a standard PA66, says Ascend, which sees potential for use managing thermal runaway conditions in EV battery systems. Starflam-X is available in unfilled, 30% glass and 60% glass/mineral filled grades, all with a glow wire flammability index (GWFI) temperature of 960°C as well as a UL94 V-0 rating at 0.8 mm wall thickness.

The glass-filled grade has an R22:HL3 rating for interior components, according to European railway safety standard EN 45545. In direct flame exposure testing at 1,100°C, moulded samples of Starflam X-Protect with a wall thickness of 3mm withstood the entire test duration of 15 minutes, compared to less than four minutes for 3mm aluminium and less than three minutes for 3mm standard flame-retardant PA66. Similar increased levels of integrity are useful in next-generation industrial power management systems, metal-welding applications, lead-free soldering processes and electrical components where arcing can occur.

X-Protect shows good flow and can be moulding under similar process conditions and on the same equipment as standard polyamides. It can also be coloured in bright shades such as the signal orange used for high voltage EV components. Ascend says Starflam also delivers good aesthetic surface quality in combination with improved abrasion resistance and better ultrasonic weldline strength over conventional PA66.

Earlier this year, **Solvay** announced the introduction of a new high-heat and flame retardant addition to its Xydar liquid crystal polymer (LCP) portfolio, designed to meet safety demands in EV battery components. The new Xydar LCP G-330 HH material addresses thermal and insulation requirements and is targeted at battery module plates operating in higher voltage systems.

“As automakers are moving from 400V to 800V on next-generation electric vehicles, new regulations in Europe, China, the US and other countries are increasing the demand on battery components

to withstand temperatures from 300°C to 1,000°C for an extended window of

up to 15 minutes,” says Brian Baleno, Head of Marketing, Transportation at Solvay Materials.

“Appropriate materials are expected to retain a level of electrical insulation protection that will provide sufficient time for passengers to exit the vehicle in a thermal runaway event. Our new Xydar LCP

**Right: Celanese materials are used in this wireless EV charging system from VMAX New Energy**



grade combines this high safety potential with exceptional processability.”

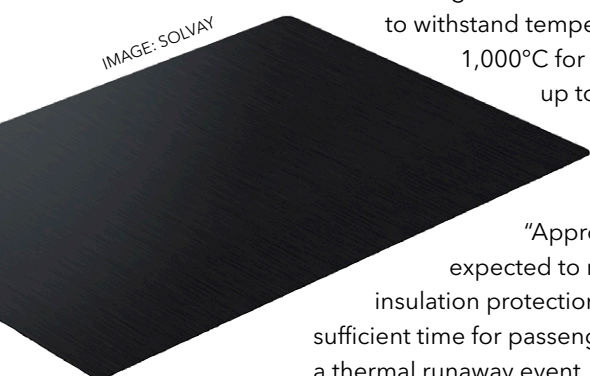
Xydar LCP G-330 HH is a glass-filled LCP capable of retaining its electrical insulation upon exposure to temperatures of 400°C for 30 minutes. It is an inherently flame retardant polymer, eliminating the need for halogen or bromine additives, and offers good flow that helps designers achieve thinner parts than possible with incumbent battery module insulation materials.

### Tackling noise

Japan’s **Kuraray** says, compared to competitive products, its Genestar PPA offers improved chemical resistance and lower moisture absorption, which makes it a good choice for use in applications such as coolant control valves and thermal management applications. With noise reduction being an area of increasing scrutiny as the EV revolution takes hold, Genestar PA9T is also available in unreinforced grades offering good NVH performance along with high dimensional stability and good wear resistance.

“Electronic applications in EVs are targeted with Genestar’s HB and V-0 grade portfolio, which can reach voltages up to 950V with an enhanced CTI test set-up, dielectric strength around 30 kV/mm and a volume resistivity of 1E+10 Ω.cm,” says Laurent Hulpiau, Advanced Sales Engineer Genestar PA9T. “All three of these properties are reduced only slightly after conditioning (high moisture, high temperature) compared to other P(P)As and combining this with a good colour stability and reflow capability makes it possible to use Genestar in high voltage (connector) applica-

**Below: Solvay has introduced a Xydar LCP material for high-heat EV battery module insulation**





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tions and power module parts like IGBTs and bobbins.”

With the acquisition last November of the engineering plastics division of DuPont, **Celanese** expanded its range of solutions to include more materials for applications requiring high temperature stability. “If you consider the classic plastics pyramid, we now offer solutions from the very top of the temperature range, LCP and PPS, for example, through all manner of polyamide, to engineering grades of LFTs based on a PP matrix,” says Richard Chang, Celanese Market Manager E&E.

Chang and his colleagues recently collaborated with VMAX New Energy, a Tier One supplier to one of China’s largest wireless charging infrastructure providers, on an 11KW wireless EV charging system now being introduced commercially. The system consists of two pads; a receiver that attaches to the car’s chassis and a transmitter mounted on the ground and connected to a power source.

A non-halogen flame retardant Zytel HTN is used for the housing of the transmission plate. It protects the inner wireless charging system and prevents damage caused by drops, wheel compression, chemicals, oils, and UV. Celanese developed this particular Zytel HTN grade not only for performance, but also for high gloss and durability. Several other components in the charging system, including the vehicle-side coil housing and ground-side coil holder, are made using Zytel PA and Zytel HTN.

