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# Compounding WORLD


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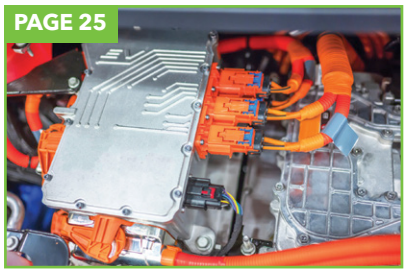
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# Otech acquires second US site

US-based compounder Otech Corporation, which develops and manufactures specialty PVC compounds, thermoplastic elastomers and alloys, says it has secured an 18,000m² facility in Auburn, Massachusetts, where it will install three extrusion lines and a laboratory, as well as creating a regional warehouse.

Otech currently operates eleven compounding extrusion lines at its main plant at Rolling Prairie, Indiana, which, following an expansion last year, has a total capacity of around 80,000 tonnes/yr. That investment included the installation of a new 4,500 tonnes/yr Banbury mixer for production of conductive and static dissipative PVCs and other specialty PVC compounds.

The new Massachussetts site is the company's second. It is located around an hour from Boston, which is considered the centre of the US biotechnology and pharmaceutical industry. Otech said opening a compounding facility in central Massachusetts to serve New England and the Northeast has been a long term goal. Engineering and site preparation work is already underway.

› **www.otechcompounds.com**

## IN BRIEF...

**Trinseo** has announced a distribution agreement with **Omya** under which Omya will supply ABS and PC/ABS resins to Trinseo automotive and mobility customers in the US. The agreement covers Trinseo's Magnum ABS resins and Pulse PC/ABS resins.
**www.trinseo.com**
**www.omya.com**

**Teknor Apex** has launched Monprene S3 CP-15170 BLK, a new black TPE grade made with 35% sustainable content. The 70 Shore A grade includes some material supplied by **UBQ Materials**, which claims to produce a polymer substitute from unsorted household waste, including the organic fraction.
**www.teknorapex.com**
**www.ubqmaterials.com**

**Techmer PM** has launched a PFOA and PFAS-free processing aid, HiTerra T5, for management of melt fracture in film production. The company says the new additive performs well and meets the latest EPA guidelines.
**www.techmerpm.com**

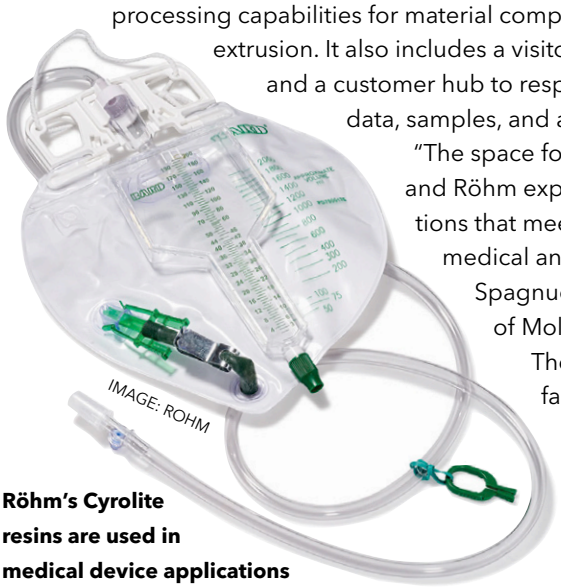
# Röhm opens acrylics tech centre for North America

Röhm has opened a new North American centre of excellence at Wallingford, Connecticut, to support future development of its Cyrolite and Acrylite acrylic compounds in the region.

The 4600m² facility is equipped with a development laboratory including advanced processing capabilities for material compounding, injection moulding, and extrusion. It also includes a visitor centre, internal/external training facility, and a customer hub to respond quickly to requests such as technical data, samples, and application support.

"The space fosters collaboration of OEMs, processors, and Röhm experts to create new PMMA-based solutions that meet the demanding requirements of our medical and general industry clients," says Thomas Spagnuolo, Vice President and General Manager of Molding Compounds at Roehm America.

The centre is located close to a Röhm manufacturing plant and represents the largest non-production investment for the company in the region. It will soon be certified with ISO and IATF accreditations.




**Röhm's Cyrolite resins are used in medical device applications**

› **www.roehm.com**

# Repsol to expand PO recycling

Repsol is to invest €26m in a new line for production of its Reciclex mechanically recycled polyolefin compounds at its site on the Puertollano Industrial Complex in Spain.

The new line, which will come into operation at the end of 2024, will have a capacity of 25,000 tonnes/yr – almost double the current site annual capacity of 16,000 tonnes.

According to Repsol, it will produce HDPE and LDPE compounds with between 10 and 80% recycled content for conversion into rigid and flexible packaging for non-food use, such as cleaning product containers or packaging bags.

The company said the investment is driven by the recent introduction of European and Spanish regulations that aim to achieve a 30% recycled content target for plastic packaging by 2030.

› **www.repsol.com**

# Sumika builds digital sustainability models

Sumika Polymer Compounds Europe (SPC) has partnered with Hexagon's Manufacturing Intelligence division to create digitial multi-scale simulation models for all of its Thermofil HP and Circle recycled glass-reinforced PPs.

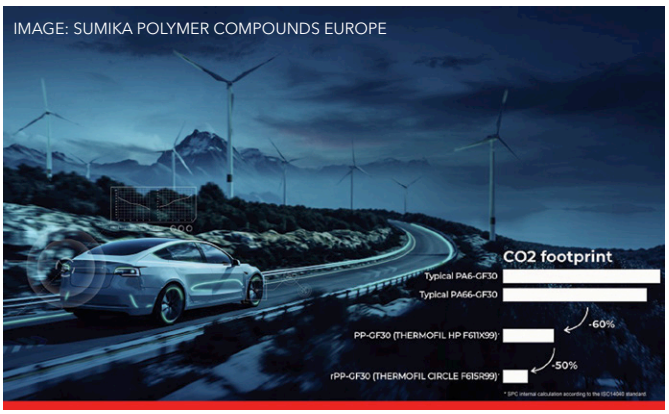
Hexagon carried out detailed testing and physical validation of the Thermofil materials with SPC to produce accurate multi-scale behavioural models for each grade. The partners said the models allow simulation of the materials' mechanical and environmental performance throughout the full lifecycle of a component.

A key aim of the development was to improve adoption in the fast-growing e-mobility sector.

"Limited material behaviour data is a barrier to sustainable e-mobility innovations because automotive engineering teams have not been able to put new materials through the rigorous virtual durability and safety tests required for automotive endorsement," according to Guillaume Boisot, Head of the Materials Centre of Excellence at Hexagon.

SPC Europe said the encrypted proprietary material models can be accessed using Hexagon's Digimat software, which is interoperable with popular computer-aided engineering (CAE) software tools, including MSC Nastran, and other third-party software.

› **bit.ly/3j4FWix**




**Above: A screenshot from the new Sumika/Hexagon environmental simulation tool**

## IN BRIEF...

**Heubach** has launched Ultrazur, a new range of ultramarine blue pigments with four shades ranging from greenish to reddish. The pigments are non-shrinking and suitable for sensitive applications.
**www.heubach.com**

**Toray Industries** says it has developed a recycled PA66 polymer recovered from silicone-coated automotive airbag fabric scrap cuttings. The grade is said to achieve the same flow and mechanical properties as virgin PA66 grades.
**bit.ly/3HbEiDG**

**LyondellBasell** and Kirkbi, the family-owned holding and investment company of Lego Group, are to invest €130, in Germany's **APK**, which developed the NewCycling solvent-based recycling technology.
**www.lyondellbasell.com**
**www.apk.group**

# DSM adds intelligence to colour prediction

DSM Engineering Materials has launched Lucidiris, a new colour performance prediction tool based on AI technology designed to help customers reduce time to market during compound development.

According to the company, Lucidiris will help users predict colour and mechanical properties of polymer compounds upon addition of colorants. It will also predict the potential colour space envelope that can be produced within defined mechanical criteria and prescribe colour ingredients that can be used to meet targeted properties.

The technology has been developed for several of the company's material grades and will be extended to include recycled grades.

**DSM's Lucidiris colour prediction tool uses artificial intelligence technology**

IMAGE: DSM ENGINEERING MATERIALS

"Lucidiris is our next step into digitisation of product development," said Angelika Schmidt, Global R&T Manager of Performance Polymers, DSM Engineering Materials. "What we can do for colour development today will be possible for product development in the future. Combining human intelligence with machine learning will enable us to get to the successful recipes with much less iterations and therefore much shorter development times."

› **www.dsm.com/engineering-materials**

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# Next steps for bio-based PP

US-based Citroniq and Mitsui Plastics Inc, part of Japan's Mitsui group, have signed a letter of intent covering large-scale supply of bio-based PP, which is to be produced by Citroniq using biogenic feedstocks and renewable energy.

Citroniq co-founder Mel Badheka said: "Together, MPI and Citroniq will be able to provide customers with global-scale supplies of 'drop-in' sustainable resins much faster than the alternatives, resulting in meaningful reductions in their carbon footprint, on schedule with their carbon reduction targets."

In a statement announcing the agreement, Citroniq said its plant at Kansas in the US has more than 360,000 tonnes capacity for green PP and a "highly competitive cost position."

IMAGE: SHUTTERSTOCK

**Above: The US is a major producer of bio-based ethanol**

Meanwhile, Braskem says it is evaluating a US-based project to convert bioethanol into physically segregated bio-based PP. The company is currently exploring partnership opportunities with several clients, brand owners, and suppliers.

Braskem, which is already a leader in bio-based PE, said its bio-based PP would be a drop-in solution offering the same technical properties and recyclability found in its current PP portfolio but with the additional benefit of a negative carbon footprint.

The company said the US is home to the largest ethanol industry in the world and boasts ample technology, infrastructure, and supply availability for such a project.

› **https://citroniq.com**
› **www.mitsuiplastics.com**
› **www.braskem.com**

# Natureworks moves ahead with Thailand PLA plant

PLA bioplastic producer Natureworks has laid the cornerstone at its new Ingeo PLA manufacturing complex in Thailand.

The new facility, located on the Nakhon Sawan Biocomplex, is fully integrated with production units for lactic acid, lactide, and polymer. When the facility starts up in the second half of 2024 it will have a capacity of around 68,000 tonnes/yr of PLA.

Natureworks said the Thai plant will make the full portfolio of Ingeo biopolymer grades, currently produced at its original plant at Blair in Nebraska in the US.

"For the last three decades, we have not only been building a company and manufacturing facilities, but also a whole new industry and market for low-carbon, renewable biomaterials that are revolutionising the sustainability and safety of packaging and product materials used in our everyday lives," said Rich Altice, Natureworks President and CEO.

The expanded global production of Ingeo biopolymer will support growth in markets including 3D printing, compostable packaging, and food serviceware.

› **www.natureworksllc.com**

IMAGE: NATUREWORKS

**Above: Natureworks is moving ahead with its second Ingeo PLA production plant in Thailand**

# Polygiene hits the right note

Polygiene's BioMaster antimicrobial additive is used in the latest musical instrument from UK firm Warwick Music – the pCorder recorder.

Developed as part of a school music initiative funded by the Welsh government, 53,000 injection moulded pCorders have already been supplied to schools in Wales.

The Biomaster additive will help control microbial growth in the shared instruments.

Warwick Music plans to make the pCorder available across the UK from April.

› **www.polygiene.com**

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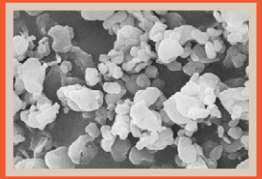

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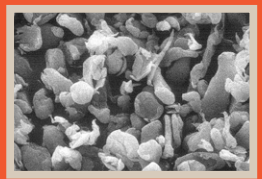

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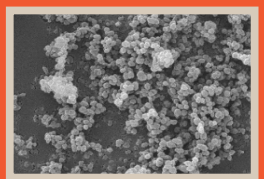

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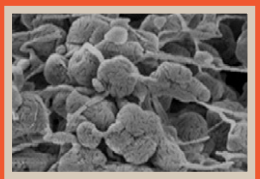

**Natural Prime PTFE for Food Contact**

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# Asahi Kasei settles PFAS suit; EU moves on bans

Asahi Kasei Plastics North America has reached a settlement agreement with Michigan's Attorney General Dana Nessel that addresses historical releases of PFAS (per- and polyfluoroalkyl substances) from its former facility near Brighton in Michigan, US.

The **Consent Decree** requires Asahi Kasei to investigate PFAS released into soil, groundwater, and surface water from the former facility and, if concentrations that exceed state criteria are found, take additional steps to cut off harmful exposures.

The company must submit its investigation and any proposed work plans to and gain approval from Michigan's Department of Environment, Great Lakes, and Energy (EGLE). It must also pay the state's past and future oversight costs and costs of litigation.

Asahi was one of 17 defendants named in Attorney General Nessel's first lawsuit against PFAS manufacturers and is the first to reach settlement. Six other PFAS cases are pending in US state and federal courts.

PFAS are a large class of chemicals that, due to their strong fluorine bonds, resist degradation (hence the commonly-used reference as 'forever chemicals'). They can disperse in to the environment, where their long lifetime means they can accumulate. One of many applications for PFAS is in processing aids for plastics.

Last year, the US EPA proposed designating two of the most widely used PFAS – perfluorooctanoic acid (PFOA) and perfluorooctanesulfonic acid (PFOS) – as hazardous substances within the CERCLA regulation.

Earlier this month the European Chemicals Agency (ECHA) published long-expected details of **proposed restrictions** on the use of some 10,000 PFASs.

The proposal will be put to ECHA's Risk Assessment (RAC) and Socio-Economic Analysis (SEAC) committees in March, with a six-month consultation likely to start on 22 March 2023.

## Sirmax takes on weld lines

Italian engineered compounds group Sirmax is to commercialise an injection moulding technology designed to increase the strength of weld lines, particularly in fibre-reinforced thermoplastic parts.

The company's new Smart Mold division is working with Prof Giovanni Lucchetta at the University of Padua in Italy on the process, which has been named Gas-Assisted Push-Pull (**GAPP**).

The technology allows dynamic packing of the mould using a single injection unit, with miniaturised gas injectors employed to manipulate the molten polymer in the cavity.

