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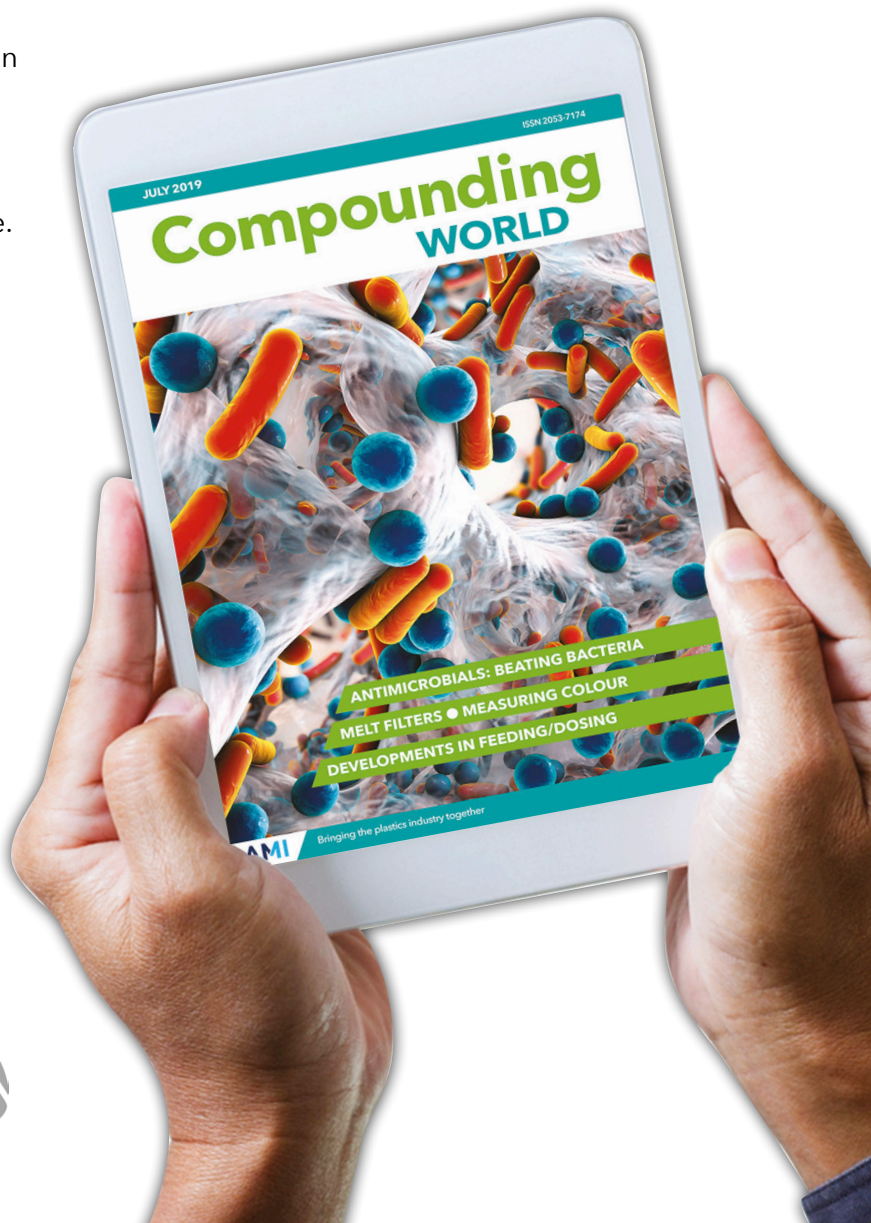
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# Compounding WORLD

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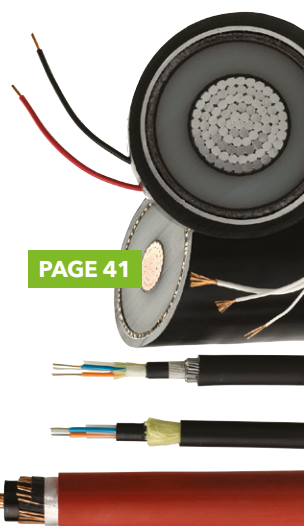
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# OCSiAl upgrades REACH limit

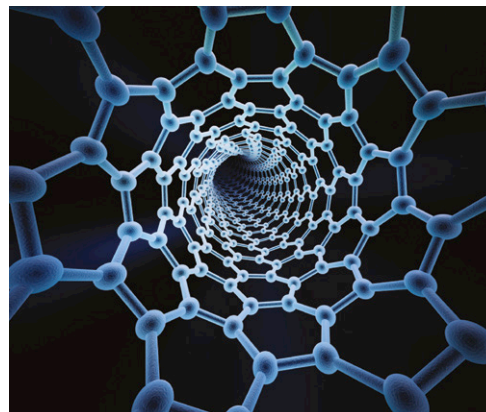
OCSiAl has upgraded its REACH dossier to allow it to commercialise up to 100 tonnes/yr of its Tuball brand of single-wall carbon nanotubes (SWNTs) within the EU market. It says the upgraded dossier also ensures compliance with the latest annexes on nanoforms.

The company said the move makes it the only company able to commercialise such volumes of single-wall carbon nanotube (SWNTs) – it refers to them as graphene nanotubes – in the European market.

OCSiAl said it already has EPA approval for industrial-scale commercialisation in the US and expects to get the required approvals to scale up its volumes in Australia and Canada later this year.

The company claims to have around 1,600 customers globally in areas including transportation, electronics, construction, infrastructure, renewable energy, power sources, sports equipment, 3D printing, textiles and sensors.

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



**OCSiAl can now commercialise up to 100 tonnes/yr of SWNTs in EU**

## Trogamid capacity expanded

Evonik has announced that its planned doubling of capacity for transparent, high-performance Trogamid CX brand of PA went onstream as scheduled in February.

According to Viviane Papa, who heads up the Granules & Compounds product line at Evonik, the decision to increase capacity for the semi-crystalline transparent PA polymer was made “because demand for Trogamid CX keeps growing.”

Trogamid CX is said to be more resistant to chemicals and stress cracking than transparent amorphous plastics.

Applications for the polymer include water management, filter technology, laboratory and medical engineering, cosmetic containers and sports and ski goggles.

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

## Chroma closes plant; invests \$1.5m

US-based compounding group Chroma Color Corporation is to close the Plastics Color Corporation unit at Calumet City in Illinois, which it acquired earlier this year, as part of a review of its expanded group capacity that has seen more than \$1.5m invested in new equipment.

“Since the acquisition of Plastics Color Corporation’s assets and business took place earlier this year, we have been diligently exploring a wide array of opportunities to maximise

the value we can bring to our customers with an optimal manufacturing footprint,” said Tom Bolger, CEO, Chroma Color Corporation.

“After careful consideration, and recognising that we have ample capacity available on more advanced manufacturing equipment located at other Chroma Color manufacturing sites, the decision to close the Calumet City location has been made. This decision puts us in the best position to invest in the locations that will best serve our

customers,” he said.

Work from the Illinois plant, which will close by end of July, will be transferred to other group locations, where the company has installed several new twin-screw compounding lines, additional mixing and blending capacity, and expanded testing equipment.

The Plastics Color facility at Asheboro in North Carolina, formerly its main development location, continues but will be renamed Chroma Color.

➤ <https://chromacolors.com/>

## Chinaplas 2020 show cancelled

Adsale Exhibition Services, organiser of the annual Chinaplas show, has announced that this year’s Shanghai show, previously postponed from May to August 2020 due to coronavirus restrictions, will not take place. The next Chinaplas will take place on 13-16 April 2021 at the World Exhibition & Convention Centre in Shenzhen.

The decision follows the issue of a circular (Further Control & Preventive Measures of the Novel Coronavirus at Key Venues, Units and Groups) by the State

Council of China on 6 April. This stated that “all kinds of exhibitions have to be stopped for the time being” despite improved containment of COVID-19 in China.

Adsale said it will make necessary arrangements and notify exhibitors and visitors regarding fees paid. It said that, given the circumstances, the April 2021 dates will mean exhibitors will be “more prepared in supporting the new market demands brought about by market recovery”.

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

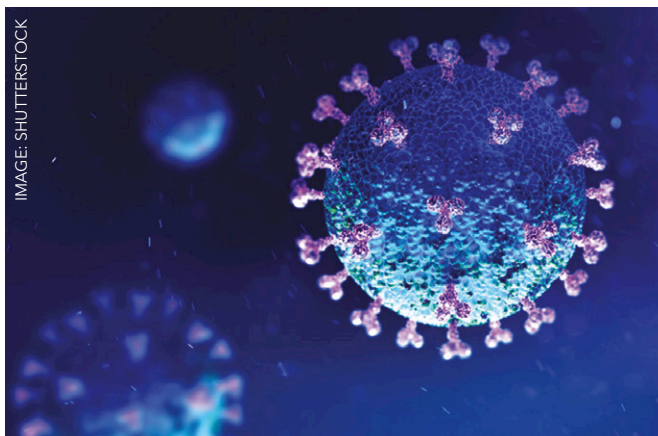


# Geon offers Covid-19 project collaboration

US-headquartered specialty compound producer Geon Performance Solutions has launched Project Collaboration, through which it will offer project development support to companies working on Covid-19 programmes at no cost.

The company described the initiative, which will run to mid-July, as "an opportunity for companies to take advantage of the intellectual and manufacturing know-how of the Geon workforce to support the fight against COVID-19".

Project Collaboration support may take a variety of forms, Geon said, depending on the needs of the individual company. However, it could include: Rapid acceleration of custom formulas; Mould design support for health-care and medical devices; Connection to Geon's raw material suppliers, producers and manufacturers; Supply chain expertise;



**Compounders are playing a part in tackling the Covid-19 virus**

Accelerated pilot scale compounding; and commercial guidance for development of marketing and sales tools.

■ In an unrelated move, US compounder **Techmer PM** has reported high interest in its Charge Enhancer masterbatch, which can improve efficacy of nonwovens used in production of face masks to protect against Covid-19.