Celanese says the wireless EV charger is a good example of an application where high-temperature PPA and PA materials are required. However, for projects with even more severe temperature demands, it offer its Vectra and Zenite LCP materials. In a recent webinar, Young Kim, Senior Principal Engineer at the company, explained how the company’s LCP solutions are playing an important role in 5G data transmission infrastructure.

The jump from 4G (15 MB/sec) to 5G (1-10 GB/sec) wireless data networks requires robust materials to ensure reliable connectivity. Critical technical requirements include low moisture absorption, high dimensional stability, and consistent Dk/Df (dielectric constant/dissipation factor). LCP materials deliver all of those along with a HDT

(Heat Deflection Temperature) enabling them to 340°C to withstand lead-free soldering at 260°C for up to four minutes.

**Competitive options**

Italian compounder **Lati** has introduced a range of performance grades – Laramid T – based on PA9T, which the company says offer very good thermal performance and a competitive price/performance ratio. Laramid PA9T compounds offer reliable mechanical performance up to a continuous use temperature of 150°C, which it says is a critical threshold for many fields, allowing them to compete with other PPAs and PPS in parts used in automotive, appliance, energy management, electronic and electrical devices.

“Thanks to the glass transition temperature of the base resin, which is close to 130°C, Laramid T can immediately be counted among the resins suitable for use in applications where heat accumulation is a real problem,” according to the company. “The polymer melts at between 290 and 310°C, meaning that its transition window is similar to those of other PPAs and of PPSs.”

The Laramid T portfolio is described as a fully developed group of compounds including glass and carbon fibre reinforced grades for structural applications, as well as thermally and electrically conductive and self-lubricating compounds. Halogen and red phosphorous-free flame retardants are available in both reinforced and unreinforced versions with UL approval said to be forthcoming. The materials provide the high flow rates required to fill suitable for complex thin-wall geometries with very narrow dimensional tolerances.

Swiss resin producer **EMS-Grivory** says that, compared to conventional PPA, its Grivory HT6 grade offers a 20°C higher glass transition temperature so provides a significantly increased load-bearing capacity at high temperatures. It says the heat deflection temperature (HDT/C) has been increased by 50°C to 250°C, which it says is 20°C more than a typical PPEK.

According to the company, Grivory HT6 offers very good creep resistance, making it particularly suitable for components operating at high working temperatures, but also for production of parts requiring high dimensional stability and long

**Right:**  
A cooling water valve manufactured with EMS-Grivory high performance PA material

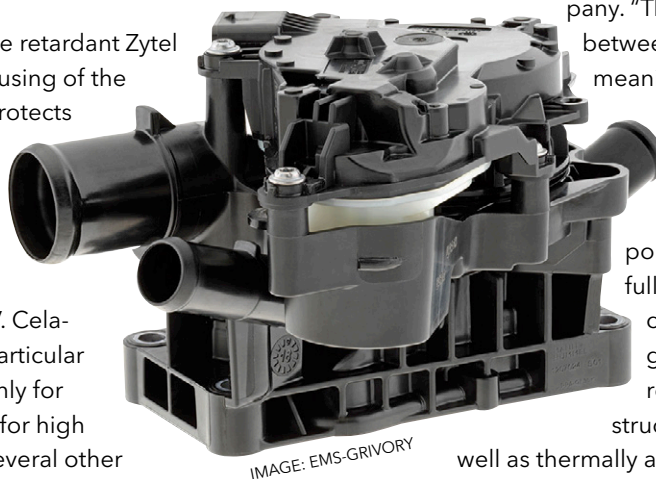


IMAGE: EMS-GRIVORY





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**Right: SABIC's new Konduit 8TF36E LNP compound can be used for the adaptor and latch parts of burn-in test sockets**

service life at lower temperatures. HT6 also offers the high flow rates required for thin-walled component designs.

**Electronic focus**

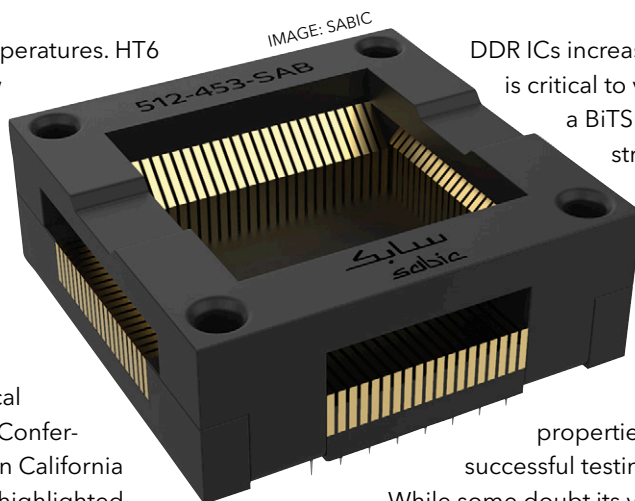
Optoelectronics is another area that often necessitates the use of HTPs. At the 2023 Optical Fiber Communications Conference which took place in California earlier this year, **SABIC** highlighted several specialised, high-heat thermoplastics that it says can simplify adoption of cutting-edge optical technologies. These included its recently launched Extem RH1016UCL resin, a thermoplastic PI said to be well suited for injection moulding lenses used in co-packaged optical transceivers, and Ultem 3310TD, a PEI with low thermal expansion targeted at lenses for single mode optical transceivers.