› **www.sirmax.com**

## Orion to reduce air emissions

Carbon black supplier Orion Engineered Carbons says it will greatly reduce air emissions from its plant in Borger, Texas, US, as a result of a $60m upgrade project.

Newly installed control technology, including a circulating dry flue gas scrubber, will lead to a major improvement in air quality by eliminating 21 tonnes of nitrogen oxide and sulphur dioxide emissions per day – a 90% reduction.

The project also involved upgrading the site's cogeneration system, which takes heat created by the carbon black production process and converts it to electricity for use in plant or for sale back to the power grid.

Orion recently upgraded emissions control technology at facilities in Ivanhoe, Louisiana, and Orange, Texas. The company plans to finish its final US emissions reduction project at its site in Belpre, Ohio, later this year.

› **https://orioncarbons.com**

# Biosol opens Korean bioplastics facility

CJ HDC Biosol, a joint venture established last year between CJ CheilJedang and HDC Hyundai EP established, has completed construction of a new bioplastic compounding plant at Jincheon in South Korea.

The facility, which has a capacity of 11,000 tonnes/yr, will focus on development of sustainable materials using a variety of biopolymers, such as amorphous PHA from CJ Biomaterials, as well as cellulose and polylactic acid (PLA).

The new plant will help CJ CheilJedang to expand its business area beyond its PHA technology while also enabling HDC Hyundai EP to further consolidate its compounding business.

CJ Biomaterials, a subsidiary of CJ CheilJedang, is the leading producer of amorphous PHA. Softer and more rubbery than crystalline or semi-crystalline forms, it is said to be a good modifier for other bioplastics.

› **www.cjbio.net**

IMAGE: WIPAG

**Above: Wipag's PA6 containing recycled carbon fibre is used in the BMW iX**

# Wipag works with BMW on sustainability

Wipag is to work with research institutions and companies from various sectors in a project managed by BMW Group to develop new approaches for the use of sustainable automotive materials.

A key objective for the 'Future Sustainable Car Materials' (FSCM) consortium is to develop new process routes and material concepts with the aim of strengthening closed-loop systems for plastics and metals, increasing use of recycled and bio-based materials, and reducing $CO_2$ emissions.

The project is funded by the German Federal Ministry of Economics and Climate Protection (BMWK) and is scheduled to last three years.

Wipag is already supplying BMW with a high performance PA6 compound reinforced with recycled carbon fibre for use in a structural windshield component on its BMW iX EV (image).

› **www.wipag.com**

# Covestro ends Maezio

Covestro is to discontinue its Maezio fibre-reinforced composites product line and to close the production unit at Markt Bibart in Germany by the end of this year.

The move is part of a strategic optimisation plan that will see the company intensify its effort on its core engineering plastics activities.

Covestro launched the Maezio product line eight years ago. The intention was to target the developing market for lightweight thermoplastic composite materials.

› **www.covestro.com**

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IMAGE: PREMIX GROUP

*The rapid global pace of electrification, together with growing penetration of smart technologies, is fueling interest in electrically conductive compounds, writes* ***Jennifer Markarian***

# EVs and smart technology push conductives ahead

Electrically conductive additives play an essential role in a wide range of plastic compounds, extending from wire and cable, through technical housings, to packaging for electrical and electronic items. Enhancing the conductivity of a polymer compound provides functions such as electrostatic dissipation (ESD) protection or, at higher levels, electromagnetic interference (EMI) shielding capabilities. It is very much an in-demand material characteristic.

"EMI shielding is increasingly important in automotive, particularly for electric vehicles (EVs) and autonomous driving functions, because there are so many digital components within the car that need to be separated from interfering external signals," says Jodi Bates, Technical Service and Development manager for Performance Materials at **Cabot Corporation**.

"Overall, there is a growing need for conductive additives in wire and cable for EVs as well as in wire and cable for new infrastructure projects, including replacement cables, new initiatives for burying cables, and new renewable energy projects… Different conductive additives are used depending on the voltage," she says.

The latest specialty conductive carbon blacks available from Cabot include two products with low compound moisture absorption (CMA) and high surface smoothness. Both attributes are important for ESD packaging, conductive sheets for electronics and automotive, and conductive components in automotive fuel and charging systems.

The Vulcan XC615 conductive and Vulcan XCmax 22 extra-conductive carbon blacks provide ESD protection and low CMA (Figure 1), according to Dominique Strässler, Global Segment Manager Plastics, Cabot Corporation.

"Low CMA enables superior surface smoothness, reduces the risk of mechanical failures, and provides nice aesthetics," he adds. CMA is affected by the moisture absorption of the carbon black, polymer, and potentially other ingredients. ›

**Main image: Demand is growing for electrically conductive plastics in applications as varied as EVs, smart devices, and medical technology**

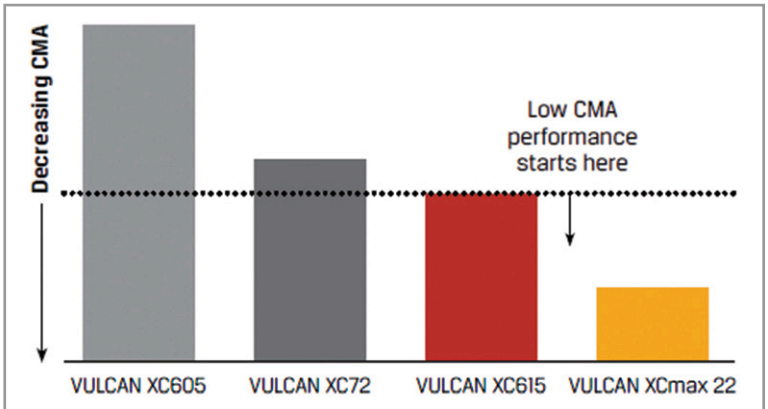


**Figure 1: A comparison of compound moisture absorption (CMA) performance of different Cabot conductive additives in an HDPE compound at equal resistivity (1E+03 ohm.cm)**
***Source: Cabot Corporation***

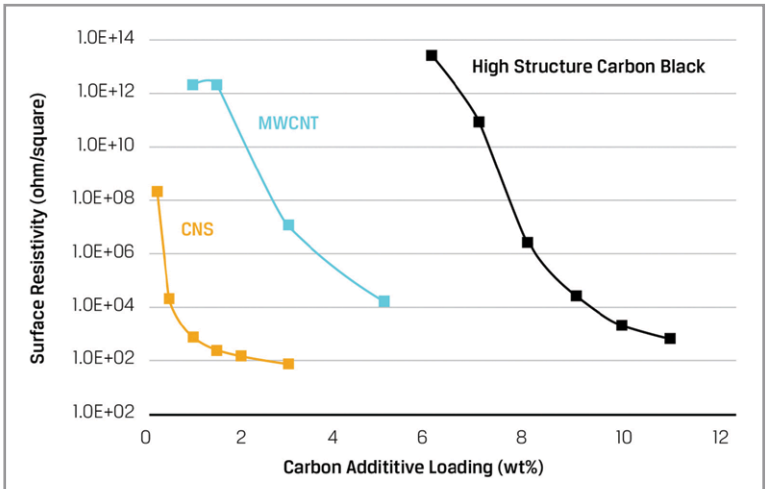


**Figure 2: Comparison of surface resistivity against additive loading for a PC compound containing a high structure carbon black, multi-wall carbon nanotube (MWCNT), and Cabot's Athlos carbon nanostructure (CNS) additive**
***Source: Cabot Corporation***

For high conductivity and EMI shielding applications, Cabot offers its Athlos Carbon Nanostructures (CNS) in the form of both dry pellets and as Cabelec conductive concentrates. "CNS are highly conductive nanomaterials with electrical percolation thresholds between 0.25% and 0.5% by weight," says Strässler. "The materials are 97% carbon, pure, highly branched and crosslinked, enabling high electrical conductivity, good processibility and excellent EMI shielding in plastic components."

The CNS particles are manufactured using a roll-to-roll chemical vapour deposition process, which results in a greater carbon content than conventional carbon nanotubes (CNTs). In addition, the morphology of CNS flakes means they are more easily dispersed than conventional CNTs. As a result, CNS materials are said to percolate at lower loadings than conventional CNTs (Figure 2). These lower loadings minimise any negative impact on the final part's mechanical properties and increase formulation flexibility, according to Cabot.

The Cabelec CNS concentrates contain pre-dispersed and exfoliated carbon nanostructures. "Each of the new CNS concentrates uses a different polymer carrier system to maximise compatibility in the customer's plastic component while achieving their conductivity, design, and mechanical requirements at a reduced usage level," adds Strässler.

## Expanding capacity

Carbon black manufacturer **Orion Engineered Carbons** is currently building a facility at LaPorte in Texas to produce conductive carbon additives using an acetylene-based process. The US plant,

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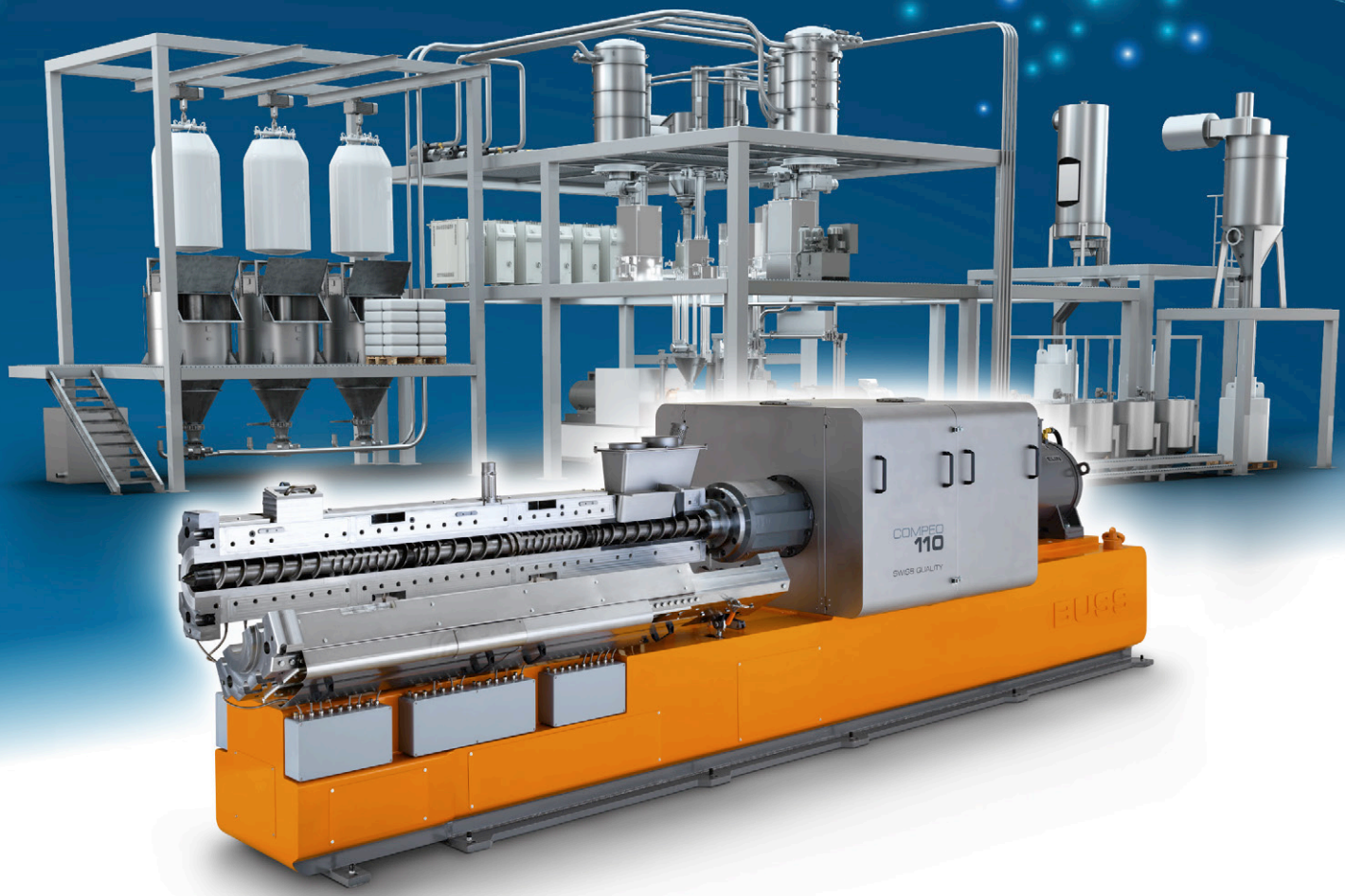


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which the company says is the only plant to use the process in the US, is expected to commence production in the second half of 2024 and will provide North American compounders with a domestic source.

The acetylene gas-based production process is cleaner and, due to the more uniform feedstock than oil-based or furnace black processes, results in improved batch-to-batch consistency. The purity of the black pigment is higher, with very low traces of heavy metals or polycyclic aromatic hydrocarbons (PAH). And Orion says the acetylene black material has a much lower moisture content when compared with the furnace black materials. In addition, because the yield of the acetylene process is very high, the resulting product carries lower carbon dioxide emissions per tonne compared to alternative carbon blacks.

"While the new acetylene-based conductive additives plant was spurred by increasing EV market demand for lithium-ion batteries, it will also benefit compounders for engineering plastics applications," says Jennifer S Stroh PhD, Orion's Director of Specialties Sales and Marketing Americas.

Orion's acetylene-based blacks for compounding include the powder form Printex Y50A grade and the bead form XPB 711. The latter is an experimental grade, which offers lower dusting levels. One of the primary applications for XPB 711 is in extra-high voltage (EHV) power cables, which require good conductivity, smooth surfaces, and high cleanliness (attributed to low ionic and particulate impurities). The smoother surface is said to reduce the risk of electrical stress and water tree failures.

According to Kevin Milks, Marketing Manager for Polymers and Batteries at Orion, because XPB 711 is an acetylene-based product, it also provides a more consistent conductivity.

Both XPB 711 and Orion's Printex HV grade, which is not acetylene based, are used in high voltage cables. This is an application that demands optimisation of both oil absorption number (OAN) and statistical thickness surface area (STSA). The highest conductivity blacks in Orion's range are its superconductive black products, such as Printex XE2B. These additives are used commercially in multiple applications, including EMI shielding and ESD applications.