As nonwoven filter material comes off the production line it is subject-

ed to an electrical charge via an air plasma treatment, which improves its filtration ability.

The Charge Enhancer additive, which is supplied in pellet form for addition to the PP at a typical 4-5% loading, helps enhance and retain the charge. Using it, Techmer PM said, helps nonwoven manufacturers meet the 95% filtration efficiency requirements set down in the ASTM F2100 standard.

➤ [www.geon.com](http://www.geon.com)

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

## Ampacet targets BOPE

IAX4CETM is a new line of masterbatch additives from Ampacet aimed at the developing market for BOPE (biaxially oriented PE) films for use in mono-material packaging laminates.

The company says interest in BOPE is growing as a means to meet packaging recycling targets set by the latest EU regulations. It can allow production of mono-material barrier structures through replacement of BOPP, POPA, BOPET and CPP in some applications. The ability to produce BOPE films on existing BOPP lines with only minor adjustment is a further attraction, it claims.

The new BIAx4CE product line includes additive and white masterbatches, including antiblock, antistatic, antifog and migrating and non-migrating slip.

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

# Unipetrol commissions €350m HDPE plant

Orlen Group subsidiary Unipetrol has completed construction and officially commissioned the main part of its new PE3 polyolefins unit at Litvínov in the Czech Republic, which it claims is the largest single petrochemical investment ever made in the country.

The PE3 unit provides capacity for 270,000 tonne/yr of HDPE granulate. Factoring in the closure of the existing PE1 unit, it will take total PE capacity at the site from 320,000 to 470,000 tonnes/yr.

Total capital expenditure on the project is planned to be CZK9.6bn (€350m). The company said the line producing natural PE is already in full operation. Operational testing and delivery of a line for production of black PE will take place once Covid-19 restrictions are lifted.

➤ [www.unipetrol.cz](http://www.unipetrol.cz)

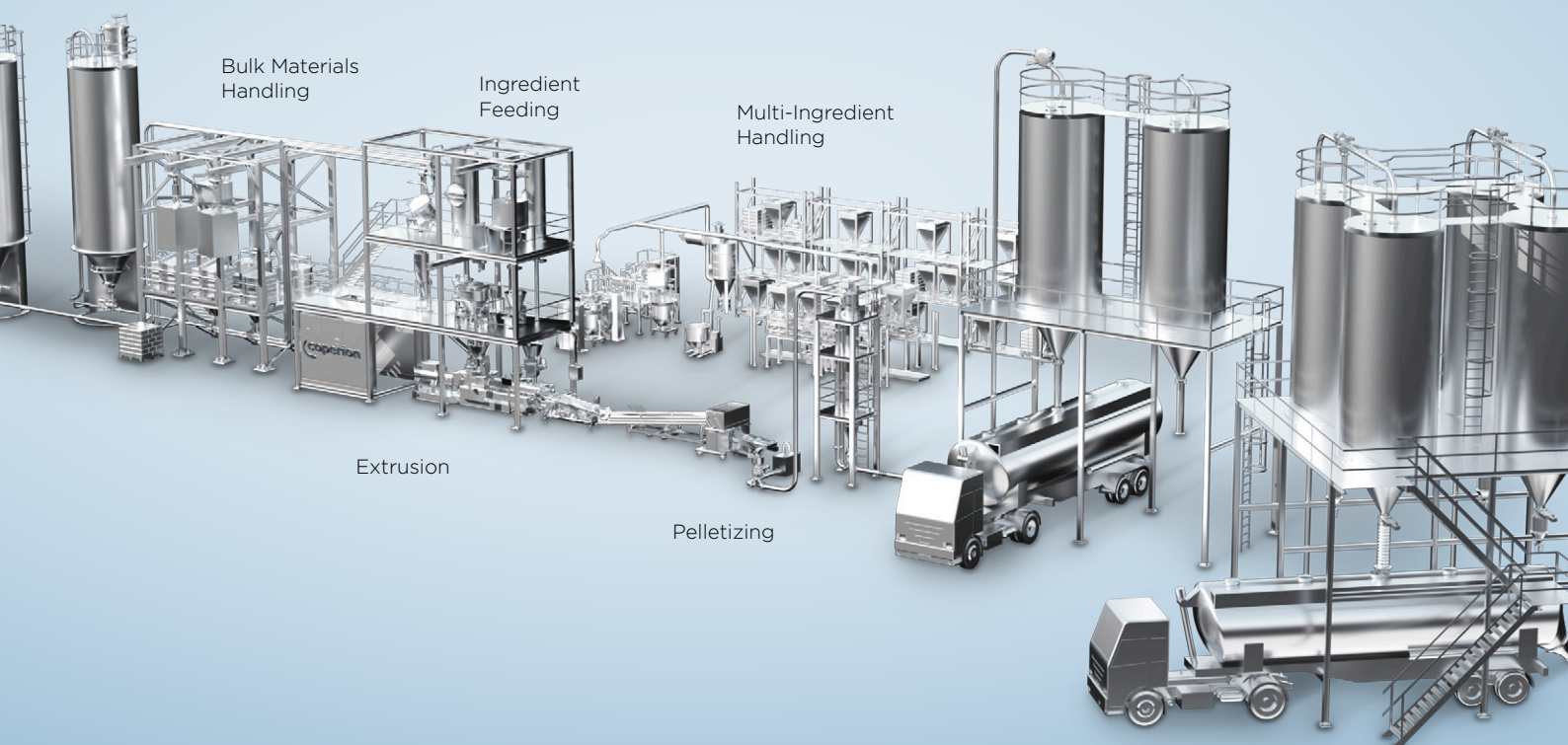




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## Kraton goes CirKular+

Specialty polymer producer Kraton Corporation has launched the CirKular+ line of polymer additives to improve recycling of post-consumer and post-industrial plastics.

The CirKular+ products are said to enable multi-resin compatibilisation and performance enhancement in a wide range of applications, including typically non-compatible polymer combinations and difficult-to-recycle engineering polymers.

"Our CirKular+ additive products enable us to meet increasing consumer demand, performance requirements and emerging regulations for circular plastics solutions, from end product design recyclability to cost efficiency," said Bob Hall, Senior Director, Global Marketing at Kraton.

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

# Chemical recycling plant destined for Chemelot

Recycling Technologies, a UK company specialising in chemical plastic recycling technology, has signed an agreement with Brightlands Chemelot Campus that will see the installation of its first RT7000 chemical recycling machine outside the UK on the Brightlands campus at Sittard-Geleen in the Netherlands.

The Brightlands Chemelot Campus is part of the Chemelot industrial park, one of the largest research and industrial sites in Europe. The two companies said in a statement that the process of gaining the required permits and planning site layout is underway prior to commencement of groundworks.

The RT7000 is described as modular, small-scale technology, which is designed to fit easily onto existing waste treatment and recycling sites. It



IMAGE: NESTE

**Recycling Technologies' Brightlands project follows Neste investment in Scotland**

recycles low-grade plastic waste into a feedstock, trademarked as Plaxx, for new plastic production.

The move is a further move towards commercialisation for Recycling Technologies. Earlier this year the Finnish renewable chemicals group Neste and investment firm Mirova each invested €5m in the company "to accelerate the development of chemical recycling and foster the transition to a

circular economy for plastic". That funding will support construction of the first commercial-scale RT7000 system at the firm's HQ in Scotland.

Recycling Technologies also reached an agreement with Citeo, Total, Mars and Nestlé late last year to develop chemical recycling of plastics in France.

➤ [www.recyclingtechnologies.co.uk](http://www.recyclingtechnologies.co.uk)  
➤ [www.brightlands.com](http://www.brightlands.com)  
➤ [www.neste.com](http://www.neste.com)

## Clariant and Floreon to work on biopolymers



**A technician in Floreon's tech centre**

Clariant's Additives business and Floreon-Transforming Packaging, which specialises in PLA-based compounds containing 70-90% renewable plant-based raw materials, have announced a collaboration that aims to make biopolymers a viable alternative to conventional polymers in single-use and durable applications.

Clariant will be contributing its Exolit OP Terra, Licocene Terra and Licocare RBW bio-based additive knowhow to help Floreon improve the performance and processing characteristics of its materials. "The scope of

benefits is vast. Examples include achieving less energy use and faster cycle times by increasing the processing efficiency or adding completely new properties to the material," the company said.

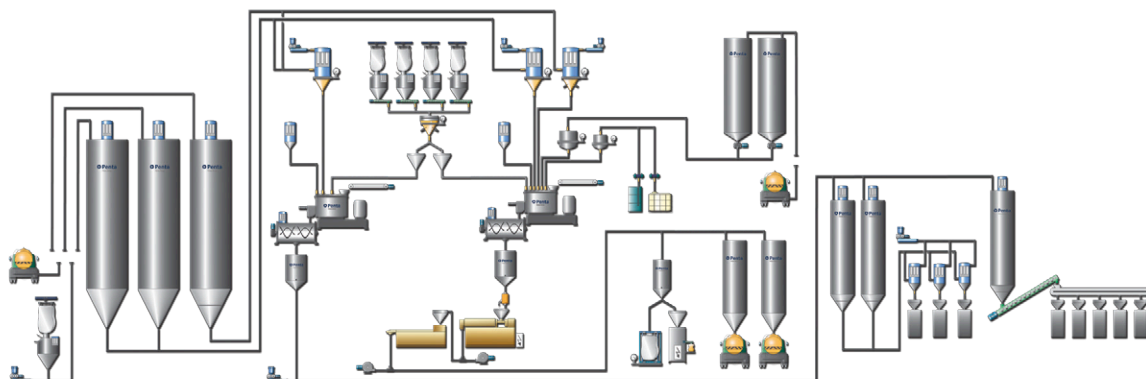
Key target markets will include rigid and flexible packaging, electrical and electronic equipment, hygiene products, consumer goods and automotive. The first products are expected to be introduced to the market during 1H 2020.