Extem RH1016UCL can withstand the 260°C peak temperature of PCB reflow soldering while maintaining the dimensional stability required for production of complex, miniaturised lenses and arrays. Aside from high temperature resistance, both Extem RH1016UCL and Ultem 3310TD provide near-infrared transparency, dimensional stability and high-volume processing capabilities.

Launched late last year, LNP Konduit 8TF36E is another new specialty material pitched at the electronics industry, in this case addressing the stringent demands of burn-in test sockets (BiTS) used to stress-test double-data-rate (DDR) memory integrated circuits (ICs). As the number of pins and the testing temperature for DDR ICs increase and their dimensions shrink, demands on materials intensifies. This new compound provides the high flow required to facilitate complex, miniaturised BiTS designs, good dimensional stability and high temperature resistance, as well as offering thermal conductivity of up to 4.5W/m.k to rapidly dissipate heat.

Trials have shown that testing process, Konduit 8TF36E withstood typical temperatures of up to 150°C (It is claimed the compound can handle temperatures up to 260°C) while maintaining good dimensional stability. SABIC says this good high temperature performance could potentially allow BiTS to be re-used repeatedly without degrading.

“Advancements in memory chips are placing new demands on burn-in test sockets,” said Jenny Wang, Director, Formulation and Application, for the Asia Pacific region at SABIC. “As the power of



DDR ICs increases, temperature control is critical to verify that all devices in a BiTS system are uniformly stressed during reliability testing. LNP Konduit achieves what incumbent materials cannot. Not only does it provide high thermal conductivity, but it also delivers other key properties that contribute to successful testing.”

While some doubt its viability, many see production of ‘green’ hydrogen playing a role in the shift to renewable energy supply. Polymers could play a key role in the production of the electrolyzers needed to produce hydrogen and fuel cells used to convert it to electrical power. Both require high polymers that offer good chemical, thermal and mechanical resistance (parts are likely to be exposed to aggressive media such as deionised water or cooling agents like water-glycol mixtures).

Germany-headquartered **Mocom** has developed several glass fibre-reinforced Tedur PPS compounds with high chemical resistance, thermal and mechanical stability, as well as low ion leakage over long operating times, especially for this application area.

The company’s Tedur L PPS FT 2030 SB1171-22 and Tedur L PPS FT 2040 SB1152-22 formulations are said to provide low creep at increased temperatures, chemical resistance and very good stability against ion leakage in deionised water at 70°C to 80°C, making them suitable for use in port splitters or stack end plates of fuel cells.

Mocom says the two new Tedur PPS grades could also find application in closed systems, such as the cooling cycle of fuel cells. These are designed for long term operation at up to 135°C and are considered ‘closed’ if the coolant circulates in a sealed loop and is not constantly replaced.

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# Taking control to new levels

*New developments in process control and the take-up of Industry 4.0 strategies are having a significant influence on the plastic compounding industry, writes Mark Holmes*

Advances in process control for compounding and masterbatch production have accelerated through the adoption of Industry 4.0 practices and are likely to see further gains in the future through the application of artificial intelligence (AI) tools. Both are providing, and have the potential to provide, valuable benefits in areas ranging from quality control and predictive maintenance to skill shortages and supply chain management.

According to the AI-powered manufacturing analytics provider **Oden Technologies**, workforce skill and availability, price inflation, global competition and supply chain challenges are key drivers of Industry 4.0 innovation and adoption in compounding and masterbatch production. "In the past few years, manufacturers have seen significant demand that required a high level of capacity improvement," says Willem Sundblad, Chief Executive Officer and co-founder. "In that type of

environment, some of these challenges can be traded off for others. Now, demand has generally decreased, and the true challenge out of this switch has been how do we make our factories as efficient as possible, regardless of the macro environment. Whether that is driven from cost pressures, or because they need to deliver for their customers. We are seeing the manufacturers who invested in efficiency gains via Industry 4.0 to meet capacity needs early come out as winners."

Oden highlights a number of specific issues in compounding that require new process control solutions, most notably the lag between product and process. It says that a real opportunity for compound manufacturers lies in the ability to reduce or eliminate the lag between understanding the quality of the product produced, and the production process itself. This lag creates unnecessary risk of failures and increased inefficiencies; being able to

**Main image:**  
**Artificial intelligence and augmented reality are supporting development of control innovations such as remote and predictive maintenance**

predict quality in real-time is a great use case for plastics compounding that can drastically reduce waste in both scrap and opportunity costs.

Another issue compounders face is the need to handle variability, Oden says. Brittle supply chains and cost pressures continue to put a strain on production, forcing producers to look at materials in different and creative ways. However, it is known that adding in variability, whether that is from suppliers or from different grades of recycled materials, increases the likelihood of something going wrong.

Manufacturers need to be able to handle a higher degree of variability on the input side, but still produce with a high degree of efficiency and high degree of commonality in the output. They need to be able to make informed decisions and trade-offs to be able to maintain that balance successfully. Oden says advanced analytics tools within Industry 4.0 systems can enable front-line teams to handle variability more effectively, in real-time.

Hiring key staff also remains a problem. Oden cites a recent US survey carried out by the National Association of Manufacturers (NAM), which showed that 74% of manufacturers say their inability to attract and retain employees is their top primary

challenge. As an operator dependent segment of manufacturing, that number may be even higher for compounding operations.

The company says that a tight recruitment environment is a catalyst for improving efficiency through solutions that make it possible to get the work done with fewer people (without overworking or increasing safety risks) or to make processes more simple so it is easier to attract and retain staff. Both are impactful to the bottom line of a business. Over the past decade or so, Oden says technology and automation changes have contributed to staff productivity by making inexperienced staff as successful as experienced staff and reducing waste in the production process.