**Right: Beki-Shield stainless steel fibres are supplied in granular form for compounding applications**

IMAGE: BEKAERT

## Metallic options

Beki-Shield stainless steel fibres, produced by Belgium's **Bekaert**, are used as a conductive additive in polymers for applications ranging from electrostatic dissipation through to EMI shielding. The fibres are available as granular grains for conventional compounding production or as continuous bundles, which are typically used in pultrusion. EVs are a growing area for these conductive additives, which can provide parts offering 30-80 dB EMI shielding.

Electrification of vehicles, together with the increase in the number of sensors in the vehicles, is creating more EMI shielding requirements, according to Sam Matthews, Market Manager for Conductive Solutions at Bekaert in North America.

The use of higher-powered batteries in EVs presents an opportunity for shielding compounds. While, in the past, electric vehicles have used metal housings that inherently have EMI shielding, these are likely to be replaced with plastics in the push to make EVs lighter. Plastic housings have the benefit of design freedom, but they need additives to supply EMI shielding. The move to 5G for communication also raises the requirements for shielding in device housings.

"In communications and EVs, people are looking for higher shielding effectiveness. The high conductivity of stainless-steel fibres requires very low loadings. Below 3 volume% is typical, which is ±20 weight% depending on your polymer; this is significantly lower than carbon black," says Matthews (Figure 3).

"The fibres are around 6mm long, so even after some breakage in the compounding process, it is easier to create a conductive network with a fibre than with a carbon black particle," he explains, adding that compounding process settings are critical and should be optimised for a particular application.

At these low loadings, the metal fibres have little effect on mechanical properties, such as tensile strength and flexural modulus, and little effect on shrinkage or warp, so they can be processed in the same moulds as non-conductive plastics. Another advantage of the low loading is that compounds can be easily colored. Matthews says combinations of glass fibres or other additives with stainless-steel fibers are often employed to provide improved mechanical properties with high conductivity.

In addition to stainless steel fibers for electrical conductivity, Bekaert is currently working on the development of new metal alloys and materials to enhance thermal conductivity and to impart magnetic properties.

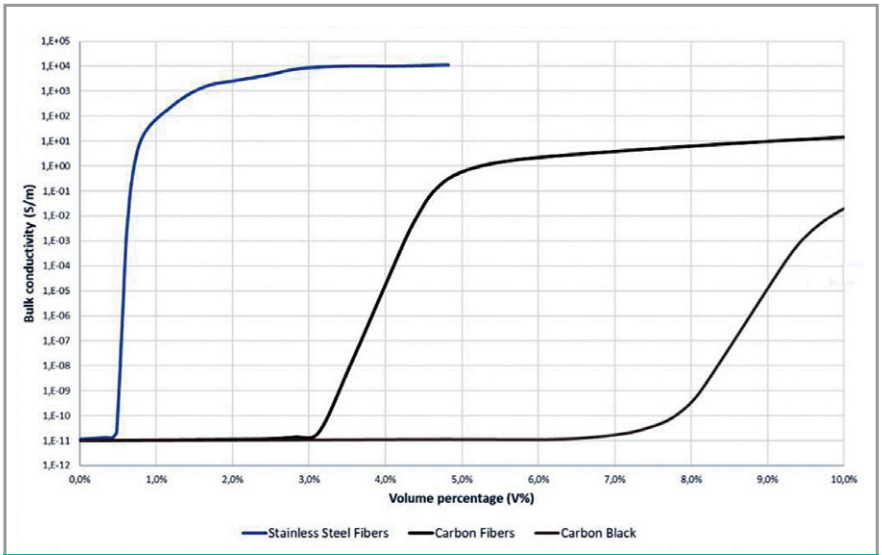


**Figure 3: Bulk conductivity results against volume% loading for a compound containing Bekaert's Beki-Shield stainless steel fibres against carbon fibre and carbon black**
***Source: Bekaert***

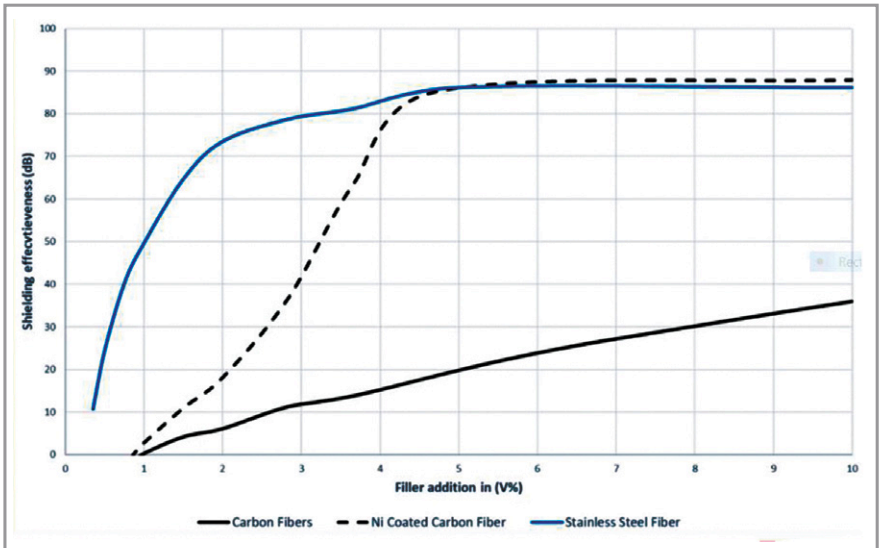


**Figure 4: Shielding effectiveness at 1GHz against volume% loading for Bekaert's Beki-Shield stainless steel fibres in a compound compared to nickel coated carbon fibres and carbon fibre**
***Source: Bekaert***

## Compound options

Germany's **Lehvoss Group**, which has been producing electrically conductive compounds for 40 years, continues to create new products specific to customers' needs, says Thomas Collet, Director of Marketing for the Customised Polymer Materials business unit.

The company added a new twin-screw extruder to its Innovation Center at Hamburg in Germany in August last year that is optimally configured for production of performance compounds such as the highly filled formulations required for electrically conductive and thermally conductive applications. "The new lab machine is enabling us to

IMAGE: LEHVOSS

**Above: LehVoss's latest compounding line in its Hamburg Innovation Centre**

extend capabilities for new conductive materials," says Collet.

When designing a new conductive compound, Collet says it is important to consider the process that will be used to make the final part (meaning injection moulding, extrusion, or 3D-printing). "Considering the processing technology is as important as the material recipe to achieve the requested part performance. In the part itself the type and orientation of the fillers do have a significant effect on conductivity," he says. "In addition, we need to design the formula to balance conductivity with the required mechanical performance."

Specialty compounder **Witcom Engineering Plastics**, a member of the Wittenburg Group, is also an active player in the conductive compounds sector. It works with many types of conductive additives, including conductive carbon blacks, permanent anti-static additives (used, for example, for coloured parts), and carbon fibres for higher reinforcement applications, and uses polyolefin and engineering plastics matrix resins, according to Christine Van Bellingen, Business Development Manager, Conductive Compounds.

Van Bellingen says the company is seeing interest in its newest PA6 and PC-based EMI shielding compounds, which it introduced last year, due to the push for replacement of die-cast metal parts or mixed metal/plastic solutions with lighter and more easily recycled plastic parts. She says these compounds are less expensive than those based on traditional metal fibres, such as stainless steel, and they do not have the environmental and health safety concerns that nickel-coated fibres yet they

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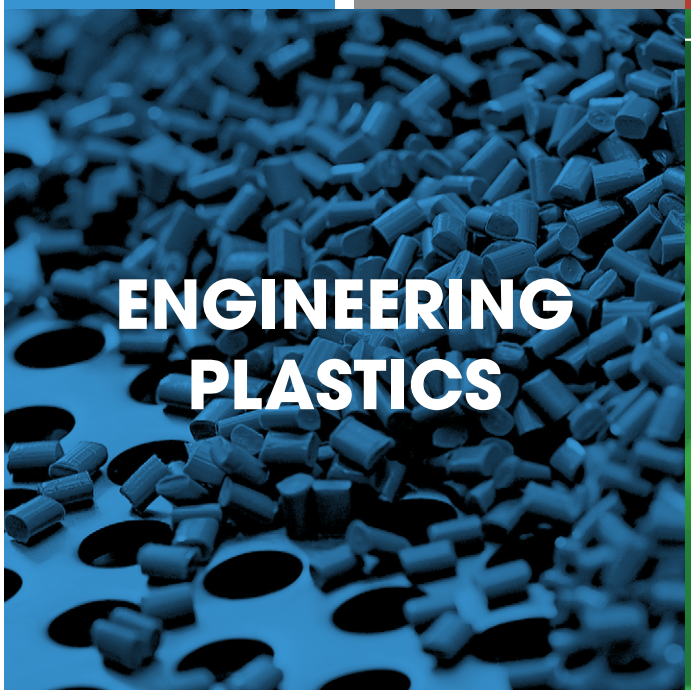



*Plastics Engineer*

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# Adeka ESD additives target 3Dprinting

Japanese additives producer Adeka has developed a nonionic-polymer based electrically conductive modifier for use with thermoplastic filaments used in material extrusion, or fused filament, 3D printing systems.

The company says that the pellet-form 3D-AS01 additive is specially designed for use in extruded filaments used for production of parts requiring ESD (electro-static discharge) protection. It says the additive can reduce the surface resistivity of ABS resin to below $10^{11}$ ohms/sq at a 10% loading, which it claims out performs current nonionic-polymers such as PEBA (polyether block amide).

The additive can be used with a variety of polymer compounds, including ABS and PC/ABS alloys. Unlike carbon nanotubes (CNTs) the polymer additive does not change the colour of base resin significantly, making colouring of the filaments possible. The company sees opportunities for the new modifier in applications such as electronic carrier trays.

› **www.adeka.co.jp**

**An antistatic electronics tray produced by fused filament 3D printing using Adeka's 3D-AS01 additive**

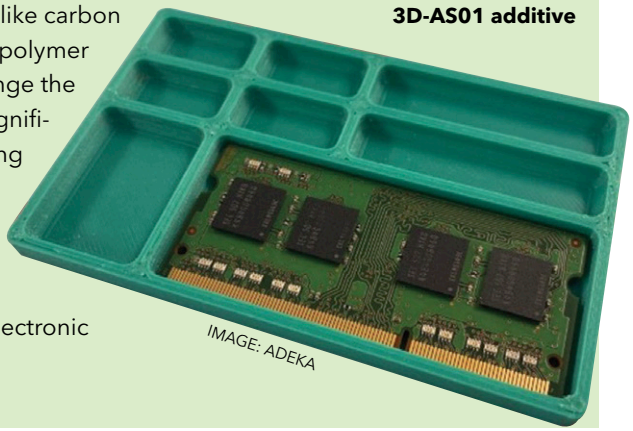

IMAGE: ADEKA

provide the high shielding performance needed.

"We can achieve 20 to 60 dB attenuation in the most frequently used frequencies for e-mobility and other industrial applications, such as measuring devices (gas pressure sensors, for example)," says Van Bellingen. Another growing area of opportunity she identifies is in batteries and fuel cells, where highly conductive plastics are used for parts such as bipolar plates.

To meet the growing demand for recycled content, Witcom can incorporate recycled carbon fibres (rCF) in conductive compounds, which can be formulated based on either recycled or virgin polymers. "The feeding of this additive is the most critical step but we can overcome this and produce, for instance, well-performing recycled PA compounds with 30% rCF, helping the automotive industry to reach its target of using minimum 25% recycled material by 2025," she says. Availability of rCF is better than in the past, she adds.

IMAGE: LEHVOSS

**Left: This tray for semiconductor manufacturing is produced in a conductive PPS compound from LehVoss**

New PP-based compounds from Finnish company **Premix** include a conductive grade (PP 19161) and a dissipative version (PP 19136), which the company reports is useful for injection moulded crates and technical parts. A concentrate (PP 19279) is also available that contains a high loading of carbon black for dilution with either virgin or recycled PP. This is intended for production of corrugated boards, sheets, and profiles.

Beyond PP, the company has also developed a new electrically conductive grade – Pre-Elec PA17970 – based on polyamide 6 with 25% glass fibre to provide enhanced mechanical properties. This material grade offers low warpage and good thermal properties. Conductivity is achieved through the use of a special conductive carbon black. The company says it is useful for the production of plastic automotive parts that need to be electrostatically painted.

Premix announced last year it is to build its first plant outside of Finland in Gaston County in the US state of North Carolina. The decision last year followed the award of an $80m contract from the US Department of Defense, working with the Department of Health and Human Services, to make electrically conductive plastic for production of pipette tips for diagnostic testing. The company aims to start operation in 2025.