➤ [www.clariant.com/additives](http://www.clariant.com/additives)  
➤ <http://floreon.com>

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# ECHA delays lead pigments report

The European Chemicals Agency (ECHA) has announced a delay of around six months in the submission of its REACH Annex XV restriction report on lead chromate, lead sulpho-chromate yellow (CI pigment Yellow 34), and lead chromate molybdate sulphate red (CI pigment Red 104) due to uncertainty over recycling rules.

A spokesperson for the agency said it was not able to move ahead with the submission until it knew the European Commission's next move for its restriction proposals on the use of lead compounds for stabilisation



**Recycling policy and court decisions delay ECHA Annex XV report on lead pigments**

of PVC, which were voted down by the European Parliament (*Compounding World* January 2020 page 12 <https://bit.ly/2Wp2dYX>)

"Both [proposals] deal

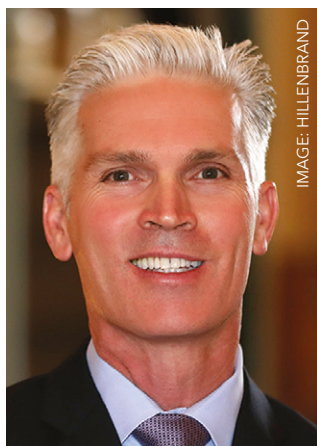
with lead in plastics and both identify release during end-of-life as the main source of emissions, hence, the assessments are very similar," the spokesperson said.

At the time of publication, the European Commission had not responded to a request for more information on its plans to regulate lead stabilisers in recycled PVC.

ECHA also said it was waiting for the outcome of a pending court case over a 2016 authorisation for the use of the same lead pigments. This was challenged by Sweden then subsequently appealed by the EC. "Depending on the outcome of the policy discussions and the court case appeal, we may need to revise our report before submission," ECHA said.

➤ [echa.europa.eu](https://echa.europa.eu)

## Hillenbrand sells Cimcool



**Hillenbrand CEO Joe Raver**

US industrial group Hillenbrand is to sell its Cimcool business to speciality chemicals firm DuBois Chemicals for \$224m, plus a further \$26m contingent on a future sale.

It acquired the company, which makes and sells metal cutting fluids, in 2019 through its acquisition of Milacron and said at the time it was reviewing strategic options.

According to Hillenbrand CEO and President Joe Raver, it will use the proceeds "for de-leveraging activities, strengthening our financial position as we seek to enhance our leadership positions in the industrial platforms that represent our most compelling opportunities for profitable growth."

Hillenbrand owns a number of industrial companies, including compounding equipment group Coperion.

➤ [www.hillenbrand.com](https://www.hillenbrand.com)

## Ineos tips chemical recycling

Ineos and Plastic Energy are to collaborate in the construction of a new plant to convert previously unrecyclable waste plastic into raw material for conversion into new plastic. No location has been disclosed but the companies said they are targeting production by the end of 2023.

This move follows trials of Plastic Energy's recycling process and subsequent conversion into polymer at the Ineos cracker in Cologne, Germany. That is said to have resulted in polymer with an identical specification to virgin material.

➤ [www.ineos.com](https://www.ineos.com)

## Profits up at R&P Polyplastic

Russian compounder R&P Polyplastic reported sales of RUB10bn (€117m) for 2019, with net profit up by 8% to RUB726m (€8.5m). Total sales amounted to 89,000 tonnes.

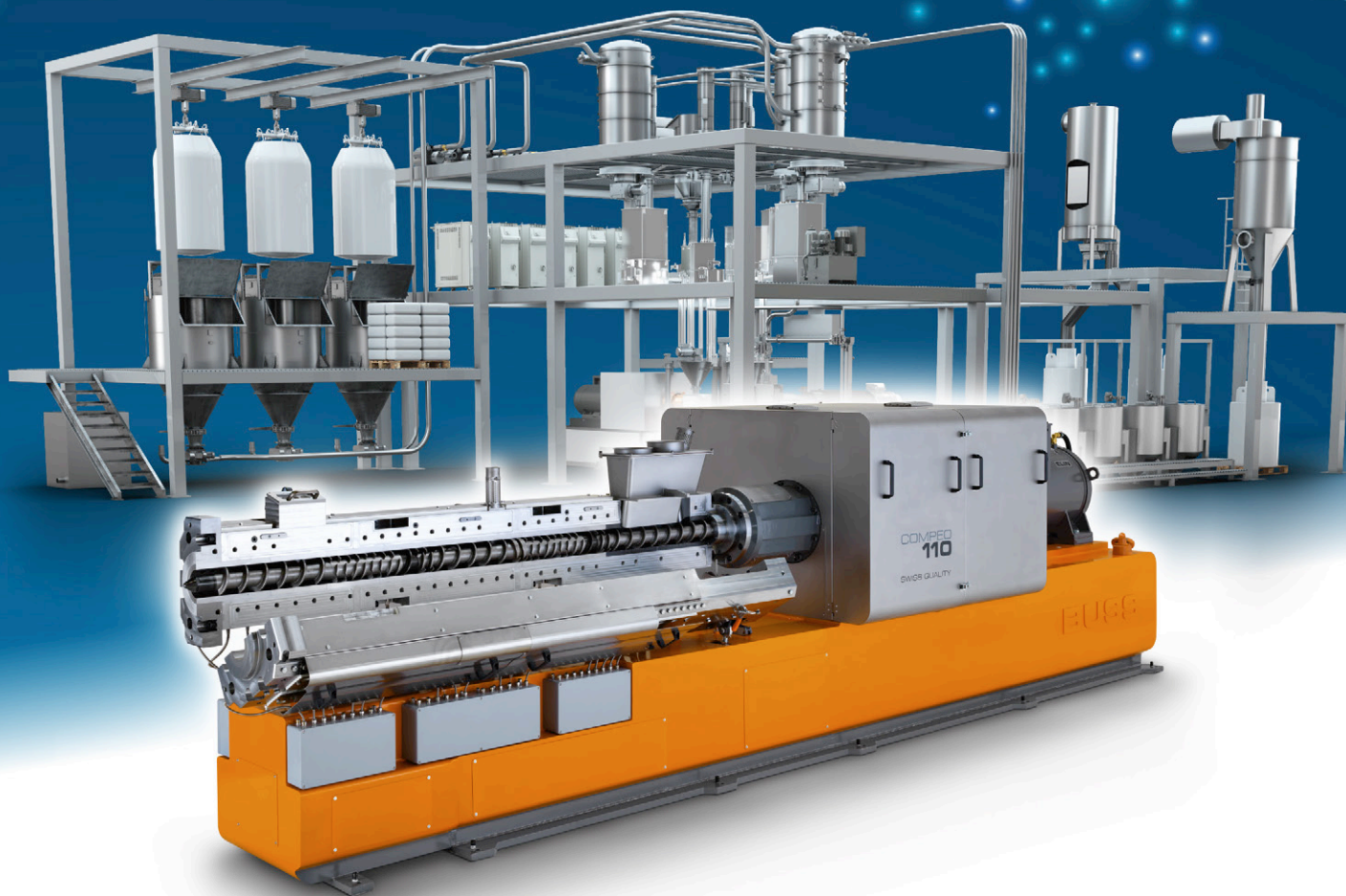
"In 2020 we are planning not only to substantially raise our production volumes but also to improve our financial results," said Managing Partner Andrey Menshov.

R&P Polyplastic's largest end-user market by volume is automotive (31%). Other key markets include household appliances (26%) and construction materials (18%). During 2019 the company said it began serial production of material for the bumpers of the latest Renault Arkana and successfully passed testing for Hyundai.

➤ <http://polyplastic-compounds.ru>

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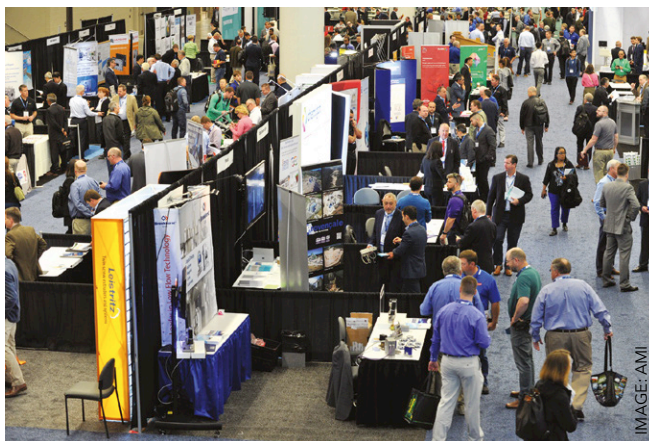


# AMI's first US plastics exhibition shortlisted for industry awards

AMI's first plastics industry exhibition in the US has been selected as a finalist for two prestigious awards organised by the UK's Association of Event Organisers (AEO). The exhibition, which was held in Cleveland, Ohio, on 8-9 May last year, included the Compounding World Expo, Plastics Recycling World Expo, and Plastics Extrusion World Expo.

The event has been shortlisted by the AEO in both the 'Best Event Launch' and the 'Best International Show - Americas' categories. The winners will be announced at a ceremony in London on 4 December 2020.

"We are delighted that the success of our American expos has been recognised in the AEO Excellence Awards 2020," said Rita Andrews, AMI's Head of Exhibitions. "AMI has a long history of organising conferences, but this was only our second big trade-show and the first outside of Europe, so it's a fantastic result to be shortlisted



**View of the packed showfloor at the first Compounding World Expo in Cleveland in 2019**

alongside lots of established players."

The Cleveland Expos attracted 261 exhibitors and 4,375 visitors from 42 countries to the city's Huntington Convention Center. In addition, more than 1,000 people attended the evening networking party at The Rock & Roll Hall of Fame.

"The focused nature of the expos worked very well for visitors from the

compounding, plastics recycling and extrusion sectors," said Andy Beevers, Events Director at AMI. "They could meet with key suppliers and participate in highly relevant conference sessions all under one roof. Similarly for exhibitors, the clear focus of the events meant they were meeting large numbers of buyers with a very specific interest in their products and services".