"Although the compounding and masterbatch industries will continue to be operator dependent for the foreseeable future, there are processes throughout the business that are ripe for automation," says Sundblad. "IT/OT convergence will drive the effective use of data. Plastics compounding and masterbatch manufacturers have been collecting data for the sake of collecting data for years through MES, OPC and other systems, but have had difficulty turning that data into actionable insights. We are



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seeing leaders in this space invest in empowering front-line teams with systems and processes directly. Although we are also seeing manufacturers building out sophisticated data science teams and data lakes, the winners will be bringing usable and impactful insights directly to the plant teams who can actually solve production issues.

### Sustainable trends

Sundblad also sees sustainable manufacturing continuing to be a key focus for many years. "However, with unstable supply chains and rising costs, we will see more experimentation with recycled materials as both a corporate social responsibility initiative and to support the bottom line. However, testing new materials can be risky, so finding a balance and partners to help reduce the risk will be key."

He identifies this as an area where AI could make a real difference. "The rapid adoption of AI is an exciting trend for all types of industries, and plastics compounding is no different. Workforce is a continuing challenge, and AI has already been making it possible to augment the workforce and help the teams that exist be more productive and ease the learning curve for new employees. Instead of thinking of AI for employee replacement, it should be thought of as an assistant or productivity amplifying tool. For example, Large Language Models (LLM) can be used to distil large manuals that can take months to memorise into a natural language, accessible library to be queried. Building on that, integrating this new format of manuals to actual production data can remove the billions of data points of 'noise', and provide clear predictive recommendations."

Sundblad warns, however, that choosing an AI partner is a challenge that must be approached with care. "One thing to keep in mind with AI adoption is that there are many new AI focused companies, some of which are helping manufacturers," he says. "However, many of them are not starting with true manufacturing problems, or an understanding of the industry. It is important to evaluate these vendors based on a long-term partnership, rather than a flashy set of tools."

Looking to its own developments, Oden says it has launched both predictive quality and predictive recommendations capabilities recently. For predictive quality, it offers a new capability that helps manufacturers, particularly those with compounding processes, auto-detect quality issues and other events on the line. This is based on historical, rather than theoretical, runs. It means that staff can be alerted in real-time of quality issues that can then

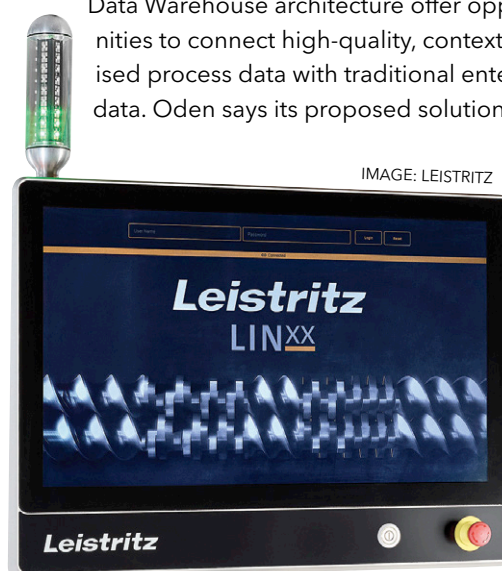
be quickly addressed rather than waiting for an offline quality test and continuing to make a product that will ultimately need to be scrapped.

For predictive recommendations, the company has introduced a new tool that provides the insights needed to maximise run cost efficiencies and/or speed in a few clicks. It predicts what process settings will yield the best results at a line and product level based on historical achievable runs, predicted quality results, and current constraints. By allowing process engineers to compare the predicted impact of different process settings it is possible to run more effective process improvements, more quickly and with a large amount of reliability and little risk.

The company says that an early pilot customer achieved a nine times return-on-investment (ROI) through cost reductions and speed improvements. Predictive quality analysis with a real time model and predictive recommendations were used to optimise for cost and line speed, with the result that the customer saw reduced costs of 5% on the one line it was implemented on without reducing quality. The solution also identified opportunities to increase line speed without affecting other constraints. Oden says the customer plans to scale this solution to other machines to improve margins further.

For the future, Oden says it is working on projects that use Generative AI to provide work instructions directly to operators and other front-line staff. The goal of these developments is to make it easier and exponentially faster for operators to get to the same level of productivity as an experienced operator.

The company is also exploring ways to make it easier for teams to understand what is going on in production. Strategies involving Data Lake and Data Warehouse architecture offer opportunities to connect high-quality, contextualised process data with traditional enterprise data. Oden says its proposed solution does



**Left: New control systems such as LinXX from Leistriz aim to upskill plant operators to lift productivity (page 52)**

**Right: An operator at the control panel of an Entek twin-screw extruder**

large-scale aggregation, cleaning, enriching, and contextualising of semi-structured process and production data in real time. It says such tasks can be expensive, complicated and resource-intensive if done within a Data Warehouse or pulled from a Data Lake.

**Smart integration**

US-based compounding machinery maker **Entek** highlights increased use of IoT and IIoT devices, such as smart flowmeters, drives and level transmitters. "This is becoming more common, where devices are no longer single variables, but a whole set of variables with a custom drop-in interface for a control system. This can also add features like parameterisation, calibration, alarming, status tracking and health monitoring, for example," says Ben Burton, Controls Supervisor at the company.