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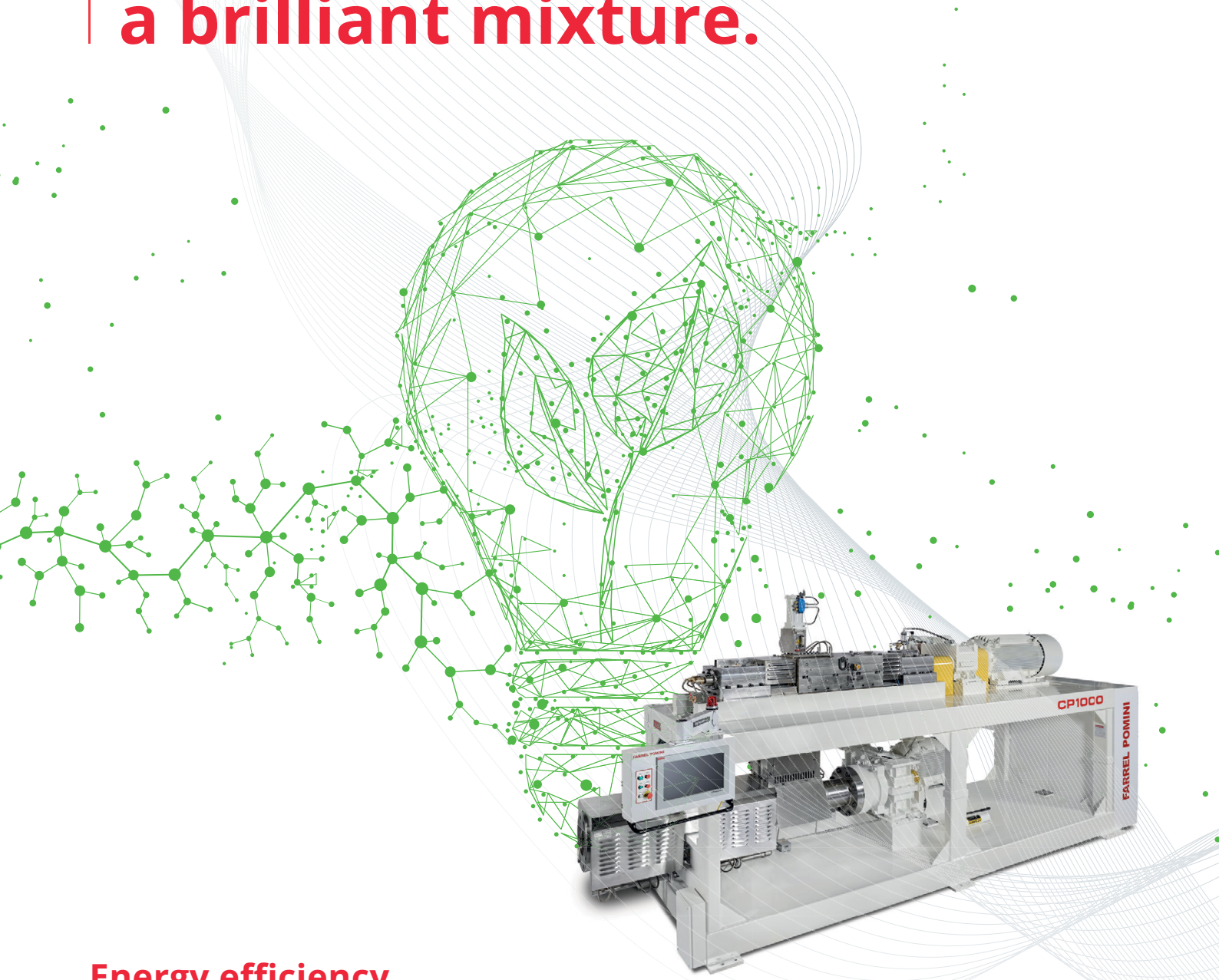


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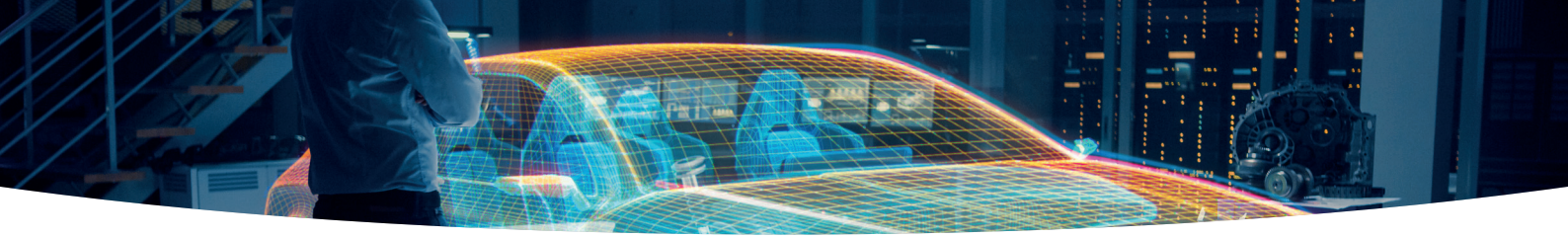

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# Automotive electrification to drive compound innovation

***EV technologies will present new opportunities for plastics but call for compounds that meet new performance and environmental requirements. Chris Saunders reports***

IMAGE: CADILLAC

**Main image: The Cadillac Lyric luxury EV claims to set new standards for range. It uses a number of innovative polymer components and materials**

Despite the challenging global economic environment and continued semiconductor chip shortage, the Electric Vehicle (EV) market is booming and shows little sign of slowing. According to the latest edition of the annual Global Electric Vehicle Outlook, there were around 16.5m EVs on the world's roads by the end of 2021, three times the number there was in 2018, and growth continued throughout 2022. Polymer compounds are at the very forefront of this EV revolution and considerable growth is expected.

Polymers have many advantages over materials traditionally used in automobile production. They can be easily processed into complex shapes and provide long-term performance and efficiency gains, while ongoing advances in polymer science have further broadened application scope.

"Freedom of design is a big plus point in terms of simpler production processes and thus lower costs," says Julian Haspel, Head of the e-Powertrain Team at **Lanxess**. "Take the housing for the high-voltage battery. In addition to the savings in material costs, if the components are made from plastic, functions like snap-on hooks or screw domes can be integrated directly in the manufacturing process. With aluminium this would require cost-intensive subsequent processing."

In the powertrain or battery of electric vehicles, as well as in charging infrastructure, plastic components are often exposed to high temperatures, high currents and high voltages. They must be resistant to creepage currents that occur when electrically conductive paths form on the surface of insulating materials –tracking – and can result in short circuits and possible damage.

Lanxess has developed a new PBT compound that is halogen-free flame-retardant and hydrolysis-stabilised. "One strength of the structural material is that its outstanding electrical properties are hardly dependent on temperature and moisture in the typical operating conditions of high-voltage connectors," says Dr Bernhard Helbich, Technical Marketing Manager Key Accounts in the Lanxess High Performance Materials business unit.

The compound is a part of the company's Pocan BFN HR range, which is characterised by a high level of volume resistance and dielectric strength. In the CTI test (Comparative Tracking Index, IEC 60112), the material achieves the highest CTI A 600 rating and can be used at voltages higher than 600V. The new grade, which is reinforced with 25% by weight glass fibres, is described as 'very stable' to hydrolysis. In tests based on SAE/USCAR-2 Rev. 6 long-term hydrolysis specification it achieved a rating of Class 3. In the UL 94 flammability test it achieved a V-0 rating at 0.75mm.

›

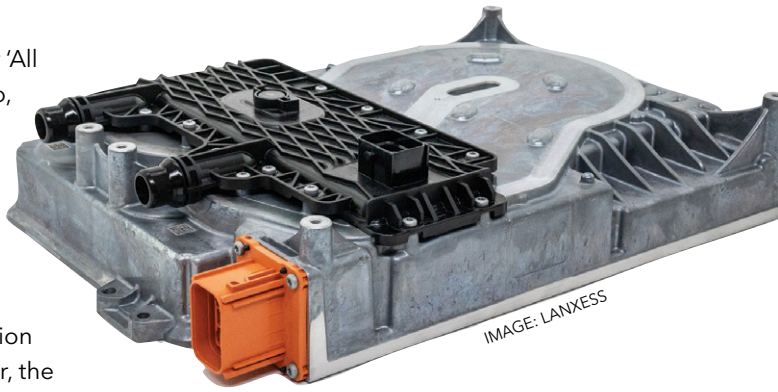
IMAGE: LANXESS

**Right: Kostal switched from PA66 to a Durethan PA6 from Lanxess to produce the cover on this on-board battery charger**

Lanxess aims to have the range listed under 'All Colours' on the Yellow Card by UL. "In doing so, we will save the processor from the time-consuming UL certification process if they were to colour the plastic themselves. They can simply use the compound that we have coloured and thus reduce costs," says Helbich.

PA66 has for some time been favoured for components in the cooling circuit of combustion engines for its resistance to coolants. However, the thermal management systems of pure electric powertrains are shifting toward lower temperatures and the long-term thermal resistance of PA6 compounds to water-glycol mixtures is sufficient for most parts.

One example of this switch from PA66 to PA6 is the cover for an on-board battery charger cover for use in an all-electric compact vehicle made by Leopold Kostal for a German car manufacturer. Produced in Durethan BKV50H3.0, Lanxess says the large-scale application underlines the point that PA6 compounds do not necessarily have to be hydrolysis-stabilised to be used in EV cooling applications with glycol-water coolants. The cover withstands temperatures of up to 85°C during vehicle operation and burst loads of up to 10 bar are achieved.

"We assume that in the future, PA6 products of this type will become very common in the mass production of covers and other thermal management components for electric vehicles. That is especially the case for applications such as fluid connectors or control units in the cooling system," says Helbich.

## Changing requirements

The different performance needs of EVs are setting new material specifications. Kurt Maschke, Senior Director Global Marketing Automotive at technical compounder **Mocom**, says: "The requirements for components in the new generations of vehicles have changed significantly. A large number of applications require flame-retardant and EMI-shielding properties at temperatures up to 100°C. At the same time, the requirements for components under the hood or in the area of thermal management must not be ignored. While ambient temperatures of 150°C and more are still applied to combustion engines, the maximum for an EV is 100°C. In the thermal management of internal combustion engines, these systems are designed in the 120°C to 130°C range.

"By contrast, the maximum temperature for electric vehicles is around 90 to 100 °C. This changes the choice of suitable polymers from PA66, PA46, PA6, PPA to PP, PC/ABS and PA6 for a wide range of applications. One example is Mocom's Altech NXT PP, which is an alternative to PA66.In addition, the combination of flame retardancy with good hydrolysis properties offers application opportunities in the field of battery vents, mounting parts, connections and busbars. Alcom HP PBT 2030 FR SB1208-20 (PBT GF30) has been developed specifically for this purpose and has already been approved by well-known automotive manufacturers."

One of the challenges in using PA in electrical applications is maintaining electrical properties over time, which requires careful stabilisation. The latest addition to **Brüggemann**'s range of electrically-neutral thermal stabilisers is TP-H2217. Developed for reinforced and unreinforced aliphatic polyamides with halogen-free flame retardancy requirements, it is said to have neither a corrosive effect on metallic components such as overmoulded sensors, nor any significant influence on the electrical properties of the polymer it is protecting.

"With Bruggolen TP-H2217, compounders can produce polyamide materials that combine a UL94 V-0 classification, electrical neutrality as well as permanent heat resistance at elevated temperatures, and are thus specially tailored to the requirements of e-mobility," says Dr Kristina Frädrich, Product Manager at Brüggemann.

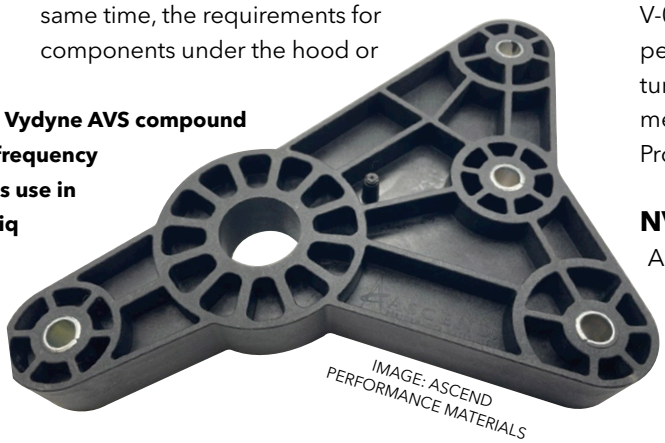
IMAGE: ASCEND PERFORMANCE MATERIALS

**Right: Ascend's Vydyne AVS compound dampens high frequency vibrations and is use in the Cadillac Lyriq**

## NVH challenges

Along with the array of electrical-based issues, EVs pose special challenges when it comes to isolating structure-borne noise and vibration. Without the relatively loud internal combustion engine to mask them, vibration-induced noise

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**Right: Cooper Standard's Plasticool lightweight tubing system uses Zytel PA 612 from Celanese**

can become much more apparent and can be distracting for the driver. Involving both vehicle safety and passenger comfort, engineers can often find it extremely difficult to pinpoint a single part or component at the root of the noise.

Polyamide-specialist **Ascend Performance Materials** has focused on this challenge with Vydyne AVS, a new engineered material effective at damping high-frequency vibrations from sources such as motors and compressors. It claims this can translate into an 80% reduction in cabin sound pressure.

One of the applications where Vydyne AVS is currently being used is in the Cadillac Lyriq, which was dubbed 'the quietest car I can remember driving' by one motoring journalist. The car sports an electric AC compressor mounting bracket made of Vydyne AVS, which effectively dampens that component's vibrations at source while also providing structural support.

Another company aiming to meet these challenges head on is **Celanese**, which recently completed its acquisition of much of the DuPont engineering plastics business, including its Zytel PA portfolio. Zytel NVH70G35HSLA2 is the first addition to the Zytel NVH Gen 2 product family. The PA66-based, 35% glass-filled polymer offers high damping, yet keeps its base polymer's robust structural properties for parts that require sustained mechanical strength.

"This new Zytel grade takes a different approach to high-frequency vibration isolation by utilising the material's structural damping ability without sacrificing extended fatigue resistance over time," says Gabe Knee, Automotive Market Manager at Celanese. "We've created a cost-efficient, mass-saving, and tunable solution for electric drive units that mitigates NVH problems in electric vehicles, making them even quieter and more comfortable."