The Plastics Recycling World Expo, Compounding World Expo and Plastics Extrusion World Expo next take place at Messe Essen in Germany on 7-8 October 2020, and they return to Cleveland, Ohio, on 4-5 November 2020. At both locations, they will be joined by the new Polymer Testing Expo.

For more information on booking a stand or registering for a free ticket for either event, please visit:

> <https://www.ami.international/exhibitions>

## BASF adds NIR black pigment

BASF Color and Effects has introduced a new carbon-free black pigment – Sico-pal Black K0098FK – for use in packaging that will go through NIR automated sorting systems. The new pigment offers food contact compliance and is said to be suitable for use with all commonly used plastics materials, including high heat polymers.

> [www.colors-effects.eu](http://www.colors-effects.eu)

## Versalis buys into Finproject

Eni Group company Versalis has taken a 40% stake in Italian compounder Finproject, a manufacturer of PVC and polyolefin-based compounds for production of compact and foamed components for industries ranging from footwear to automotive.

Versalis described the investment, its first into the high performance compounding sector, as a strategic move that will leverage the specific expertise of the two companies. The aim is to

jointly develop innovative solutions for major brands in the fashion and footwear sectors, as well as for industrial applications such as cables, pipes, renewable energy, construction and automotive.

"This operation is part of Versalis's development strategy to re-position its portfolio on higher specialisation and geographical expansion," said Versalis CEO Daniele Ferrari. "This also opens up opportunities to create new products using renewable or recycled

raw materials for a market increasingly sensitive to sustainability issues, in line with the company's circular economy strategy."

Headquartered at Morrovalle in Italy, Finproject, is a 50-year old business with 11 production and research facilities (five in Italy plus locations in Canada, China, India, Mexico, Romania and Vietnam). Group companies include Foam Creations and Padanaplast.

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

> [www.versalis.eni.com](http://www.versalis.eni.com)



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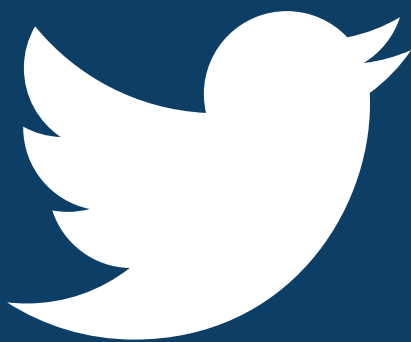
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# Natural fibres stretch beyond sustainability

*The latest developments in natural fibre processing move beyond simply lifting the bio-content of compounds to truly elevating their performance. Peter Mapleston finds out more*

There's a growing interest in natural fibre reinforced polymer compounds and Nordic organisations, perhaps unsurprisingly given the availability of the key natural resources to them and the region's reputation for sustainably-focused technologies, are playing a dominant role. Commercial companies and research operations in Finland and Norway in particular are making significant progress in the use of cellulosic fibres to enhance the sustainability and performance of plastic compounds. Interesting work is also taking place in forest-rich North America.

"Environmental concerns over plastics littering are motivating the development of sustainable biocomposites, where biobased plastics reinforced with lignocellulosic fibres are clear options," says Gary Chinga Carasco, Lead Scientist at **RISE PFI**, the Norwegian lignocellulosic biomass research institute. "The wood processing industry has realised the potential of lignocellulosic fibres as replacement and reinforcement of plastics and bioplastics. We see a constant development of new biocomposite products."

Carasco says the benefits of lignocellulosic fibres include the improvement of the mechanical,

as well as the environmental, performance of compounds. He says RISE PFI has been a major driver in realising these benefits. He cites the FiberComp project on high-performance wood fibre composite materials and the ValBio-3D project on valorisation of residual biomass for advanced 3D printed materials, which he coordinated, as examples, saying they are contributing to the realisation of novel compounds containing lignocellulosic fibres and various types of biobased polymers such as PLA and PHA, as well as polyolefins derived from sugar.

He also highlights several projects where companies from the wood processing and injection moulding industries are collaborating in Norway. Examples include recent initiatives and investments at paper maker Norske Skog Saugbrugs and bio-refiner Borregaard, in which the two companies will use spruce fibre from their production to produce biocomposite pellets. Applications are envisaged within various industries, including furniture, automotive, construction and packaging.

Recent research activities have also demonstrated that wood fibres can improve biodegradation in soil of bioplastics such as polyhydroxyalkanoates

**Main image:**  
Bagasse waste from industrial sugar cane processing is one of many potential sources of performance-enhancing natural fibre additives



## Right:

**Densified pulp granules are easy to store, handle and dose, says Performance BioFilaments**

that can be used for single use products, he says.

Fibres from agro-industrial residues are also interesting, Carasco claims, due to their low cost and high availability. This is especially the case in countries, such as Brazil, where biobased ethanol and polyethylene is produced from sugarcane. Bagasse fibre results as a side stream and accounts for around one third of the sugarcane biomass. He says results will shortly be published confirming that bagasse fibres can contribute to the improvement of mechanical performance in biocomposite products.

## Fibre handling

In Finland, research organisation **VTT** has carried out studies and development in fibre handling for compounding of natural fibres in thermoplastics. "We have, for example, developed a unique compactor device for natural fibre pre-processing before compounding and a novel compounder, which also enables the introduction of long natural fibres to thermoplastics," says Kirsi Immonen, Senior Scientist, Solutions for Natural Resources and Environment.

Meanwhile, Canada-based **Performance BioFilaments** (PBI) reports success in enhancing material properties of PP and PA, as well as PLA biocomposites. Working in collaboration with the NRC Automotive and Surface Transportation Research Center, it used a densified blend of nanofibrillated cellulose (NFC) and unfibrillated Kraft pulp.

PBI's commercially available, dry granules were specifically developed to improve storage, handling and dosage of biofibres for a wide range of applications. Managing Director Gurminder Minhas says good dispersion of the granulated fibres is observed in the biocomposites as well as good adhesion between the fibres and the polymer matrix.

Tensile strength gains of between 9-14% are seen for PP-composites, 3-14% for PA-composites, and 19-31% for PLA-composites with fibre loadings of between 10% and 30%, he says. Tensile modulus



IMAGE: PERFORMANCE BIOFILAMENTS

gains of 5-76% were observed for PP, 45-116% for PA, and 41-97% for PLA. Flexural strength gains reached 26-64% for PP, 3-11% for PA, and 40-45% for PLA. And HDT increased by up to 60% for PP, 37% for PA, and 134% for PLA.

Minhas says a comprehensive evaluation of compatibilisers allowed for fine-tuning of the mechanical properties for each of the biocomposites. A recyclability study was also conducted and showed that PA and PLA biocomposites could be subjected to at least five cycles of moulding, testing and grinding while maintaining tensile strength and elongation properties. Tensile and elongation properties of the PP biocomposites were only slightly reduced over seven recycling cycles.

## Automotive interest

Developed by New Zealand-based **Scion Research**, Woodforce is an engineered diced wood fibre-based pellet designed to provide reinforcement in polyolefin compounds (it is currently produced on a contract basis in Germany by **Sonae Arauco**). Business Development Manager Jeremy Warnes says Scion is seeing good demand in Europe for trial orders, with several compounders planning large commercial production runs within the next 12 months for different but undisclosed applications.

"Demand for Woodforce samples is also coming from Asia, where the interest in natural fibre reinforced plastics is growing," he says. "Japan, in particular, has significant research effort going into cellulose nanofibres (CNF) for thermoplastics. However, many companies are recognising that CNF still has challenges for commercial supply and they are looking at more readily available, cost

## Below:

**Engineers at work on VTT's foam-forming plant at its site at Jyväskylä in Finland (see story on page 27 for more details)**



IMAGE: VTT



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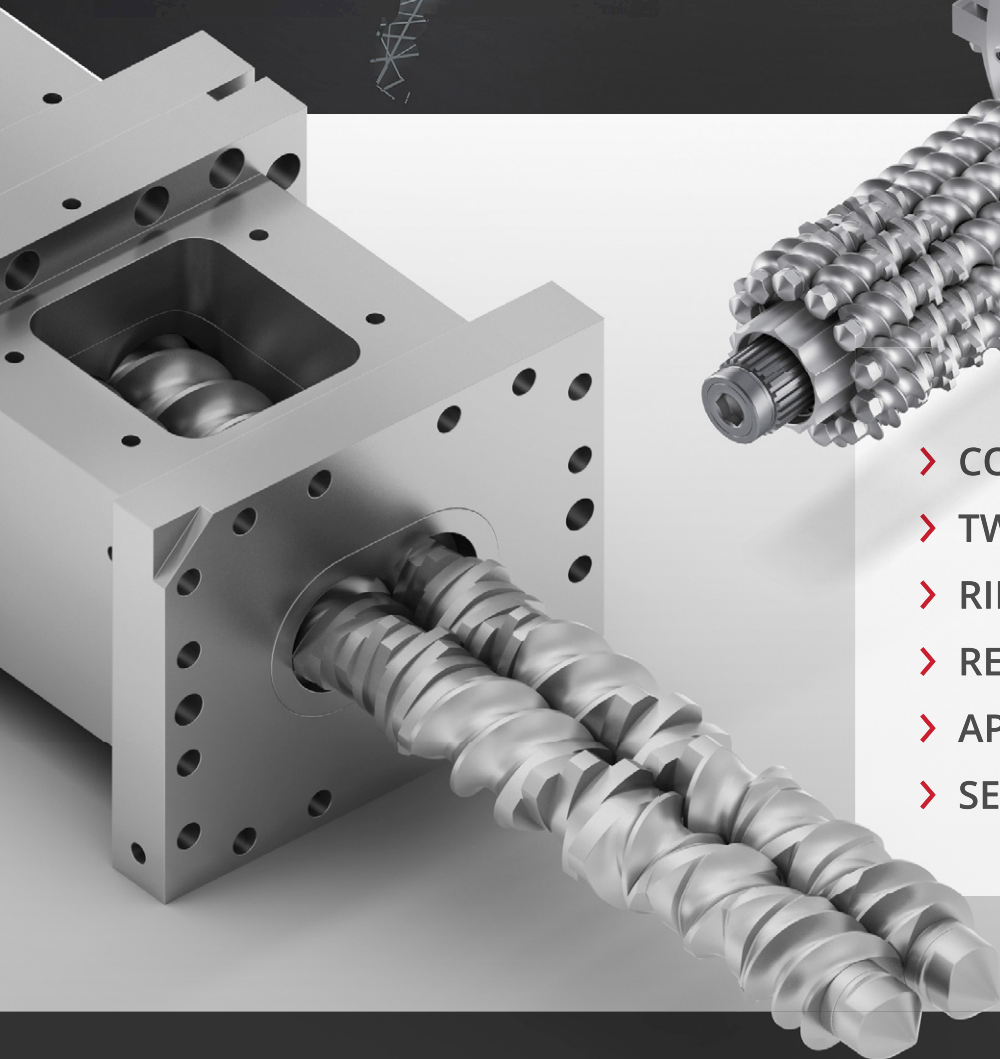
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effective options. For this reason, several automotive companies and their suppliers have trialled Woodforce and are now looking for larger trial samples for product testing."