"We have also developed a new temperature control algorithm. This new temperature control has some aspects of machine learning, particularly where the auto-tune comes into play. The system warms up and records heating and cooling percentages, and other bias terms, to come up with a set of gains automatically. Entek is rolling this new



IMAGE: ENTEK

temperature control out to all new extruder projects soon," he says.

"In addition, we are making our plant operations collaborative and interconnected. We track our runtime and downtime and share statistical data from the lab using GEMs (Generic Equipment Models) to correct process variables on the line. Some of this data is entered manually, either from process data or lab tests, and some of it is logged automatically by the control system in GEMs. Extending the function-

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ality of this system will involve software upgrades, which Entek is exploring," Burton says.

Such control technologies move in to the realms of Big Data. "The challenge with Big Data is not only capturing the data but presenting it in a readable way," Burton explains. "That is why so many manufacturing companies are data rich, information poor. Given the tools we use at Entek, we do a good job of assessing and presenting vital plant metrics and making real-time decisions based on this, which is in the spirit of Industry 4.0."

The company is also working on simulation processes. While full digital-twin capabilities are not utilised very often in controls, Entek says it routinely simulates processes at a lower level. For example, the company has developed a new set of standard code blocks which have built-in simulation features. An Entek Analog Input block can be used for simulating the level of a tank or a temperature, and this value can be calculated based on other block behaviour, such as pumps running at a certain speed, or heaters outputting a certain heat percentage. While this is not a full simulation, the company says it covers much of the basics for simulating and testing a small pumping solution with a tank, or a heating system like an extruder barrel.

According to **Buss**, the Switzerland-headquartered manufacturer of kneader extruders, while the engineering industry traditionally moves slowly compared to automotive and other industries, it requires a high level of IT quality compared to consumer markets. The company's Head of Business Development - Innovation & Digitalization, Dr Krischan Jeltsch, says this is because compounds are often the baseline for the manufacturing chains in sensitive industries such as medical, aerospace and automotive.

Jeltsch adds that other process control solutions requiring attention include unexpected downtime management, efficiency tracking and predictive maintenance. Key topics Buss sees reaching more mature states are condition monitoring/machine health, process/product quality control, service KPI monitoring, efficiency recording and full plant integration of engineering devices.

Buss is currently progressing the development of its SenseHUB project by focusing on machine health and linking it to the company's service organisation for maximum equipment uptime performance. SenseHUB is a cloud-based machine health monitoring product, which acquires various sensor-data,

such as vibrations and oil status, for early intervention options in the case of anomaly detection. Jeltsch says that SenseHUB will grow modularly by adding new sensor types – beyond machine health monitoring – but enabling production and energy efficiency dashboards and added safety features.

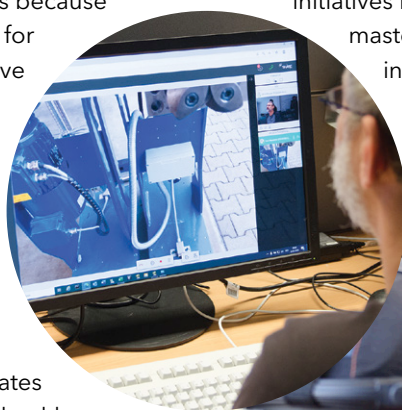
### Precise connections

Industry 4.0 is revolutionising the plastics compounding and masterbatch processes and is ushering in a new era of efficiency, precision and connectivity, according to German twin screw extruder manufacturer **Feddem**. "With advanced technologies and real-time data analytics, we are witnessing a transformative impact on production, quality control and supply chain management. Embracing Industry 4.0 enables us to optimise material formulations, streamline operations and deliver exceptional value to our customers in this dynamic and evolving landscape," says Klaus Hojer, Business Development/Account Manager at the firm.

"The complexities of compounding demand innovative process control solutions to address specific challenges effectively. By leveraging cutting-edge technologies, we can tackle issues such as batch-to-batch consistency, precise dosing of raw materials, uniform dispersion of additives and efficient energy consumption. These new process control solutions empower us to enhance product quality, reduce waste, optimise resource utilisation, and unlock the full potential of compounding operations," he says.

"In the realm of process control and Industry 4.0 initiatives for the plastics compounding and masterbatch industries, we are witnessing several significant trends and influences shaping new developments. Machine learning algorithms, and advanced data analytics provide additional

**Below and right: Feddem has introduced augmented reality systems that allow for remote support and servicing**



IMAGES: FEDDEM

potential in real-time monitoring, predictive maintenance and intelligent decision-making. Moreover, the increasing demand for customisation, shorter time-to-market, and supply chain resilience is fuelling the development of agile and adaptable production systems in our industry," Hojer says.

Feddem's goal is to seamlessly integrate data-driven automation, real-time monitoring and advanced analytics. The challenge, it says, arises in the ability to explore cloud-based platforms and intelligent algorithms to enable remote monitoring and optimised production scheduling. It says it is currently evaluating the potential in advanced analytics and real-time data to identify proactively maintenance needs and prevent unexpected breakdowns. By continuously monitoring equipment condition and utilising sophisticated algorithms, it believes it is possible to optimise maintenance schedules, minimise downtime and maximise equipment lifespan.

"Our vision is to simplify data analysis further, providing our customers with complete transparency over their entire production process in real time," says Hojer. "With our partners, we are committed to developing innovative solutions that enable businesses to access and interpret their data effortlessly, empowering them to make informed decisions and drive operational excellence."