New developments in polymer compounds for EVs was a main focus at the 51st Annual Society of Plastics Engineers (SPE) Automotive Innovation Awards Competition in November last year, where the team from the Engineered Materials business of Celanese had a memorable evening with its thermoplastics customers named as winners in two different categories. ❯

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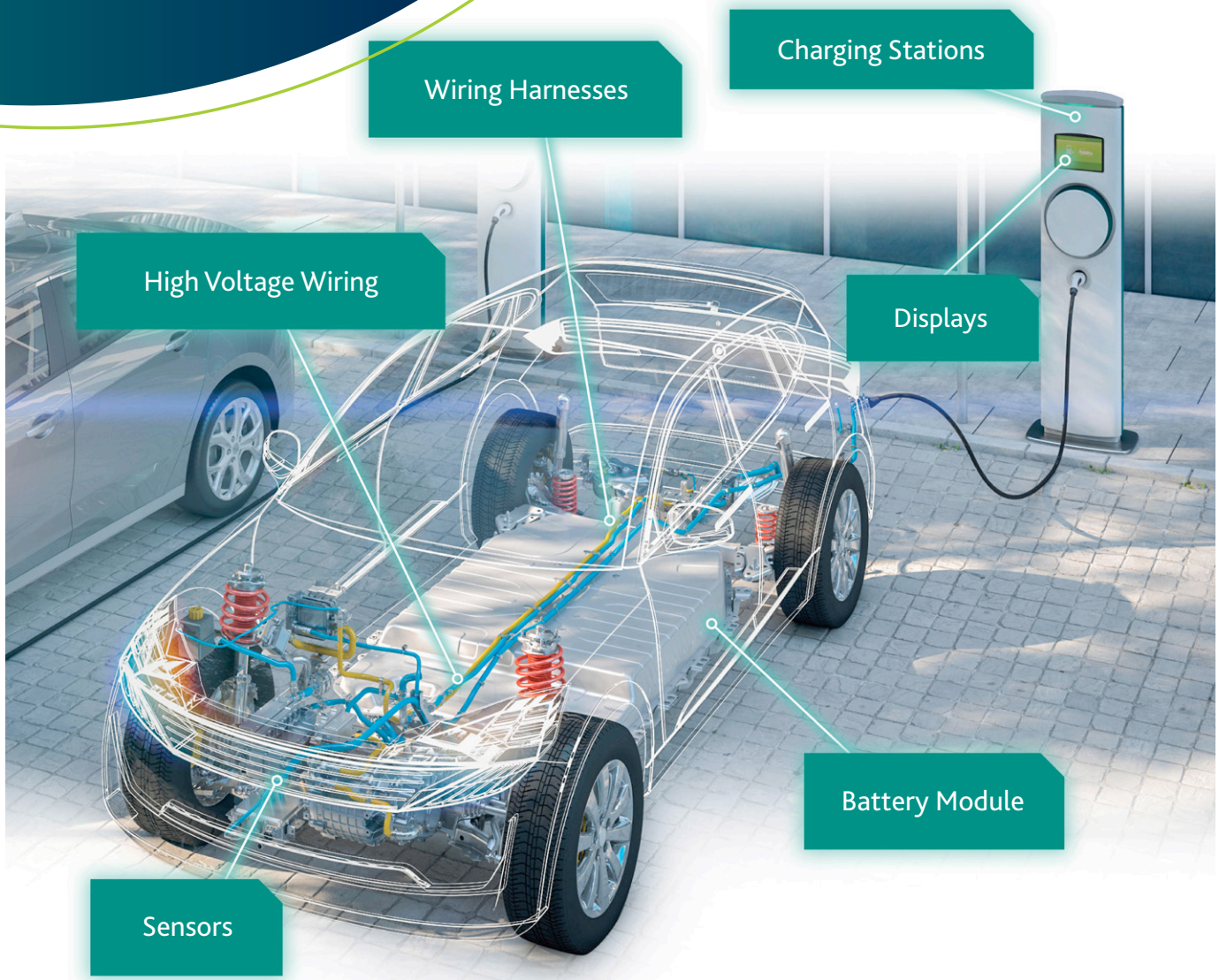


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IMAGE: DSM ENGINEERING MATERIALS

**Above: Renault has developed a lightweight fuel tank for PHEVs using Akulon Fuel Lock PA from DSM**

The winner in the Materials category was Cooper Standard's Plasticool Lightweight Multi-layer Tubing, developed for General Motors. The Celanese team collaborated on the tubing design to replace an EPDM thermoset rubber with Zytel PA612 polyamide. The result was a 60% reduction in weight and better chemical resistance and strength.

The winner in the Electric and Autonomous Vehicle Systems category was a High Voltage (HV) power distribution system created by Yazaki/Aptiv with more than 130 components to meet all Ford's flame retardant and sealing requirements. The car maker selected a flame retardant glass-filled Crastin PBT for the high voltage contacts and for a structural cover produced with over-moulded silicone seals in a hydrolysis resistant grade.

## Targeting emissions

Hybrid vehicles fit in the gap between EVs and ICE vehicles and share some of the challenges of both powertrains. Despite using smaller fuel tanks, for example, emissions can still be a challenge using current multi-layer HDPE technology. To address this issue, **DSM Engineering Materials** partnered with Renault to create a lightweight and decomplexed plug-in hybrid vehicle fuel tank using its Akulon Fuel Lock PA6 grades. The company says etremely high parison stability enables very narrow wall thickness distributions, while robust performance at both high and low temperatures ensures a high level of safety.

Dr Laurent Gervat, Leader of the Upstream Strategy Material Team at Renault says: "Working with DSM Engineering Materials to create our new hybrid vehicle fuel tanks has helped us take a significant step toward providing more sustainable mobility to our customers. Hybrid vehicles are a key part of the transition toward a more sustainable economy, and we're very proud to offer this innovative new solution to the market."

Danish company EVBiler manufactures and sells parts for both electric and hybrid cars, including mobile and stationary charging stations and various accessories. The company recently decided to change the material used in one of its flexible holders for charging cables. Originally produced in ABS and 3D printed, increasing demand meant a switch to injection moulding. It chose **Polykemi** to provide the right material for the application.

After considering EVBiler's specific needs and demand profile, Polykemi's technical team, aided by their counterparts at sister company Rondo Plast, proposed its REPRO PP RG124 recycled PP with 20% glass fibre. The material change meant a saving of 4.25kg of $CO_2$ per kg of material and an overall $CO_2$ saving of more than 80%.

"The choice was based on the fact that we wanted the same strength of the material but with lower $CO_2$ emissions. We also looked at the recycling of the material after the lifetime of the product," says Ole Tietze, Sales and Technical Support for Polykemi in Denmark and Benelux.

Charging box maker Heidelberg has also been looking at material options, selecting PA for the housing of its latest Amperfied wallbox rather than the metal enclosures it had used previously. The company selected an Ultramid PA6 grade from **BASF** for the part, which in addition to dimensional stability and mechanical strength also had to be transparent to the radio frequencies necessary for the unit's data communication.

"Heidelberg Amperified wallboxes have always been characterised by a timelessly designed and robust housing. With the Ultramid housing, together with BASF, we have managed to transfer the qualities of the first generation to the wallboxes of our new generation and to meet additional requirements, such as connectivity," says Ulrich Grimm, Technical Managing Director of Amperfied. ›

IMAGE: POLYKEMI

**Right: EVBiler is using a recycled PP compound from Polykemi in its latest charging cable holder**

## Environmental impact

Reducing environmental impact is an ongoing theme in the evolution of EVs. Hexagon's Manufacturing Intelligence division and **Sumika Polymer Compounds Europe** (SPC Europe) have teamed up to digitise the performance of the latter's automotive-grade PP compounds, enabling engineers to design components that are more recyclable and offer a lower carbon footprint.

Plastics can contribute up to 20% of the total weight of a car and their application is escalating with the continuing replacement of metals. The shift to e-mobility has increased the need for component lightweighting to maximise energy efficiency and mitigate the weight of battery packs, according to the companies, but their environmental performance must be taken into account.

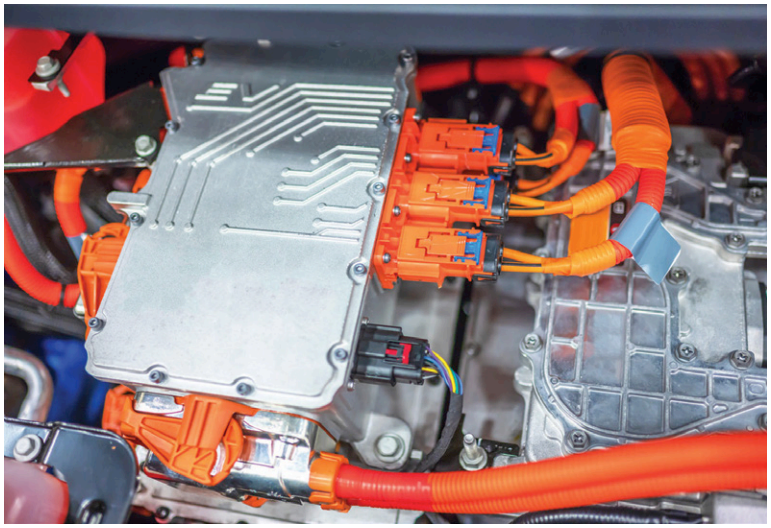
"Limited material behaviour data is a barrier to sustainable e-mobility innovations because automotive engineering teams have not been able to put new materials through the rigorous virtual durability and safety tests required for automotive endorsement," says Guillaume Boisot, Head of the Materials Centre of Excellence at Hexagon. "Our multiscale material modelling technology accelerates the adoption of SPC Europe's recycled materials by making it possible for product development teams to accurately simulate a component and subject it to established automotive engineering tests and validation."

IMAGE: BASF

**Above: Heidelberg's Amperified charging wall box housing uses an Ultramid PA from BASF**

Weight reduction and easier recycling are two factors also accelerating the use of EMI shielding plastics versus metal or mixed metal/plastics solutions. **Witcom Engineering Plastics**, part of

IMAGE: AVIENT/GETTY IMAGES



**Above: Avient sees its Edgetek polyketone providing a low emission alternative to PA in EV applications**

the Wittenburg Group, says it is attracting a lot of interest in the EMI shielding PA6 and PC-based compounds it introduced last year. It says these allow shielded solutions that are more affordable, safer and better performing than traditional solutions.

"We can achieve 20 to 60 dB attenuation in the most frequently used frequencies for e-mobility. Applications include ECU housing, inverter housing and PCB housing," says Christine Van Bellingen, Business Development Manager, Conductive Compounds at Witcom. "For over 15 years, we have been a worldwide supplier of radar absorption compounds used to enhance ADAS radar sensor performance [and] their role was recently extended to door opening protection. On top of PA, PP, PBT and PC radar absorption grades for RF absorbers or brackets, we also offer softer radar materials based on TPEs. This technology is key for EV cars and aids safer and more autonomous driving as 100% of the sensor power can be dedicated to its basis calculation rather than being influenced by ghosting effect, for instance."

Witcom also provides plastic compounds for use in automotive gears and bearing applications, where they provide reduced noise and improved wear resistance. "In order to continue using these materials responsibly in a sustainable future, we have developed several compounds without PFOA/PFAS that comply with increasingly stricter legislations," Van Bellingen says.

Last year, **Avient** introduced two new grades within its reSound Rec TPE portfolio of materials containing recycled content. Offering Shore-A hardnesses of 47 and 54, both TPE grades are formulated with polyvinyl butyral (PVB) recycled from automotive glass. "We are closing the loop by incorporating recycled PVB from vehicle glass into our reSound Rec TPEs which then go back into other automotive applications," says Matt Mitchell, Director of Global Marketing, Specialty Engineered Materials.

The company also offers its Edgetek polyketone (PK) grades, which it claims offer an alternative to PA that can lower carbon footprint. Edgetek PKE NHFR formulations overcome some of the limitations of PA6 by delivering low moisture uptake as well as good chemical, wear and impact resistance. According to Avient, production of PK emits up to 61% less $CO_2$ than production of PA66 and 46% less than PA6. The Edgetek PKE materials can also provide flame retardant performance to UL94 V-0.

## Accelerating transition

Launched last year, **SABIC**'s Bluehero programme is intended to provide "an expanding ecosystem of materials, solutions, expertise and programs designed to help accelerate the world's energy transition to electric power and support meeting global goals on climate change." Delivery of automotive polymer materials, solutions and capabilities for the enhancement of EV battery systems is its first area of focus.

"The global transition toward clean energy and decarbonisation is driving innovation in batteries at an ever-faster pace and the battery industry needs new materials with the right property profiles to implement more sustainable, safer and efficient energy storage concepts," says Bob Maughon, Executive Vice President, Sustainability, Technology and Innovation and Chief Technology and Sustainability Officer at the company.

SABIC sees a need for new battery designs with enhanced performance in terms of structural integrity and operating safety. It says it has carried out extensive research on performance of EV batteries exposed to external fires and internal runaway situations, highlighting results from tests based on UL 2596, which combines pressure, ablative force, heat, and fire exposure.

Noryl NHP8000VT3 PPO-based resin has been developed to meet these demands. It achieves a high comparative tracking index performance (CTI PLC0), provides ultra-thin-wall extrusion and thermoforming capability, and meets the UL94 V-0 standard at 0.25mm with a non-brominated, non-chlorinated flame retardant system. It is said to be well-suited for production of insulation film used in EV battery modules.

At the K show in Germany last year, SABIC displayed an Air EV from Lucid Motors. This fast charging luxury EV provides a claimed range of up to 530 miles (around 850km) on a single charge and uses SABIC thermoplastics in more than 25

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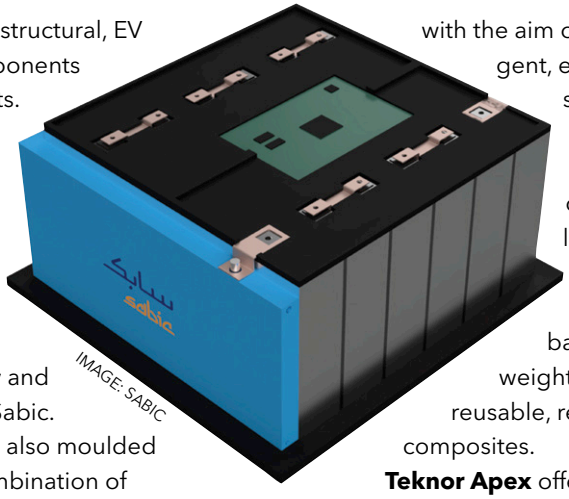


**Right: SABIC's Noryl NHP resins have been developed for e-mobility applications such as batteries**

applications, ranging from structural, EV battery and electrical components to exterior and interior parts.

Lexan FR resin is used in the battery module housing, which integrates the electrical conductor directly into the housing in a one-shot moulding process, saving assembly time and improving quality and consistency, according to Sabic.

The front-end module is also moulded in a single shot using a combination of Stamax long-glass-fibre PP with and thermoplastic composite sheets. The process involves insertion of pre-cut sheets into the mould, where they are shaped and combined with additional inserts, then overmoulded to form a lightweight yet rigid composite component. Stamax is also used for the front trunk, which is a single-piece moulded part in combination with a thermoplastic elastomer. In both these applications, Stamax was selected for its high stiffness-to-weight ratio, low warpage, adhesive properties, and impact performance.