In South Africa, meanwhile, **Sappi** (the now-global company that began as South African Pulp and Paper Industries) recently announced that its Symbio bio-composite cellulose fibre, which is derived from responsibly managed renewable forests, has been chosen as feedstock for the development of lightweight bio-composite materials within the Life Biobcompo project. This project aims to reduce vehicle CO<sub>2</sub> emissions by 8% through replacement of mineral fillers with bio-based fibres. A key aim is to highlight the potential use of more sustainable resources and to demonstrate these technologies at an industrial scale.

The project partners include the SAPA Group (a producer of injection moulded automotive



components), Fiat Chrysler Automobiles (FCA) and Sòphia High Tech Group, all of which are based in Italy. The biocomposite materials are required to have good thermo-mechanical properties, a high aesthetic value and good dimensional stability.

Sappi says the experience acquired by SAPA on the development of low-density bio-composites for automotive applications in a previous R&D project, together with its cooperation with Sappi, have been fundamental in achieving the previously listed requirements.

### Flowable lignin

At US-based **Attis Innovations**, which is located at Milton in Georgia, Product Development VP Bob Montgomery says the company's primary product for the plastics space is a "unique melt-flowable lignin; a bio-additive that brings unparalleled cost savings and performance to common resin systems."

Attis uses a proprietary extraction process that is

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**Right: 3D printed hand orthoses made of compounds containing bioplastics reinforced with thermomechanical pulp fibres (left) and lignin (right)**

claimed to enable cost-effective separation of lignin from virtually any form of biomass. Once extracted, the lignin can be compounded with traditional resin systems or new bioplastic materials to cost dilute the finished formulation, increase sustainability and maintain performance.

"To date, Attis's lignin has shown terrific compatibility with polyolefins such as HDPE and PP where, when blended at 15-25% concentrations, finished products have yielded 100% retention in tensile modulus and impact strength as well as 90% of the tensile strength compared to the neat polymer," Montgomery says. "The melt-flowing material injection moulds extremely well with a high gloss, uniform surface and has the ability to fill long flow-length parts and complex geometries."

The Attis lignin has also coupled successfully with an array of other polymers. "There is evidence of outstanding coupling behaviour in conjunction with PMMA and other acrylics," Montgomery says.

"Attis lignin is also an intuitive complement to various bioplastics, where the inherent 100% biobased content adds to a number of fantastic solutions currently provided, while serving as a stiffening agent and cost diluent. Attis lignin can work effectively alongside PLA, PBAT, PHA, PBS, and more, provided appropriate coupling technologies are followed."

Montgomery is even more excited by the ongoing development by Attis of a fully biobased, 100% lignin-borne carbon fibre product. "With tensile strengths and modulus value exceeding any benchmarks found in current literature, this technology has already been proven out on existing commercial melt extrusion equipment," he says. "Combining the lower material and manufacturing costs possible using this breakthrough product, Attis expects a finished carbon fibre can be manufactured at a dramatic price reduction



IMAGE: GARY CHINGA  
CARRASCO, RISE PFI

compared to current low-cost carbon fibre available in the transportation market."

**RISE PFI's** Carasco also sees growing interest in lignin for biocomposite products. "We have various ongoing initiatives, in close cooperation with Norwegian and European companies, where different lignins are being explored for 3D printing and injection moulded products." He highlights 3D printing of complex structures such as hand orthoses, composed of bioplastics and lignocellulosic components such as thermomechanical pulp fibres.

"3D printing of polymers and compounds is rapidly evolving from a technology for prototyping to production of tailor-made products. This has been in a focus recently in the coronavirus crisis where engineers are cooperating with the health sector to 3D print equipment of urgent necessity such as ventilators, protection masks and various tools to fight Covid-19," he says.

### Granular biocompounds

Germany's **Nova-Institute**, which provides research and consults on the bio-based and CO<sub>2</sub>-based economies, monitors European producers and suppliers of biocomposite granulates. It estimates there are at least 35 producers across the continent, with the amount of granulates produced and sold in 2018 reaching almost 140,000 tonnes. Before the coronavirus emergency, Nova-Institute was predicting double-digit annual growth for the next few years.

One such producer is **UPM** in Finland. It has developed what it says is a new world-class biocomposite material which meets the highest sustainability requirements. The Formi EcoAce biocomposite combines certified wood and cellulose fibres with a certified renewable polypropylene from SABIC's Trucircle solutions, which is made using wood-based feedstock from UPM's biofuel production. Each tonne of UPM's naphtha saves three tonnes of greenhouse gas emissions compared to fossil naphtha, it is claimed.

**Below: With single-use cutlery soon to be banned in Europe, multi-use versions made in biocomposites may gain favour. These are made using UPM's Formi EcoAce**



IMAGE: UPM

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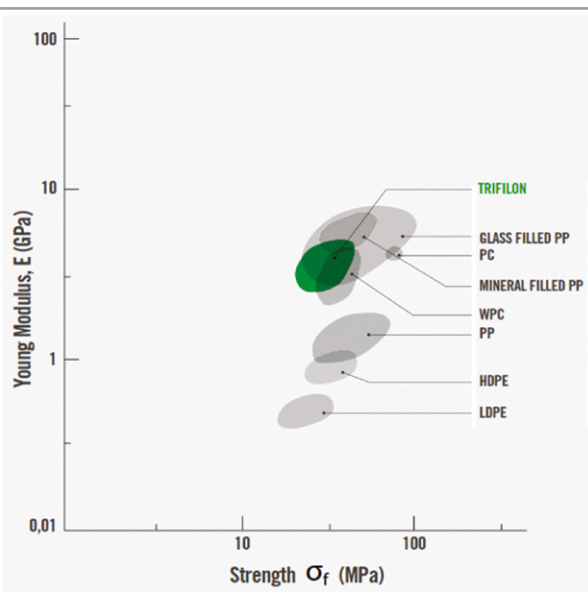
*Melissa Jensen-Morgan  
Design Engineer, ENTEK Extruders*





Trifilon claims its natural fibre reinforced BioLite PPC compounds now compete well with traditional offerings

Image: Trifilon



UPM describes Formi EcoAce as a drop-in solution. "It can smoothly replace fossil-based solutions as it is identical in quality and performance to non-renewable alternatives," the company says. The biocomposite is said to be near 100% based on renewable resources.

Ralf Ponicki, Director of the UPM Formi business at UPM Biocomposites, says: "After successful pilots, we are now looking forward to start offering our new biocomposite to business partners around the world." Typical end-use applications include food contact products, personal care and consumer goods made by injection moulding or extrusion. UPM Formi EcoAce is described as warm and silky to the touch and can be produced in different colours, including both light and dark shades.

Following the UPM Formi EcoAce development, Ponicki says the company is now working on a UPM Formi FibCo concentrate, which will contain 90% or more fibre content. "We are in the final development phase right now and want to commercially launch UPM Formi FibCo next year. The concentrate would give compounders the possibility to develop their own products based on natural fibres and expand their portfolio accordingly. There are plenty of new opportunities for compounders to expand towards more sustainable products and position their solutions into automotive as well as the consumer market."

Hungary's **Inno-Comp** is also working in this area. The compounder has a decade of experience in product developments with compounds containing natural fillers and reinforcements, according to sales engineer Balázs Kugler, who says it currently offers three options.

The first option is based on cellulose-powder filled polymers. "These are classic fillers: using

these we can increase the bio content of the material and decrease the density. Typical application field is the extrusion like decking, but we also have projects with the injection of hunting bullet holders," says Kugler.

The second option is wood fibre-filled polymers. "Using this fibre we can increase the mechanical properties of the material, like flexural modulus, and decrease the density," he says. "In this case the fibre content is 10-40% because at a content over 40% the fibres interfere with each other and decrease the properties. It is popular in the automotive industry because the mechanical properties are close to glass-fibre filled grades."