US-based compounding plant manufacturer **Farrel Pomini** says it sees the opportunity to increase efficiencies and decrease expenses as significant drivers of Industry 4.0 adoption and process control developments for compounders and masterbatch processors. The company says the fact that many operating expenses are fixed or increasing, such as the cost of energy, means converters are looking to gain an advantage through efficiencies. Process automation can take efficiency to a new level through the use of real time data, predictive analytics and mobility and the company sees these three items as dominant trends for its customers.

Farrel Pomini offers an automatic data export whereby machine process data available within its Synergy Control System platform can be accessed by the customer's MES or ERP system. This data allows decision makers to understand the current settings of their equipment and to better optimise the production process. It allows use of predictive analytics to identify the likelihood of future outcomes based on historical data, which can enable

better resource planning. The company says it has a number of active process control projects currently in development.

The development of Industry 4.0 technology will be driven by customers and their needs for data analysis and process control, according to Sean Doran, Global Market Segment Director at global compounding machinery maker **CPM**. He says that specific problems, such as prevention of downtime, improving yield and product margins, as well as overall profit impact, are all tied to process control solutions and IoT development.

Simply increasing ease of control over manufacturing, by increasing efficiency in production, must translate into increased profits for customers, Doran says. It cannot simply be an improved and more costly investment in compounding; it must yield clearly visible profit improvements. Influences driving new developments include critical equipment monitoring, such as gearboxes and process section wear items, and their impact on throughput and downtime.

Meanwhile, German twin screw extruder maker **Leistritz Extrusionstechnik** identifies several interesting areas where Industry 4.0 is an influencing factor in compounding. "Firstly, engineering and machine technology. This because condition monitoring and predictive maintenance will become increasingly important to reduce downtimes. However, it will also influence process technology because processes have become more complex. Industry 4.0 can also help support machine operators, with digital assistance systems being particularly important," says Daniel Nagl, Managing Director.

"Skills shortages, as well as a lack of specialists, will increase in future. Here, new process control solutions are a strong support. For this reason, Leistritz has developed LinXX, a new control system which makes safe and reliable machine operation much easier. In addition, both rising energy costs and ever-increasing cost reduction pressure will call for new solutions," Nagl says.

LinXX is a new control system that provides an optimised Human Machine Interface providing benefits such as an instant overview on the entire extrusion line and key process parameters. It is said to provide an intuitive operating structure with a clear display and easy icon recognisability. Leistritz adds that LinXX has been developed in close cooperation with partners in several projects and case studies involving customers, institutes and other industry partners.

"As a result, we know what practical requirements have to be met and what customer pain points have to be addressed," says Nagl. "In future



**Above: A ZSE 27 iMAXX extruder equipped with the latest Leistritz LinXX control system**

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**Right: ColorAdjust from KraussMaffei integrates colour-measurement into the machine control system to ensure precise colour control**

developments, machine learning and AI will play a vital role in our strategic development. This will enable us to keep supplying state-of-the-art machine technology, as well as design and build extruders and extrusion lines for a wide range of applications.”

**Auxiliary developments**

Control innovations are also a priority for compounding ancillary equipment maker **Maag Group**, which is offering a range of new control solutions including the maax PC standardised pump controller. The company says that the most important benefit of the cost-effective maax PC control system is the Inlet Pressure Control (PID), which lowers the pressure during the start-up phase by 40% compared to previous control systems. In addition, the PID control is capable of handling 50% greater pressure fluctuations. The controller is built using proven Siemens hardware and is suitable for use with a wide variety of pumps, ranging from Maag’s Extrex 20 up to Extrex 160 models.

The maax FC is designed to control the company’s DSC/CSC and CSC Backflush screenchangers (melt filters). Based on the same technical platform as the maax PC, the unit’s key feature is precisely controlled piston movements to vent the piston and avoid pressure fluctuations during operation. The maax FC also enables micro-movement to avoid the piston getting stuck at start-up due to minimal use. Like the Maax PC, the control is based on Siemens hardware and is designed to support up to six heating controllers. The company says it provides a feature set suited for most industrial applications.

A further addition to Maag’s digital portfolio is the Maag Integration Platform, which is a newly-designed Industry 4.0 platform developed to support the increasing OEE and energy efficiency demands of customers. It provides an easy-to-use interface for storage and ad-hoc analysis of data while the platform allows connection of IIoT sources with business IT systems to bring production insights into planning and operational processes.

German machinery maker **KraussMaffei** has developed the ColorAdjust colour measuring and control system, which it demonstrated at last year’s K show in Germany on a twin-screw compounding extruder converting shredded medical caps into a fibre-reinforced recompound with precise colouring.

“With ColorAdjust, KraussMaffei is providing the market with a spectrally operating measuring system for compounding applications,” says Xiaojun Cui, Executive Vice President New Machines at KraussMaffei. “This system is designed



not only for contactless monitoring of colour variations, but it also detects even the slightest deviations, in which case it triggers instant corrections to restore the colour setpoint.”

The company says that the system enables processors to achieve a high level of reproducibility even when processing input materials of varying colour spectrum. The colour setpoint is rapidly restored when starting the compounding process after a stop, as well as in the event of colour changes. ColorAdjust also supports sustainable and highly efficient production of reclaim materials, where base colour specs can vary considerably.

Start-up scrap and rejects are minimised, which the company says eliminates disposal requirements to save time and money, and raw materials. The system is also operator-independent, so it can provide consistently high productivity and quality.