Mexican interior parts supplier GDO selected Elix Ultra HH4115PG, an ABS/PC blend from **Elix Polymers** for the chrome-plated dashboard trim used by a premium EV manufacturer. Ultra HH-4115PG is one of several products the company offers for chrome-plated applications; Elix ABS P2MC carries a number of OEM approvals, HH P2MC is recommended for applications requiring greater thermal resistance, and Ultra HF4200PG is an ABS/PC blend with high flow.

Last year, Elix Polymers partnered with **Aimplas** and Itera Mobility Engineering on a SMART5G Project funded by the State Research Agency (AEI) with the aim of developing an intelligent, efficient and sustainable system to enable drivers to replace their discharged EV battery packs with charged ones to avoid lengthy charging stops. The initiative is also developing sustainable, structural battery casings for lightweight vehicles based on reusable, recyclable, thermoplastic composites.

**Teknor Apex** offers its Flexalloy PVC elastomers for EV charging cables. The company says the materials are abrasion, chemical, and oil resistant and offer brittle points as low as -60°C and high temperature ratings of up to 105°C. It says this property combination makes them well suited for wire and cable applications routinely exposed to the elements, such as those in EV charging cables.

The compounder offers materials to support light-weighting goals - including its semi-aromatic Creamid S and low moisture absorption Creamid P polyamides, and is developing long glass PP and PA products for structural metal replacement. It is also expanding it is sustainable materials portfolio and claims a core competence in sustainable PA materials. Already available in North America, its Recyclon PA solutions include grades containing up to 100% recycled content that offer high degree of consistency in performance and processability.

"Our key approach is that we're identifying and engineering solutions to meet actual challenges faced by our customers in real time," says Lance Nunley, New Business Development Manager at Teknor Apex.


**Right: Teknor Apex sees opportunities for its Flexalloy PVC elastomers in EV charging cables**

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IMAGE: DELTA TECNIC

# Electric vehicle market is wired for growth

## *The move to EVs presents both opportunities and challenges for the cable industry. Here **Eric Xirinachs**, CEO at cable masterbatch maker Delta Tecnic, shares his perspective*

The shift to electrification and electromobility is accelerating rapidly. Global power generation is forecast to grow from 27 TWh in 2020 to 48 TWh by 2035 and on to 83 TWh by 2050 over the next 15 years, according to McKinsey's Energy Insights Global Energy Perspective 2022, with the share provided by renewable technologies – predominantly solar and onshore and offshore wind – growing from 29% in 2020 to 60% in 2035 and on to 86% by 2050.

The transport sector is leading the transition away from fossil fuels. According to data from the International Energy Agency (IEA), global electric car sales amounted to 6.6m units in 2021 – near double the 2020 result –and drove the global fleet of electric cars to more than 16.5m.

Electrification will require huge grid investments, while EVs will present new cable applications. For the plastics industry, this presents both opportunity and challenges. Here Eric Xirinachs, CEO at Delta Tecnic, a masterbatch producer with a strong position in the cable industry, shares his views on both.

**How far-reaching do you see the impact of electrification on cable compound demand?**

The electromobility boom has not left anyone indifferent. Administrations, companies and society are increasingly aligned on this path, and autoparts manufacturers are demanding new materials and formulations to meet global demand. The supply chain calls for new types of cable to boost electric mobility. ›

**Main image: Electrification is calling for new cable types that can withstand exposure to extreme conditions**

**Right: Silicones and fluoropolymers are likely to find application in new EV cable applications**

There are some other important facts to keep in mind, one of these being the energy transition due to decarbonisation. The generation of renewable energy is being accelerated, along with the transmission and distribution of more sustainable technologies. In this sense, the presence of a network of Electricity Storage Systems (ESS) with photovoltaic modules in electric vehicle charging stations will help solve the problem of generation imbalances.

**What does electromobility mean for cable compound producers?**

Hybrid and electric cars require new types of cables, such as battery and charger cables, but also new materials to withstand higher temperatures and other special features. And self-driving technologies – in other words computers on wheels – leads to an increase in precision electronics in the car and therefore renewed wiring needs. New generations of cable products are required and new masterbatches with special polymers are necessary.

We are talking about thermoplastic polyurethane (TPU) coated charging cables with halogen-free compounds and flame retardant polyolefin insulation. Demands include light resistance, thermal stability, weather resistance, hydrolytic resistance, colour stability, abrasion resistance and mechanical resistance.

Companies not only need to create quality products that are competitive, but also need to optimise their manufacturing and assembly processes, making them faster, more reliable and more efficient. In cable production, there is a trend to produce faster, to reduce the thickness of insulation, and to reduce the length of extruders. To do this without compromising the final results requires perfect dispersion and excellent dilution.

IMAGE: DELTA TECNIC

**What do you forecast in compound material trends?**

Companies will focus on more technical materials to insulate automotive wiring. In this regard, fluoropolymers, in the form of thermoplastics and elastomers, will find wide use in automotive applications due to their combination of high resistance to fuels, lubricants and elevated temperatures.

Silicones are also highly in-demand compounds and are useful in various types of automotive cables, such as batteries or lighting and high-demand wiring. Silicones allow working with a constant dielectric and with dielectric properties of dimensional stability from -80 °C to 250 °C. In addition, they are resistant to vibration and fire; they produce low smoke emissions, and emit non-corrosive, non-toxic combustion gases.

Eric Xirinachs is CEO of Spanish masterbatch producer Delta Tecnic. The company, owned by Aurica Capital since 2017, has production locations at Barcelona in Spain and Querétaro in Mexico. It is a key supplier of colour masterbatch to the automotive cable industry, operating 22 lines with a total capacity of around 18,000 tonnes.

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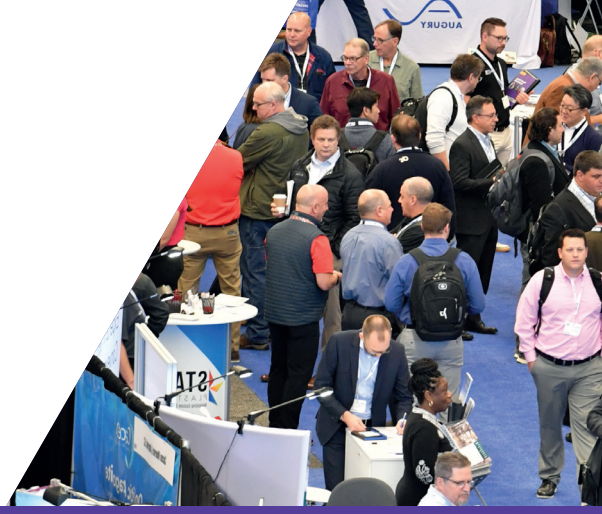

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# Planning a sustainable future

***Global demand for sustainable compounds continues to grow. While the industry is rising to the challenge, issues regarding recyclate availability and quality remain, writes Mark Holmes***

IMAGE: SHUTTERSTOCK

**Main image: Recycling, bio-sourcing, carbon footprint reduction, and circular material flows are all playing a part in plastics industry sustainability plans**

Compounders and masterbatchers are finding increasingly innovative ways of progressing the circular economy and meeting rapidly rising demand for sustainable compounds. Availability and quality of recyclate and bio-based polymers is improving, albeit with considerable room for further improvement. Meanwhile, designing for recycling is becoming increasingly commonplace with successful collaborations across the entire value chain providing some promising results.

Sustainable plastic compounds are undoubtably the future but are also very much the present, according to researchers at **Aimplas**, the Spanish Plastics Technology Centre. "Regulations and social perception of plastics is driving the industry to go in that direction as a result of geopolitical issues and oil prices," says Luis Roca, Compounding Research Leader.

"The rate at which the climate has changed has been rapid and unexpected, which is evident in the response from the industry and administrators, suggesting neither were prepared or equipped for such fast changes. Specifically, the plastics industry was not ready for these changes in recycled materials. It is not only in recycled materials that the industry was not adequately equipped for the large amount of plastic product required, such as raw materials and complex structures, but bioplastics have also had other issues more associated with inadequate capacity to cover current market needs," he says.

Roca sees an emerging sector of society that is increasingly eager for more sustainable compounds, adding that this is one of the reasons why the major industry players are adjusting the role they play in the development of sustainable compounds and raw materials.

When considering the various factors driving market demand for sustainable compounds, Roca says it is first of all important to distinguish the difference between the recycled and bioplastic paths. "Recycled materials are driving market demand due to regulations and their availability is related to administrative issues to collect more post-consumer recycled (PCR) materials with greater quality" he says.

## Quality matters

"Technologies, most notably, in mechanical recycling, are strongly dependent on the issue of collecting quality PCR materials to create sustainable compounds. However, there is not the quantity to keep up with demand, which is further widening the gap between market demand and

IMAGE: AIMPLAS

**Above: Compounding plays a key part in the sustainability research work carried out at Aimplas in Spain**

what is available, inevitably driving market demand for sustainable compounds," Roca adds.

The picture is different for bio-based polymer compounds. "Bioplastics rely strongly on availability, which is currently at a rate too low to keep up with market demand. This demand is linked to the fact that companies grow and develop rapidly through the development of new bioplastics, such as compostable renewable resources. To close the gap between supply and demand, companies need to be able to obtain similar properties to those conventional polymers can be subjected to in injection moulding applications and provide higher technical performance," he says.

"Another factor driving market demand is linked to natural additives, but this is made more complicated by the low thermal stability of these materials. At this time more research is needed in this field before natural additives can be used for sustainable compounds," Roca explains.

Aimplas says the key common trend driving new developments is availability, linked to price and performance. From a technology angle, it says a variety of problems are yet to be resolved as far as the matrix materials are concerned. "However, compounding is not a complex process and once this matrix is more universally understood, it will have a knock-on effect where there is more availability at the right quality," says Roca.

"For recycled materials specifically, the problems we see most often besides availability - which is not a technical issue - are quality and consistency. These issues include odours, rheology, colours and stabilisation, all of which are crucial to boost the reintroduction of recycled material in the value chain," he says.

Roca says he sees interest growing in recycling of complex materials where compounding equipment is carrying out the most critical operations, such as decontamination, controlled degradation and de-crosslinking. Another area of interest is how to remove legacy additives, such as flame retardants, stabilisers and plasticisers.

"For new bioplastics, mechanical performance and rheology such as melt strength, are the main challenges," he says. "The main interest is finding new natural bio-based polymers that can be converted into bioplastics to boost renewability and to profit from biowastes of bio by-products. The reformulation of PHA, as well as compounds with other types besides PHBs, are also the next areas of interest."

AIMPLAS is currently working with new types of bioplastics based on biowaste from different sources. It aims to understand how to make these compounds more processable and to engineer them to behave like conventional bioplastics, which is not always possible. It is now looking for new renewable fillers, possibly sourced from agricultural waste, and renewable natural additives such as flame retardants.

## Customer expectations

The Netherlands-based **Wittenburg Group**, which includes Witcom Engineering Plastics, also argues that sustainable compounds are now very much expected by customers. "Sustainable compounds are increasingly a qualifier, instead of a differentiator," says Vice-Director Anne Looije-Traa.

"The demand for sustainable compounds keeps increasing. However, it is also difficult to determine and prove what exactly a sustainable compound is – it depends on which angle you look at it from," she says. "Market demand for sustainable compounds is being driven by increasing concerns about climate change, resource depletion, and waste and pollution and resulting health effects. Although every global market has its own context and therefore the main focus may differ between them."

Looije-Traa says that the main trend driving new developments in sustainable compounding is circularity, including the use of recycled and/or renewable materials but also the need to design-for-recycling.

"Together with the whole value chain, we should redesign products in a more circular way," she says. "This requires more transparency between partners throughout the design stage. At the end all partners, as well as society, should gain something from participating in the development and generating added value, otherwise the endeavour will not be sustainable and viable."

Other problems requiring solutions include

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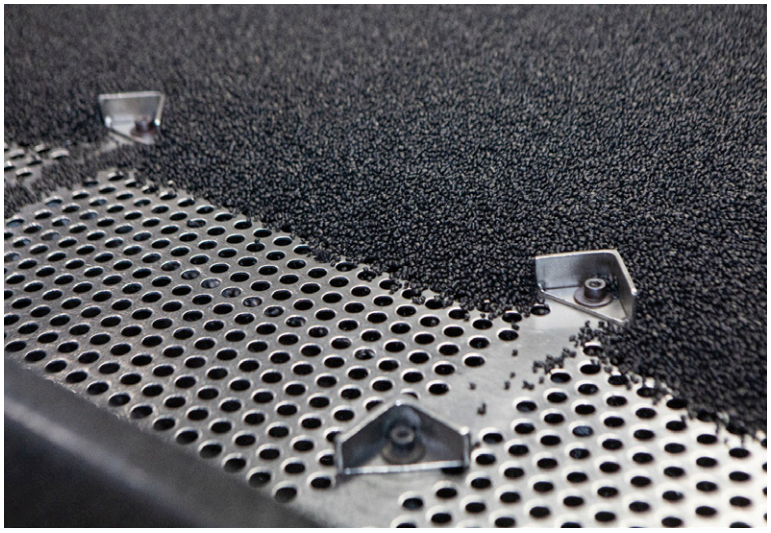
IMAGE: CABOT CORPORATION



**Above: Cabot recently launched black masterbatches formulated in resins from post-industrial and post-consumer sources**

availability of affordable materials, recycling infrastructure, and the recycling of multi-stream waste such as filled materials and reinforced engineering plastics. "The plastics processing and recycling industries are also not yet well aligned," she says. "Cooperation, partnerships and more alignment are necessary in the transition towards a more circular economy. In addition, governmental and regulatory support and direction is also needed."

As a speciality compounder with a focus on high-end applications for highly regulated markets, Wittenburg Group focuses on upcycling and reducing waste and material usage by applying the 10R framework. "We connect with our customers and listen to the challenges they face," says Priscilla Lips, Business Development Manager. "Together we develop sustainable solutions to address these challenges. There is no one approach that fits all. Over the years we have developed a broad understanding of different sustainability topics that can be important for customers. These can be related to the carbon footprint of products, but also to increase reusability or prevent the use of potentially harmful substances in materials.