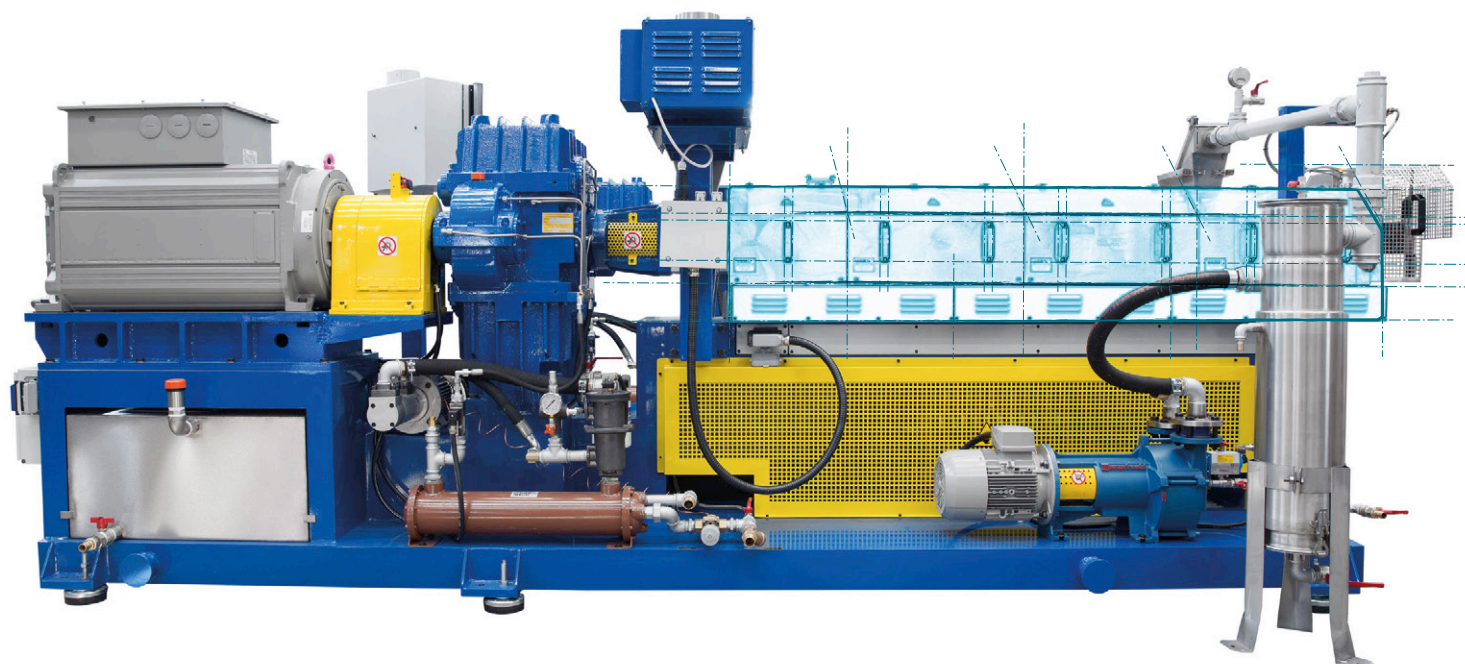
The company's third is special polymers filled with agro-industrial residues such as nutshell, apricot, or almond shells. "The filler is also our speciality, we developed a process to mill it and a special preparation to be ready for our compound production," says Kugler. "We can fill thermoplastics with up to 70% filler, not only in ready-to-use compound but masterbatch too. Currently products are available for injection moulding. It is not only for commodities but also specialties like PLA, to get 100% bio-solutions. This filler also reduces the price of the compound. PLA has a really high price and problems with availability nowadays."

Applications under development at Inno-Comp partners include cutlery, cosmetic cream jars, flower-pots, food trays and containers, and specialty products such as a nasal aspirator for babies.

Interest in the NAFILean range of hemp-filled compounds for production of automotive structural parts continues to grow, according to **APM**, which is a joint venture between automotive Tier One Faurecia and agricultural cooperative Interval. The company says the compounds, which contain 20%

**Right: This electric-powered cooler by Dometic is made using Trifilon's BioLite, a biocomposite derived from hemp that gives it an attractive flecked finish**





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# Architectural opportunity

Researchers at the University of Stuttgart and the Fraunhofer WKI Institute for Wood Research are developing bioplastic profiles that use regionally-available plant residues, such as wheat straw, as a filler material.

Fraunhofer WKI is focusing on compounding and profile extrusion, as well as the characterisation of the bio-profiles; the University of Stuttgart is focusing on implementation of the developed materials in architectural and construction sectors.

"Thanks to the good formability during the extrusion process, the bio-profiles can be utilised not only for windows and façades but also for diverse architectural applications," says Dr Arne Schirp at Fraunhofer WKI.

"An important aspect is to fulfil the requirements for the profiles in terms of fire retardancy, UV stability, thermal insulation and durability," says Schirp. "To achieve a high level of fire-retar-

dancy, we pursue the approach of introducing flame retardants into the outer layer of the profiles by means of co-extrusion."

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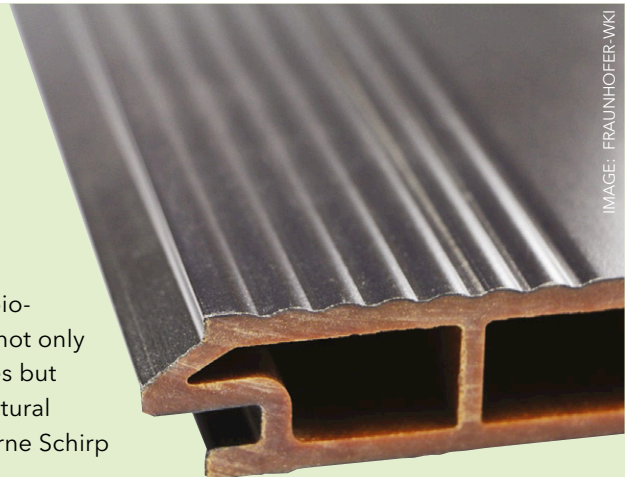


IMAGE: FRAUNHOFER-WKI

hemp, show very good thermo-mechanical properties. The big benefit is the reduction in the weight of the parts, which can extend to 25%, according to Jean-Marie Bourgeois-Jacquet, Sales and Business Development.

Last year, NAFILean parts appeared in some 13 different car models, with the total number of vehicles produced numbering around 3m. The forecast for 2022 (which was made before the impact on car production of the coronavirus emergency) was to reach 7m vehicles.

APM intends to introduce a new and more rigid generation of products around the end of the year. NAFILean Stiff is being developed for two new vehicle projects, says Bourgeois-Jacquet. The material is a lighter alternative to glass fibre-reinforced PP offering a similar tensile modulus of around 3.5GPa.

Swedish biocomposite maker **Trifilon** went into commercial operation at a new plant at Nyköping last year, producing mainly PP-based compounds using hemp sourced from European farms as a reinforcement. It describes the compounds as "second generation" materials, which it explains as meaning that the plant ingredients are used to improve performance rather than simply to bulk out the plastic.

"First generation biocomposites were great for their era, considering cost, the upcycling of a waste stream, and the impact on CO<sub>2</sub> footprint," says David Sandquist, Chief Research Officer at Trifilon and a former VTT specialist. "But their recipes greatly limit their mechanical properties, in part because the cellulosic components are not opti-

mally bound to other components in the composite. Trifilon studied the interactions between hemp fibres and the polymer molecules and developed smart ways to optimise those bonds."

The company uses proprietary techniques to cut and process the hemp fibres in order to optimise them as a reinforcement. Its new production plant, which has two lines, provides a capacity of 4,000 tonnes/yr of its BioLite products for injection moulding applications. Jeremiah Dutton, Chief Sales Officer, says the company is seeing interest from industries as diverse as packaging, toys, furniture, automotive, and electrical.

Trifilon recently announced a project with another Swedish materials company, RenCom, which aims to use the lignin by-products from forestry industries to form plastic resins. It says the partnership has already produced a prototype, hemp-based "third generation" biocomposite with all primary ingredients derived from biological sources.

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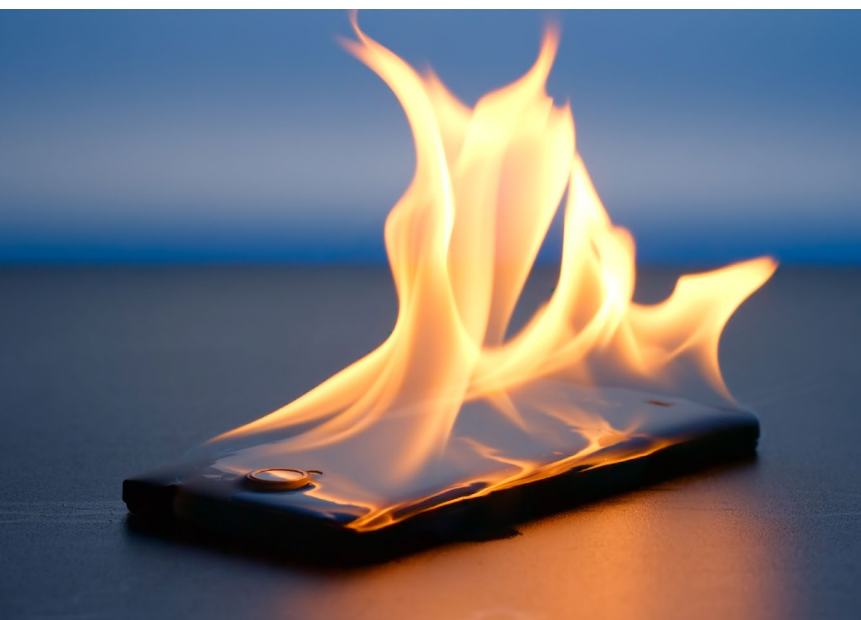


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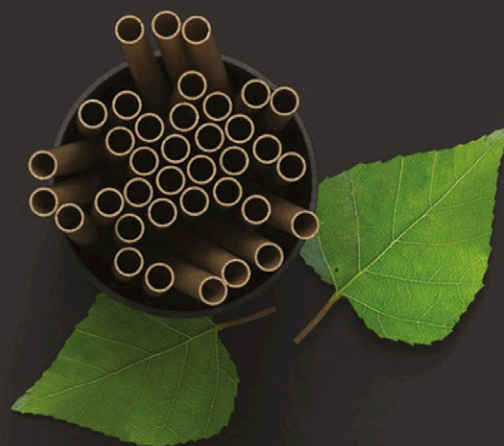
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# The plastic challengers



**Sulapac's drinking straw is produced from wood and plant-based binder resins and processed on conventional extrusion lines**

Materials based on natural fibres may replace some plastics altogether in areas such as packaging, hygiene products, building materials and textiles, according to the Finnish research institute **VTT**. Its Piloting Alternatives for Plastics project brings together a range of Finnish and international companies to take materials developed in the VTT laboratories towards more industrial production (the three-year project began in April and is funded by the European Regional Development Fund, VTT and 52 participant companies).