Other KraussMaffei control developments focus on elevating skillsets. “The shortage of skilled personnel is also affecting the plastics processing sector and companies are finding it increasingly difficult to recruit qualified specialists,” says Xiaojun Cui. “That is why KraussMaffei’s pioneer process-Control focuses on simple and clear operation.”

The core feature of the new user interface is its ‘wizards’ that provide the operator with step-by-step instructions for certain procedures, such as starting the production line or shutting it down.

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- ▶ Plastics Recyclers in Europe and Turkey

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- ▶ Feedstock Availability for Plastics Recycling Europe 2022
- ▶ Recycling of Flexible Polyolefin Films Europe
- ▶ Recycling of Agricultural Films Europe
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## Upcoming events from AMI

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### Plastics Recycling Technology

10-12 October 2023

Vienna, Austria

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### Plastics Recycling World Expo

15-16 November 2023

Cleveland, OH, USA

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### Recycling Flexible Packaging

22- 23 November 2023

Barcelona, Spain

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### Plastics Sustainability Strategies

5-6 December 2023

Dusseldorf, Germany

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### Plastics Recycling

6-7 March 2024

Bangkok, Thailand

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### Chemical Recycling

12-13 March 2024

Houston, TX, USA

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### Chemical Recycling

June 2024

Germany

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### Plastics Recycling World Expo

11-12 September 2024

Brussels, Belgium



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# AMI

## Compounds, additives and masterbatch

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# Download these new product brochures

## SUKANO: BIO-MASTERBATCHES



Switzerland's Sukano offers a full range of bioplastic masterbatches and compounds to allow processors to maximise the performance of bio-based resins such as PLA and PHA and to simplify and speed up processing.

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## MIXACO: SPEEDY MIXER



Speedy mixers provide a flexible mixing option for small batch production. Available in sack and drum versions, the two ranges are supported with a full range of mixing tools designed to achieve fast and homogenous results.

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## BUSS: COMPEO KNEADER



The Compeo is the latest generation of kneader extruder from Buss and is designed to provide the utmost flexibility in application. This 12-page brochure details key features and model specifications.

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## CABOT: SPECIALTY CARBON BLACK



This brochure from Cabot details the company's range of Vulcan specialty carbon blacks for formulation of low moisture absorption electrically conductive plastics for applications such as ESD packaging.

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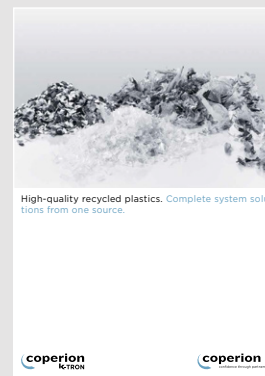
## KLK OLEO: GREEN ADDITIVES



KLK OLEO provides a series of products for industrial application. PALMOWAX and PALMESTER provide a green lubricant solution to polymer processing. PALMERE and PALMERA are green ingredients for PVC additives/plasticisers

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## COPERION: RECYCLING SYSTEMS



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

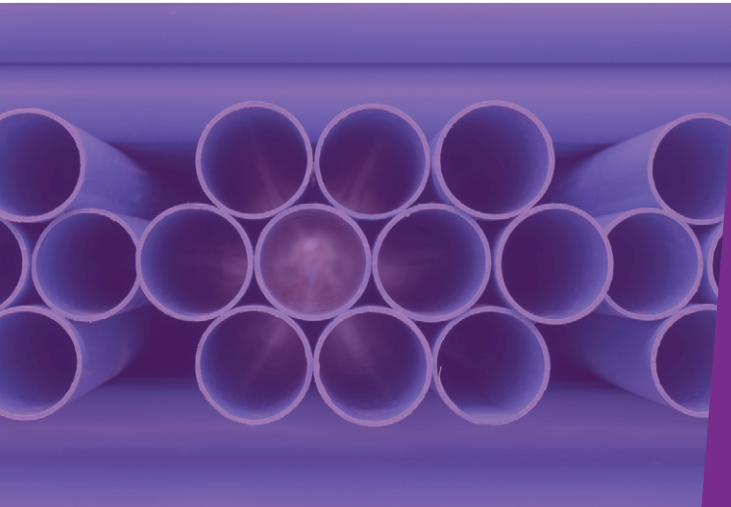
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If you would like your brochure to be included on this page, please contact Claire Bishop [claire.bishop@amiplastics.com](mailto:claire.bishop@amiplastics.com). Tel: +44 (0)1732 682948

AMI | Events

# PVC Formulation

February 27-28, 2024 | Cleveland, OH, USA



## To speak, sponsor or exhibit contact

Matthew Dowler  
Event Sales Manager  
E/ [matthew.dowler@amiplastics.com](mailto:matthew.dowler@amiplastics.com)  
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## AMI | Market Reports

# Masterbatch Markets Asia 2023

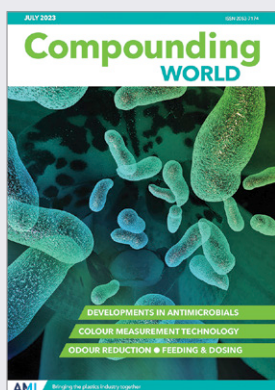
Understand the implications of recent developments, the impact they have had on the masterbatch market in Asia and the direction the sector will take in the future



[www.ami.ltd/masterbatch-asia-report](http://www.ami.ltd/masterbatch-asia-report)

# Keep informed: read our latest editions

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



## Compounding World July 2023

The July 2023 edition of Compounding World magazine explores some of the latest innovations in antimicrobials. Other in-depth features in the issue cover recent developments in colour measurement, odour and emission reduction, and materials feeding.