"A good example is the upcycling of post-consumer recycled raw materials into high end applications, such as safety components in automotive applications or high-end consumer products. With these applications we demonstrated that it is no longer necessary to downgrade mechanically recycled materials into low-end products. Through compounding it is possible to upgrade this material to a higher quality," she says. "We are making increasing use of life-cycle assessment and certifications to support our customers and we expect that this will play an even bigger role in the future. We also aim to advise our customers to select materials with a lower environmental impact and improve the recyclability of their products."

## Carbon transition

Many plastics users are focused on the transition to a lower carbon future and, to that end, are looking to reduce greenhouse gas (GHG) emissions and/or increase circularity in their products, according to **Cabot Corporation**. "Biodegradable, bio-compostable, reclaimed and recycled raw materials are all areas of interest in the plastics market," says Bernadette Corujo, Specialty Compounds Marketing Manager, Americas region.

"In fact, market studies suggest sustainable compounds made from sustainable processes and feedstocks are outpacing the growth of the traditional masterbatch market. Another developing trend is increased partnerships between suppliers and customers. This trend is helping to accelerate new product developments that support sustainability," she says.

Corujo identifies factors driving demand for sustainable compounds as competition for resources such as water and energy, new regulations, climate change pressures, and an overall increase in awareness about the impact plastics can have on the environment. "At Cabot, we actively collaborate with our customers to develop new sustainable compounds that improve performance and impart sustainability benefits," she says.

"Market pull has a major influence on driving new developments in sustainable compounding. In addition to solutions, customers and consumers are also asking for measurable, meaningful metrics related to Scope 1, 2 and 3 GHG emissions," she says. "Sustainable solutions vary greatly by market segment and can also be interdependent on one another. For example, packaging focuses on the elimination of single use plastics and waste reduction, while agricultural films focus on biodegradability and labour savings. Post-consumer and post-industrial recycled resins can be used as feedstocks for several segments, such as drainage pipe and automotive parts."

Cabot adds that it is very important that the benefits of sustainable plastic compounds are evaluated quantitatively across the entire value chain. It says plastics often have a poor perception with consumers and even with OEMs and FMCGs but the entire life cycle impact of the product needs to be understood and quantified to truly understand the full environmental impact.

Limiting waste through recycling, recovering, and reusing raw materials in an economical manner is another challenge that requires new solutions. According to Corujo, technical areas of interest currently include developing solutions that enable circularity, as well as increase recycling to help

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conserve resources and minimise waste. "This can be done both through the design and manufacture of sustainable compounds," she says.

"In terms of product design, Cabot has been formulating masterbatches with recycled resin for many years. We have also started using reclaimed raw materials. Recently, we launched biodegradable resin-based masterbatches used in agricultural films in Asia and are bringing this technology to other regions," Corujo says. "We continue to invest in our manufacturing facilities to help enable sustainability by using hydropower or recovered waste heat energy from our carbon black facilities. We are actively working with our customers to understand their product lifecycle so that we can best support their sustainability needs."

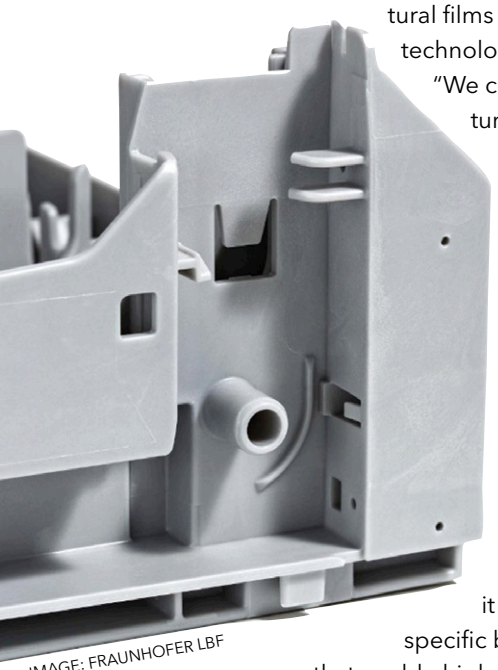

IMAGE: FRAUNHOFER LBF

**Above: Fraunhofer LBF has investigated the use of old battery housings to make new household appliance parts, such as this Bosch dishwasher base**

Cabot recently launched black masterbatches formulated in recycled resins from both post-industrial and post-consumer sources. The company says that it has experience in formulating specific blends of recycled raw materials that enable high performance, delivering consistent colour, and UV protection and quality. Masterbatches are also currently being developed that are formulated in both recycled resins and reclaimed carbon to help customers meet their sustainable targets.

Two of Cabot's most important markets are automotive and packaging. In automotive, the company is supplying products to meet key automotive requirements including lightweighting, electrification, sustainability and aesthetics, which are often interdependent. Black masterbatches are also the primary method of colouring black plastics for the packaging industry. In addition to aesthetics, black masterbatches can improve ultraviolet durability, circularity and conductivity of black packaging.

In future developments Corujo says that Cabot is striving for a deep knowledge of customers' sustainability needs by segment. "We want to deliver solutions to customers that are meaningful and will help them with their customers and end-products," she says. "For example, that could be a higher focus on decreasing GHG emissions or increasing circularity. Aligning on the data source of information for Scope 1, 2 and 3 emissions will also be part of that. Additionally, we are continuing the work we have started in biodegradable resins in mulch and exploring extending this to other segments such as packaging. In packaging, we are also working on better ways to sort plastics for recycling."

## Stress investigations

In cooperation with Robert Bosch and BSH Hausgeräte, the **Fraunhofer Institute for Structural Durability and System Reliability LBF** has been investigating the use of recycled plastics in high-stress applications. The work carried out extensive investigations into the morphological and mechanical properties of a PP recyclate and compared the results with new material that is currently in use. The recyclate originated from used starter battery housings and was compounded and optimised – from a usage requirements perspective – by Bosch and recycling company BSB. This involved comminating, cleaning and drying the PP housings. In a subsequent compounding process, the molten material was filtered; mixed with additives, stabilisers and fillers (30wt% talc) and then granulated.

To gain a full understanding of the differences between the properties of recyclate and new material, extensive analytical and mechanical investigations were carried out on material samples. From an analytical perspective, the molar mass distribution, the degree of crystallinity and the level of contamination by metals or foreign polymers were investigated. Mechanical tests were used to examine how the service life was affected by the interplay of static and cyclic loading on notches and the joint line, as well as the temperature, load ratio and ageing. To ensure that the recyclate and new material were comprehensively characterised for the planned intended use, 250 static tensile tests and 450 fatigue strength tests were carried out.

For household appliances, the recyclate could potentially be used as a substitute for new material that is currently being used to produce injection moulded dishwasher bases with dimensions of 600mm by 400mm by 100 mm and weight of 2 kg. To enable the use of recyclates in the base various aspects had to be verified, such as the cyclic strength of the most highly stressed area of a bearing dome, which is cyclically stressed up to 100,000 times due to the opening and closing that takes place during operation.

Using numeric calculations, the mechanical properties that had been determined from the sample tests were processed so that they could be incorporated into the concept of the most highly stressed volume of material V80 and the concept of the stress gradient $\chi^*$. With the aid of compo-

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**Right: Gravi-Tech REC recycled and BIO bio-based formulations are useful for luxury cosmetic caps and closures**

nent tests and numeric calculations, the level of stress that the recyclate could withstand was compared with the stress capacity identified in the sample tests. This revealed that the recyclate had the structural durability to withstand the cyclic load exerted on the component during operation.

Offering more sustainable products across the entire product range is one of the aims for **Avient**, with the latest example an extension of its Gravi-Tech density-modified portfolio to include more grades based on recycled and bio-based resin and/or filler. The company says performance is not sacrificed.

Gravi-Tech density modified formulations were originally developed to mimic the luxurious look, weight, and feel of die-cast or machined metals by using select metallic fillers. The company says that they are a cost-effective alternative to metal and are useful for applications in luxury packaging and consumer goods including caps and closures for cosmetics, bottle caps and boxes for spirits, and decorative knobs and grips for appliances, furniture, and automotive applications.

The Gravi-Tech REC recycled formulations are based on recycled resin and/or filler from post-industrial recycled (PIR) and/or post-consumer recycled (PCR) sources. Gravi-Tech BIO bio-based formulations contain bio-based resin from renewable plant sources. Both families are developed to offer comparable performance to conventional density-modified solutions.

**Below: Teknor Apex is offering its latest recycled content Monprene RX CP-15100 TPEs in colorable natural grades**

ReDefyne is a range of PA compounds from **Ascend Performance Materials** containing up to 100% pre and post-consumer recycled PA6 or PA66. The grades are said to provide a lower carbon footprint and reliable performance, even in demanding applications. ReDefyne products are third-party certified and Ascend is partnering with ITW Global Fasteners to pilot blockchain traceability through Plastic Finder's Certified Circular Plastic

IMAGE: TEKNOR APEX

IMAGE: GETTY IMAGES

programme. With ReDefyne, ITW is producing fasteners with a considerably lower carbon footprint.

## Composite options

New additions to the **Lanxess** Tepex thermoplastic composites product line include grades made from recycled or bio-based raw materials. One uses a matrix polymer based on PA6 produced from cyclohexane containing over 80% sustainable raw materials. Another new product line comprises variants of Tepex containing recycled carbon fibres from post-consumer and post-industrial waste. The fibres are used as non-woven material or as chopped fibre mats. A variety of thermoplastics are suitable as the matrix material, Including PA6, PA66, PP and PC.

The latest addition to the **Teknor Apex** range of thermoplastic vulcanisates (TPVs) is Sarlink R2 3180B. Based on its existing Sarlink technology, the new grade incorporates 25% post-industrial recycled (PIR) content. It is described as a pre-coloured black, high-durometer multi-purpose TPV that is essentially a functional equivalent of its virgin counterpart in terms of processing and performance. According to the company, Sarlink TPVs typically provide faster cycle times and throughput rates when compared with competitor products and this advantage is retained in the recycled content version.

The company has also developed its Monprene TPEs, which contain 25-35% recycled content (sourced from domestic, commercial and industrial waste streams) and are available in a light, natural colour rather than the more usual black. This allows product designers considering using recycled materials considerably more freedom. Monprene

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IMAGE: SABIC

**Right: SABIC and Scientex developed a BOPP packaging material based on chemically recycled ocean-bound plastics using mass balance accounting**

RX CP-15100 series TPEs are available in standard grades from 55-80 Shore A. They can also be tailored for specific requirements.

The CP-15100 products are designed for injection moulding applications, including overmoulding onto PP, and are said to offer performance on a par with prime TPEs. Target applications include personal care products, lawn and garden tools, writing instruments, appliances, sporting goods and protective packaging.

As part of a project with furniture maker GSM Sella and processor Aurora Kunststoffe, Austria's **Gabriel-Chemie Group**, has developed a new masterbatch for use in production of stadium seats using post-industrial recycled PA66. The company says when added to post-industrial polymer the masterbatch guarantees mechanical resistance and flame-retardant properties are achieved. It also offers a good aesthetic appearance and resistance to prolonged exposure to UV rays and other aggressive atmospheric agents. Some 30,000 new stadium seats have already been produced using the new grade.

IMAGE: SABIC

**Right: SABIC has developed a 30% recycled content HDPE for blow moulded applications**

As part of its Trucircle initiative, **SABIC** recently introduced a new HDPE for blow moulding of motor oils that is custom formulated using 30% mechanically recycled PCR content. It is part of a project to move to a full closed-loop bottle-to-bottle scheme in the Saudi Arabian automotive aftermarket. The HDPE T3K01B grade has been tested at SABIC's Plastics Application Development Center (SPDAC) in Riyadh and has been shown to provide the same batch-to-batch consistency, process ability and in-use properties as the company's equivalent virgin HDPE blow-moulding grade. Reliable bottle performance has been confirmed in comprehensive practical trials, including standard drop impact, top load and dimensional stability tests. According to SABIC's internal life cycle assessment, the compound offers a carbon footprint reduction of around 20% compared to a 100% virgin alternative.

## Matters of balance

Tracking use of mechanically recycled material is straightforward but it is not so easy when dealing with the products of chemical recycling, where the recycled content takes the form of basic hydrocarbons fed into complex cracking and polymerisation processes. In such situations, inputs are accounted for using the principles of mass balance – the input of individual components is measured and its contribution to a unit of end product allocated.

In the case of chemical recycling, the mass balance system should ensure that the amount of recycled feedstock entering a production plant equates to claims made about recycled content of products leaving it. The concept is explained in more detail **HERE** in AMI's Chemical Recycling Global Insight 2023 special publication.

The principle is being applied by many major players in the polymer industry. SABIC, for example, worked with Scientex in development of flexible food packaging made using SABIC-certified chemically recycled PP sourced from ocean-bound plastics (defined as plastics waste collected from within 50km of the ocean that could otherwise have found its way to the sea). The polymer is being used in a premium brand of noodle packaging sold in Malaysia.

In this case the waste is recovered and converted to pyrolysis oil by chemical recycling, which SABIC uses as a feedstock to produce PP polymer for processing to BOPP film. Scientex then manufactures and prints the noodle packs from this film. The entire chain from management of the collected ocean-bound plastic to the final package is accredited under certification regimes and a mass balance ocean-bound content of 30% claimed.

In Europe, Rehau has selected a Bornewables PP grade from **Borealis** over conventional PP for production of its Raukantex Evo Sustainable edgebands, which are used to trim furniture panels. Bornewable PPs are produced using a renewable feedstock derived solely from waste and residue streams within the ISCC mass-balance feedstock accounting system. As such, they are a

drop-in replacement for standard petrochemical-based polymer grades.

"The home furnishing sector is keen to find new ways to enhance the circularity of everyday products, but maintaining top product quality and longevity is essential," says Daniel Elfe-Degel, Manager Product Management Edgebands and Sustainability Officer at Rehau Industrial Solutions Division.

**Covestro** is now being supplied with two mass-balanced renewable raw materials – phenol and acetone – from the **Ineos** Inviridis product range, which it is using in production of polycarbonate. The reduced carbon-footprint grades are offered as drop-in solutions for applications including headlights and other automotive parts, housings for electronic devices, light guides and lenses, and medical devices. The company says the products display the same performance as fossil-based counterparts and easily integrate into existing production processes without technical changes.