Pilots are being carried out at the VTT centre at Jyväskylä, where the organisation claims to operate the world's first foam-forming production line, which employs an aqueous foam (rather than water) as the carrier medium for the fibres when forming parts. Using renewable cellulose and fatty acids, VTT is developing a thermoformable material – Thermocell – that it hopes to apply in food packaging. Arla Foods, Paulig and Wipac are cooperating in the project.

Final application of the Thermocell material will depend on how companies want to use it, says research team leader Jarmo Ropponen. "It is suitable for many purposes for which fossil-based plastics are currently being used. Thermoplastic cellulose, i.e. cellulose that can be moulded using heat, can be processed in conventional plastic treatment processes. Like plastic, the material can be refined into packaging films and bulk commodities."

**Sulapac** is another Finnish company aiming to tackle the issue of plastic waste by developing alternatives. Founded in 2016 by biomaterials specialists Suvi Haimi and Laura Tirkkonen-Rasasalo, its portfolio includes 100% biodegradable plant-based compounds that can be converted on existing plastics processing machinery (mostly

injection moulding but also extrusion).

One of the company's latest launches is a drinking straw that is already used in Finnair's lounges in Helsinki and by food delivery platform Wolt and alcoholic beverage brand company Altia. The straws are also available for consumers online from outlets such as Biofutura.com and Verkko-kauppa.com.

The main components of the straws are wood and plant-based binders. They are produced using extrusion machinery originally designed for plastic straw production with only minor die modifications and are intended to be recycled via industrial composting (the design is undergoing EN13432 certification). Sulapac has developed its own compound recipe for the straws; Helsinki-based Stora Enso, a manufacturer of pulp, paper and other forest products, provided support in product development and business development.

Sulapac CMO Antti Valtonen says in its current variant, the 0.3mm wall thickness of the straw means it is heavier than a typical PP alternative but third party LCA suggests additional transport costs will be outweighed by reduced GWP per unit due to sourcing and lower processing energy requirements.

**Stora Enso** also has its own biocomposite portfolio – Durasense. The materials are a blend of wood fibres and polymers (virgin, recycled or bio-based) and are said to be suitable for a wide range of applications extending from consumer goods to industrial applications. The materials can be processed by injection moulding, extrusion, and 3D printing.

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

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

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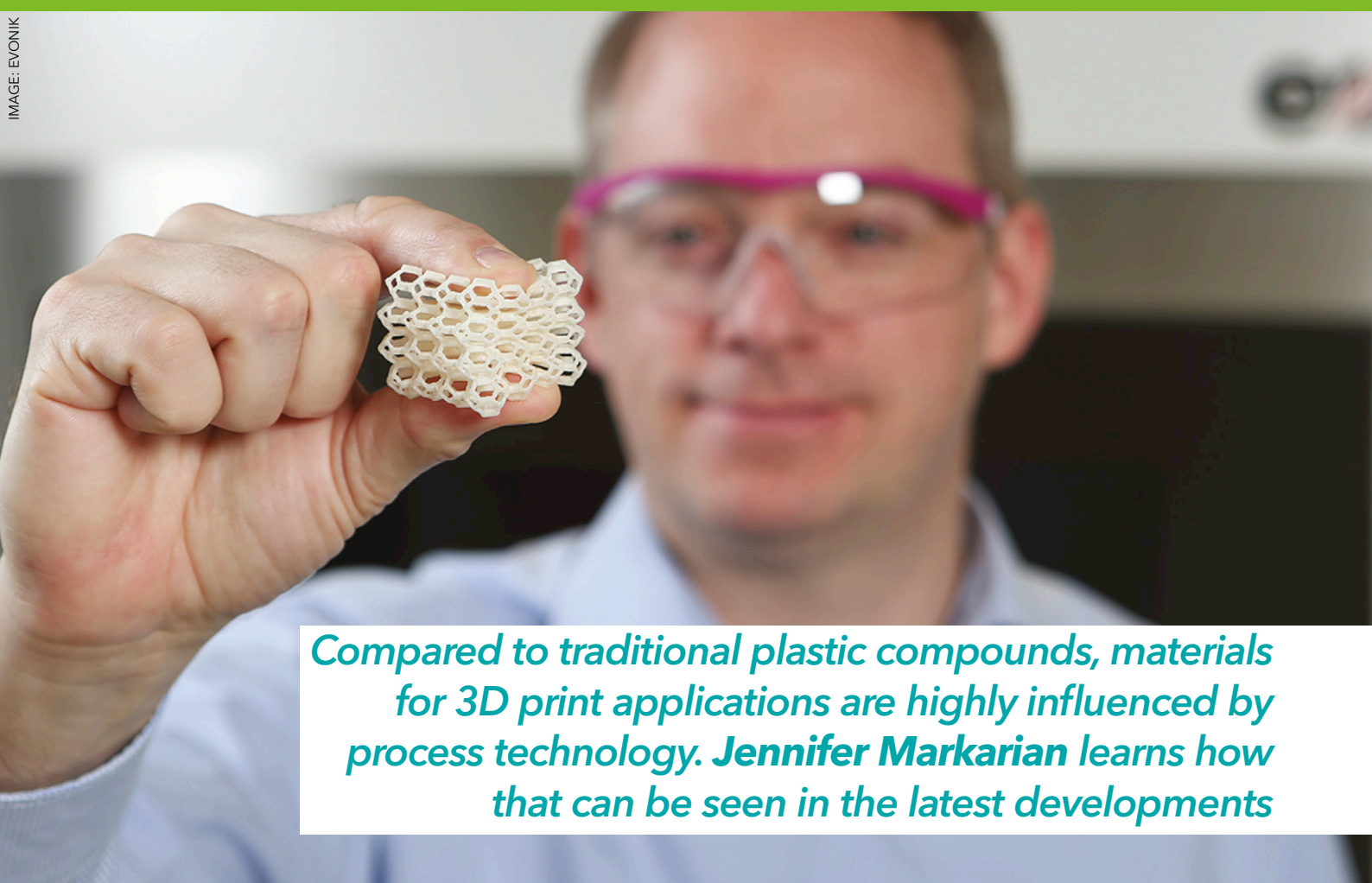
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*Compared to traditional plastic compounds, materials for 3D print applications are highly influenced by process technology. Jennifer Markarian learns how that can be seen in the latest developments*

# Developing 3D print plastics

Industrial additive manufacturing (AM) – or, more popularly, 3D printing – techniques place a number of process-specific demands on materials and this can call for a very different approach to formulation. As a consequence, compounds are being developed with new or alternative polymers for this growing application space. And with material performance often very closely linked to the particular 3D printing (AM) process, many polymer suppliers are partnering with printing equipment makers, as well as software and simulation specialists. In some cases, equipment suppliers themselves are taking the lead to offer materials designed for their printers.

Arrangements vary across the sector – some 3D print materials are designed to only work on a certain brand of printers while some are “open source” and can be used with any suitable printer.

**Solvay** has taken the open source option. Its most recent AM material is Solef PVDF, which is now available as a ready-to-use filament. It joins a range of Solvay materials for AM, including KetaSpire polyetheretherketone (PEEK) and Radel polypbenylsulphone (PPSU), introduced back in 2018.

The key attraction of the Solef PVDF fluoropolymer is its lower melting temperature, which makes it compatible with more printer models and extends applicability to a broader range of industrial applications. PVDF's chemical and weather resistance are beneficial for fittings and valves in oil and gas or chemical processing, for example.

For the PVDF filament, Solvay joined Ultimaker's Material Alliance program. Christophe Schramm, New Technologies Manager at Solvay Specialty Polymers, said the new grade was developed specifically to meet the viscosity and dimensional stability requirements of 3D printing and is compatible with Ultimaker's low-temperature printers for industrial-grade applications. Schramm said the partnership with Ultimaker allows it to offer material, machine and software as a bundle. However, it can also be supplied for use on other printers.

Solvay has also been working with other third party partners. Together with Chinese filament maker **Polymaker** it has introduced two PC blends, Polymaker PC-ABS and PC-PBT, and a flame retardant grade, PolyMax PC-FR, that can achieve a V-0 flame resistance rating in the UL94 test. ➤

**Main image:**  
**3D print materials**  
– such as this  
**Evonik Vestamid PEBA grade** – frequently need to be tailored to the specific build platform to gain optimal results



IMAGE: EVONIK



**Above: The latest TPE grades from Evonik for 3D printing are available in black and white**

Schramm says Solvay has also worked with e-Xstream to provide its Digimat simulation tools. He says the right simulation tool is critical when designing parts that are impossible to mould or machine but can be 3D printed as partly hollow structures. "To do this [part design] right, you also need simulation tools to be able to predict the behaviour of the parts and optimise design and topology before actually printing it," he says.

**Covestro** launched its 3DP Addigy brand late last year, which it describes as a toolkit of materials and technologies for AM. The company offers thermoplastic polyurethanes (TPU) and polycarbonate (PC) materials for fused-filament fabrication (FFF) equipment, as well as some TPU powders for powder bed fusion (PBF) AM processes such as selective laser sintering (SLS).

### Powder options

The range of AM materials from **Evonik** has been extended to include ready-to-use powders of copolyester-based thermoplastic elastomers in both white and black colours. "White and black are the most requested colours for powder materials suitable for PBF technologies," says Sylvia Monsheimer, Head of Evonik's Market Segment New 3D Printing Technologies. "White is in many cases the 'natural' colour and black is often requested for technical parts."

From a technical standpoint, there are not any limitations on making compounds with other colors for 3D printing, according to Monsheimer. The practical limitation is that most commercial machines can only process one coloured material

for a given print job, so the equipment would need to be cleaned between colours. This limits demand, she says.

The development of powder materials for 3D printing is complex, with both process and materials needing to be adjusted together, Monsheimer says. "That leads directly to the next steps for Evonik: developing new materials in order to open up new applications, and harmonising machines and material systems in order to find an optimum solution suitable for large-scale production."