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## Compounding World June 2023

The June edition of Compounding World looks at low-carbon advances in mineral fillers, sustainability and innovation in PVC additives. Plus there is a preview of the Compounding World Expo in Essen, Germany.

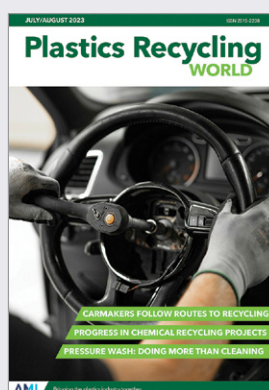
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## Injection World July/August 2023

The July-August 2023 issue of Injection World magazine contains features on colour suppliers responding to sustainability pressures, changes in packaging, and the latest in LSR. Plus there is a feature about Arburg celebrating 100 years as a family business.

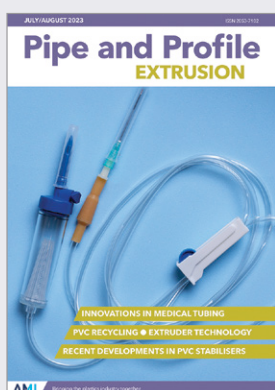
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## Plastics Recycling World July/August 2023

The July/August edition of Plastics Recycling World magazine looks at how car makers are ramping up their plans to use recycled plastics. Plus, the latest developments in chemical recycling, washing technology, and innovation in recovering ABS-base polymers from WEEE material streams.

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## Pipe and Profile Extrusion July/August 2023

The July-August issue of Pipe and Profile Extrusion has features on medical tubing, PVC additives, PVC recycling and new extruder technology; plus all the regular features and news from the global industry.

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## Film and Sheet Extrusion July/August 2023

The July-August edition of Film and Sheet Extrusion has a cover article on advances in bioplastics, including projects using wood, carbon dioxide and cellulose as raw materials. Other features look at sustainability developments in stretch and shrink film and plastic pouches.

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Plastics Recycling  
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## GLOBAL EXHIBITION GUIDE

2023	<b>5-8 September</b>	Plast 2023, Milan, Italy	<a href="http://www.plastonline.org/en">www.plastonline.org/en</a>
	<b>20-21 September</b>	Injection Molding & Design Expo, Novi, MI, USA	<a href="http://www.injectionmoldingexpo.com">www.injectionmoldingexpo.com</a>
	<b>20-23 September</b>	T-Plas, Bangkok, Thailand	<a href="https://www.tplas.com/">https://www.tplas.com/</a>
	<b>26-28 September</b>	Interplas, Birmingham, UK	<a href="http://www.interplasuk.com">www.interplasuk.com</a>
	<b>28-30 September</b>	Central Asia Plast World, Almaty, Kazakhstan	<a href="https://plastworld.kz/?lang=en">https://plastworld.kz/?lang=en</a>
	<b>5-7 October</b>	PackPrintPlas Philippines, Manila, Philippines	<a href="https://www.globallinkmp.com/packprintplas">https://www.globallinkmp.com/packprintplas</a>
	<b>17-21 October</b>	Fakuma, Friedrichshafen, Germany	<a href="http://www.fakuma-messe.de">www.fakuma-messe.de</a>
	<b>15-16 November</b>	Compounding World Expo USA, Cleveland, USA	<a href="http://www.compoundingworldexpo.com/na/">www.compoundingworldexpo.com/na/</a>
	<b>22-25 November</b>	PlastEurasia, Istanbul, Turkey	<a href="https://plasteurasia.com/en/">https://plasteurasia.com/en/</a>
<b>28 Nov-2 Dec</b>	IPF Japan 2023, Chiba, Japan	<a href="https://www.ipfjapan.jp/english/">https://www.ipfjapan.jp/english/</a>	
<b>13-15 December</b>	Arabplast, Dubai, UAE	<a href="https://arabplast.info/">https://arabplast.info/</a>	
2024	<b>4-6 March</b>	Plast-Alger, Algiers, Algeria	<a href="https://www.plastalger.com/">https://www.plastalger.com/</a>
	<b>6-10 May</b>	NPE 2024	<a href="http://www.npe.org">www.npe.org</a>
	<b>11-12 September</b>	Compounding World Expo EU, Brussels, Belgium	<a href="http://www.compoundingworldexpo.com/eu/">www.compoundingworldexpo.com/eu/</a>


## AMI CONFERENCES

<b>12-13 Sept 2023</b>	Performance Polyamides, Cologne, Germany
<b>12-14 Sept 2023</b>	PVC Formulation Europe, Cologne, Germany
<b>3-4 October 2023</b>	Polyolefin Additives, Barcelona, Spain
<b>10-12 October 2023</b>	Plastics Recycling Technology, Vienna, Austria
<b>11-13 October 2023</b>	Executive Summit, Hilton Head Island, SC, USA
<b>1-2 Nov 2023</b>	Medical Tubing and Catheters, Tampa, FL, USA
<b>20-22 Nov 2023</b>	Fire Resistance in Plastics, Berlin, Germany
<b>22-23 Nov 2023</b>	Recycling Flexible Packaging, Barcelona, Spain

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

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