The Inviridis phenol and acetone feedstocks are produced from bio-attributed cumene at the Ineos sites at Gladbeck in Germany and Antwerp in Belgium, both of which are certified to the ISCC PLUS and RSB standards. The raw materials provide a lower carbon footprint than petroleum-based equivalents and do not compete with food supplies, according to Ineos.

Plastic seatbelt buckle covers used in the Audi Q8 e-Tron car are being produced in a **LyondellBasell** plastic compound that uses feedstocks derived from mixed automotive plastic waste. Under the scheme, plastic parts from scrapped Audi customer vehicles are chemically recycled into pyrolysis oil by SynCycle (a partnership between Next Generation Group and BDI), which is then used as a feedstock in LyondellBasell's production process. The recycled content of the polymer is allocated according to industry-standard mass-balance principles.

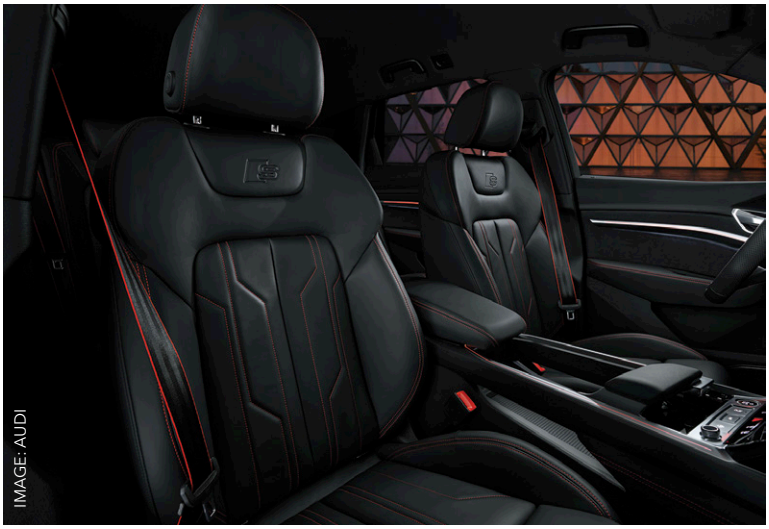

IMAGE: AUDI

**Above: Audi is using a LyondellBasell compound with mass balance chemically recycled content for seat belt buckle parts in its Q8-e-Tron**

According to the project partners, this approach allows a recycling stream to be created from materials that are currently only suitable for energy recovery. It is claimed to reduce usage of fossil-based primary materials while keeping feedstocks in a circular loop. Materials with mass-balance allocated pyrolysis oil feedstocks are of the same quality as virgin materials and show the same properties.

The latest line of recycled PMMA materials from **Trinseo** is Altuglas R-Life, an umbrella brand that will include chemically and mechanically recycled, reused, and bio-based PMMA grades suitable for production of cast and extruded sheets, resins, and compounds. Altuglas R-Life acrylic resins have been developed with both 50% and 80% chemically recycled monomer from PMMA waste and can be used in a broad range of applications in sectors such as retail, lighting, interior architecture, furniture, construction, and transportation.

IMAGE: BOREALIS

**Left: Rehau is using mass balance certified Bornewables PP from Borealis for production of furniture edge trims**

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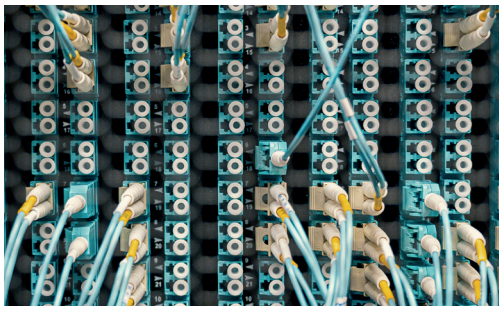

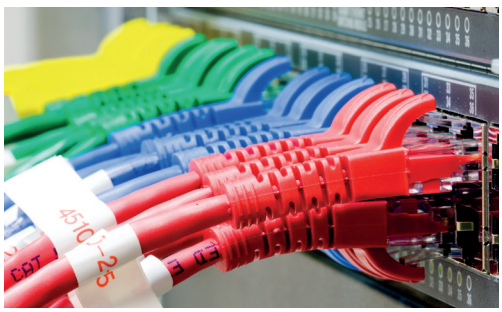

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IMAGE: SHUTTERSTOCK

# Compound and masterbatch makers to meet in Bangkok

## *AMI's first Compounding and Masterbatch Asia conference takes place in Bangkok later this month. We preview the event*

This month sees the launch of Compounding and Masterbatch Asia, a new two-day conference organised by *Compounding World* publisher AMI that runs over 28 February – 1 March at the Banyan Tree Hotel in Bangkok, Thailand.

Built on the foundations of AMI's previous Compounding World Asia and Masterbatch Asia events, the new conference brings together a diverse selection of presentations and panel discussions covering the key trends and drivers within the Asian and global market.

The event provides an opportunity to discuss and engage with leading industry experts and is supported by an international array of founding sponsors, including Equitech, ICL, Rianlon, Leistritz and Labtech Engineering. That supports means that compounders and masterbatch makers can benefit from a discounted delegate rate of $195 (check the **website** for more details).

This article takes a look at the speakers and the expertise they will be sharing at the event.

### Setting the scene

Compounding and Masterbatch Asia opens with a presentation by **Dr Hanne Jones**, Business Unit Manager at **AMI** in the UK, who will talk about the outlook for the global polymer market and explore key trends within the masterbatch industry, including a discussion of the implication of moves toward greater sustainability. She will be followed by **Shanmugam Srinivasan**, Managing Director, and **Sampath Lakshminarasimhan**, AVP-Technical & Marketing, from **Xmold Polymers** in India, who will provide insight into the challenges facing the

**Main image: Thailand's capital Bangkok hosts the first Compounding and Masterbatch Asia conference later this month**

Speakers sharing their expertise at Compounding and Masterbatch Asia later this month include (clockwise from left): AMI Business Unit Manager **Dr Hanne Jones;** Xmold Polymers Managing Director **Shanmugam Srinivasan;** Leistritz Director Processing & Applications **Sebastian Fraas;** ICL Invesment Technical Marketing Manager Flame Retardants Asia & Pacific **Dr Daisy Li;** Mahidol University Associate Professor, Polymer Science and Technology Department of Chemistry **Dr Kalyanee Sirisinha;** Dr Knoell Consult Thai Asia-Pacific Business Development & Regulatory Policy Lead **Dr Piyatida (Tung) Pukclai;** Aquent Advance Material Technologies Managing Director **Visha Mehta;** and Teknor Apex Asia Pacific Technical Manager **Dr Ng Yean Thye.**

compounding sector within India's growing economy.

The second session features a presentation from **Sebastian Fraas**, Director Processing & Applications at **Leistritz** in Germany, who will discuss some of the top tips and tricks for optimised masterbatch production on twin screw extruders. Then **Rudi Scheman**, Managing Director & Consultant at **DeDo Engineering** in Thailand, will speak about configuration and design of twin screw extruders to reduce abrasive wear and overcome feeding limitations. The session concludes with a perspective from **John Ellis**, R&D Manager at **Labtech Engineering** in Thailand, who will provide some deep insight into the standard filter test requirements for masterbatch quality control.

The day continues with **Dr Klaus Keck**, Senior Global Application Technology Manager at **Rianlon** in Germany, discussing systematic approaches to improving durability of high performance polymer compounds in exterior and interior automotive applications. Then **Dr Daisy Li**, Technical Marketing Manager for Flame Retardants in Asia & Pacific at **ICL Investment** in China, will detail some sustainable flame retardant solutions for new energy vehicles and other applications.

The first day will close with an hour-long panel discussion exploring the future of the masterbatch industry. Participants include **Amit Puri**, Director Marketing at **Alok** in India, and **Devang Sheth**, CEO at **Polycromax**, also based in India.

## Compounding technologies

The second day of the conference opens with a presentation by **Chris Smith**, Editor of *Compounding World* magazine at **AMI** in the UK, who will discuss five global market innovations that are opening up new opportunities for compounders. This will be followed by an assessment of the use of real-time UV-visible spectroscopy for in-line control of compounding operations from **Rattayaporn Jidtarahang**, Product Manager, **LMS Instruments/ Equitech** in Thailand. The session will be rounded off by **Dr Kalyanee Sirisinha**, Associate Professor, Polymer Science and Technology Department of Chemistry at **Mahidol University** in Thailand, who will speak about transforming polylactic acid waste into high performance product via reactive compounding.

The penultimate session of the conference includes a special extended presentation from **Dr Piyatida (Tung) Pukclai**, Asia-Pacific Business Development & Regulatory Policy Lead at **Dr Knoell Consult Thai** in Thailand, who will take attendees through the chemical regulatory developments across Southeast Asia.

The conference continues with a presentation on the role of functional polymers in compounding and sustainability from **Vishal Mehta**, Managing Director at **Aquent Advance Material Technologies** in India. That will be followed by **Dr Ng Yean Thye**, Technical Manager from **Teknor Apex Asia Pacific** in Singapore, who will share some sustainable solutions for thermoplastic elastomers.

## Looking to the future

The event will close with a second panel discussion. Participants include **Shanmugam Srinivasan**, Managing Director at **Xmold Polymers** in India, **Vishal Mehta**, Managing Director at **Aquent Advance Material Technologies** in India, and **Dr Ng Yean Thye**, Technical Manager, **Teknor Apex Asia Pacific** in Singapore.

### About Compounding and Masterbatch Asia 2023

The Compounding and Masterbatch Asia conference takes place at the Banyan Tree Hotel, Bangkok, on 28 February – 1 March 2023. The event is supported by Equitech, ICL, Rianlon, Leistritz and Labtech Engineering, which enables attendees from compounders and masterbatch makers to attend at a discounted rate of $195. To find out more visit the **website**.

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Cavalier Tool & Manufacturing Ltd.
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Moldex3D — Molding Innovation
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# Download these new product brochures

## COPERION: PELLETISING SYSTEMS


The Pelletising technology division of Coperion manufactures a full range of strand pelletising systems ranging in capacity from 2-6,300 kg/hr. Explore the key system features and benefits in this eight-page brochure.

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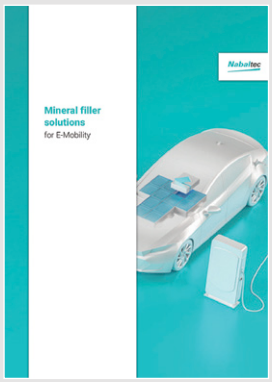
## NABALTEC: EV FILLER SOLUTIONS




The ongoing move to e-mobility calls for new polymer solutions. This brochure details the Nabaltec range of mineral fillers to support developments in batteries and HV power systems.

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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 green lubricant solution to polymer process. PALMERE and PALMERA as green ingredients for PVC additives/plasticiser. Visit us at K Fair 2022

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## HUBER: THERMAL MANAGEMENT


Heat dissipation has become an important consideration in many plastics applications. Find out how the thermal properties of Huber's Martoxid, Magnifin and Martinal fillers can be used to create thermally conductive polymer compounds.

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

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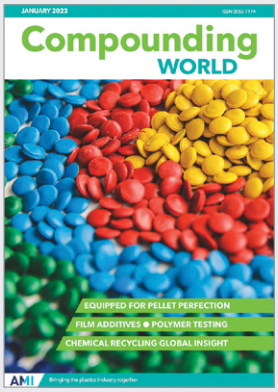


**Compounding World January 2023**
The January 2023 edition of Compounding World magazine starts the year off with a look at efficiency gains in new pelletisers, pellet inspection, additives for film production, and developments in polymer testing.

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**Compounding World December 2022**
The Compounding World December issue has a cover feature on flame retardants, the latest products and new market developments. Plus anti-counterfeiting additives, laboratory compounders and materials testing and a review of K2022.

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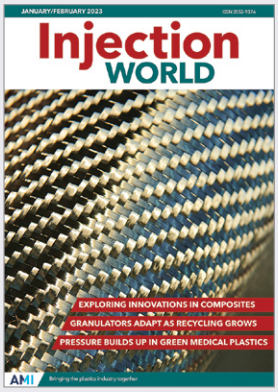


**Injection World January/February 2023**
The first 2023 edition of Injection World magazine looks at the latest developments in thermoplastic composites. It also explores the latest granulator introductions and highlights some of the newest materials for the demanding medical sector.

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**Plastics Recycling World November/December 2022**
This edition of Plastics Recycling World takes a look at the latest PET recycling equipment that was on show at K2022 in Germany. It also explores new EU regulations on food contact process authorisation and reviews progress in chemical recycling.

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**Pipe and Profile January/February 2023**
The January-February edition of Pipe and Profile Extrusion has a cover feature on the diverse applications for pipes made with composite materials. The magazine also has features covering melt filtration, titanium dioxide and the latest in controls and instrumentation.

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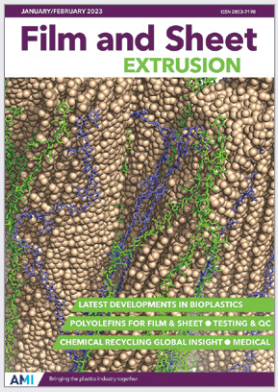


**Film and Sheet January/February 2023**
The first 2023 edition of Film and Sheet Extrusion looks at the latest innovations in the bioplastics arena. It also reviews developments in materials testing, medical materials, and polyolefins for film applications. Plus, Chemical Recycling Global Insight 2023.

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Plastics Recycling WORLD

## GLOBAL EXHIBITION GUIDE

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

## AMI CONFERENCES

| | |
|---|---|
| **21-22 February 2023** | PVC Formulation North America, Cleveland, OH, USA |
| **28 Feb -1 March 2023** | Compounding and Masterbatch Asia, Bangkok, Thailand |
| **6-8 March 2023** | Cables Europe, Cologne, Germany |
| **18-20 April 2023** | Masterbatch Europe, Cologne, Germany |
| **26-27 April 2023** | Fire Retardants in Plastics, Philadelphia, PA, USA |
| **16-17 May 2023** | Functional Fillers, Philadelphia, PA, USA |
| **16-17 May 2023** | Polymers in Flooring Europe, Berlin, Germany |
| **6-7 June 2023** | Plastics in Electric Vehicles, Munich, Germany |
| **20-21 June 2023** | Polymers in Cables North America, Philadelphia, PA, US |

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

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