In February this year, Evonik launched an AM process selection software tool that is intended to help manufacturers decide whether a part is suitable for 3D printing and what the best technology and material would be given the specific part requirements. The software, developed by Israeli start-up company **Castor**, analyses existing computer-aided design (CAD) files to develop a report that gives a "break-even point" for AM compared to traditional manufacturing for any given part. This is based on technical and economic analysis. Evonik expects the tool to help widen adoption of AM and provide a clearer insight into users' needs and preferences, which it will use to inform future material development, according to Monsheimer. At present, the 3D Screener on Evonik's website includes its own material products; the Castor version includes other materials.

Another recent Evonik development is a free-flowing bioresorbable powder – Resomer PrintPowder – for production of implantable medical devices using the SLS technique. The powder is said to offer tight specifications and can be used for ISO 13485-certified formulations (Evonik is a GMP supplier that can provide bioresorbable polymers in filament, granule and powder forms).

The latest AM developments from **DSM** include the introduction of a flame retardant PA6/66 material for open application as well as several new partnerships intended to develop products for specific AM "ecosystems" (combining materials with machinery and services).

The new, non-halogenated flame-retardant filament material – Novamid AM1030 FR – is a PA6/66 for automotive, electronic and other applications. The company says the new material is certified to V-0 at 1.6 and 3.2mm, and V-2 at 0.85mm. It carries a UL Blue Card that certifies its use in combination with an Ultimaker S5 printer,

**Right: DSM's Novamid AM1030 FR is a halogen-free flame retardant PA6/66 for electronic parts**



IMAGE: DSM

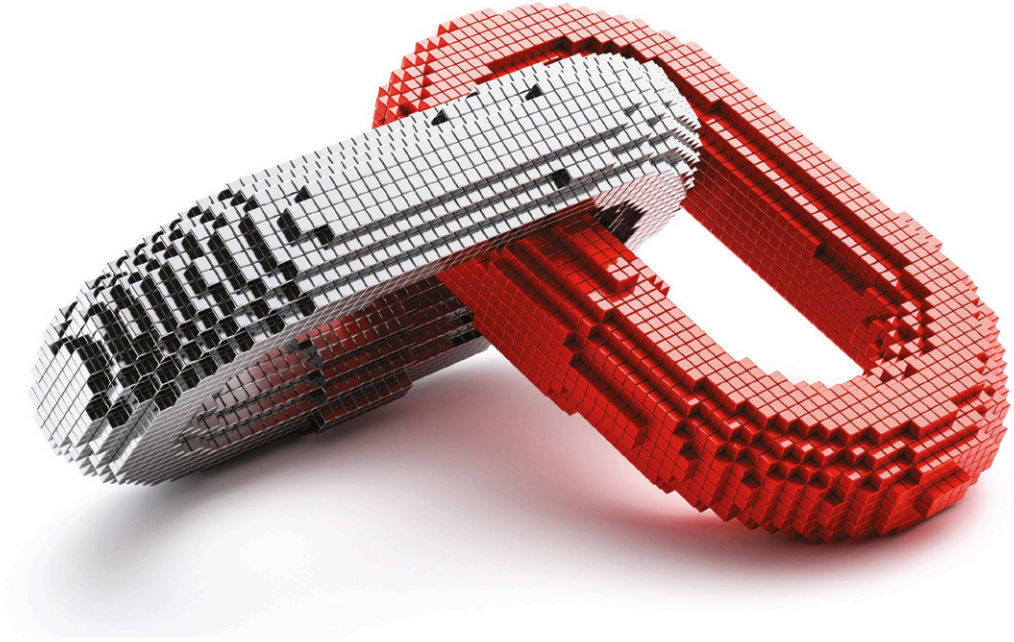
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## Applications

- Compounding
- Composite Pipes
- Multilayer Pipes with Oxygen Barrier
- Composite Panels
- Cables with flame retardant
- Metal coating
- Co-extrusion
- Cast and Blown Films
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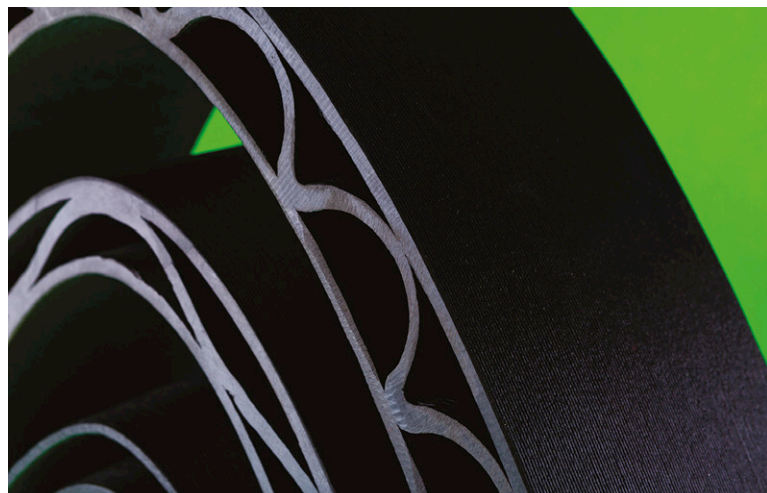
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IMAGE: DSM



**Above:**  
Juggerbot's  
pellet-based  
FGF technology can handle  
materials such  
as DSM's Arnite  
reinforced PET

however, DSM says it is available for open-platform FFF systems.

DSM has also introduced a PBT powder for SLS application. Arnite T AM1210 (P) is said to provide good dielectric properties for 3D printing of parts requiring high levels of electrical insulation.

### Post-processing

Meanwhile, the company has joined a partnership to improve post-processing of parts made with its filament and powder materials. Post-processing has long presented a challenge in AM manufacturing due to the layer-on-layer build methodology, which results in poor surface smoothness in certain directions. DSM is working with **Additive Manufacturing Technologies** (AMT), which has an automated post-processing machine – PostPro3D – that is UL-approved and said to provide a considerable cost saving over manual post-processing methods.

"For too long, additive manufacturing has been

viewed as a standalone solution for prototyping and small volumes, which often leads to disappointment or abandoned projects. It is only by considering the entire manufacturing process chain, including optimum material selection and automated post-processing, that the extensive potential of additive manufacturing can be realised for increasing volumes of parts," says Joseph Crabtree, CEO at AMT.

Another DSM partnership, in this case with **Shapeways**, aims to provide a lower barrier to entry and give companies quicker access to AM technologies using the latter's custom 3D printing services with DSM's materials.

The materials firm has also joined a partnership with US-based machine builder **Juggerbot 3D** to develop its fused granulate fabrication (FGF) method, which uses pelletised materials. These pellets can have filler ratios up to 50%, which allows them to be formulated to provide the strength, stiffness and heat resistance for large structural applications. For example, JuggerBot 3D's P3-44 printer is designed to process materials such as DSM's glass-reinforced Arnite AM8527 (G) PET. DSM says it will continue to add pellet grades to its AM materials portfolio.

### Turning up the heat

High temperature AM is an area of considerable interest as many applications tend to be relatively low production volume. The University of Exeter's **Centre for Additive Layer Manufacturing** (CALM) in the UK has commissioned an EOS P 810 laser sintering platform for the development of high-temperature polymer processing. The group, which

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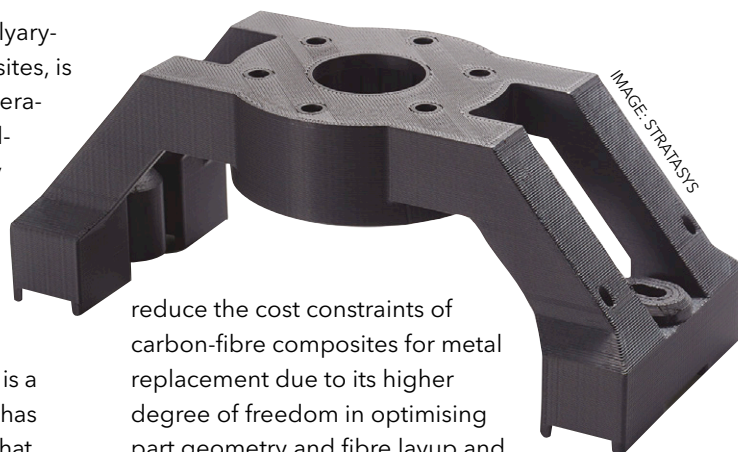
**Right: Diran 410MF07 is a Stratasys PA grade formulated for low friction applications**

is collaborating with **Victrex** to develop polyarylether ketone (PAEK) polymers and composites, is able to handle materials with melting temperatures up to around 300°C. Victrex has developed a number of PAEK grades specifically for AM.

**Arkema** is working with Zurich-based start-up **9T Labs**, which is focused on high-volume mass-production of carbon-fibre composite parts using Arkema's Kepstan polyether ether ketone (PEKK). 9T Labs is a spin-off from ETH Zurich set up in 2018 that has developed a software system called Fibrify that defines optimal fibre designs and allows control of fibre placement through a 3D-printed part.

In February 2020, 9T Labs announced a partnership with US engineering simulation firm **ANSYS** to provide an integrated design and simulation workflow solution. An interface between ANSYS Composite PrepPost (ACP) and 9T Lab's Fibrify design software allows the import of fibre lay-ups and converts them into a model for finite element analysis (FEA). Designs can then be optimised in the simulation software before they are produced, when the Fibrify Production software module controls and monitors processing.

9T Labs launched its Red Series solution in March, which combines software, additive manufacturing equipment, engineering services, and materials—including a neat polymer filament and a composite filament—for carbon-fibre composite part production using FFF. Currently, the company supplies continuous carbon fibre in PA12 and PEKK filaments, but it plans to add other matrix polymers in the longer term. It says its technology will help



reduce the cost constraints of carbon-fibre composites for metal replacement due to its higher degree of freedom in optimising part geometry and fibre layup and its processing automation.

### Proprietary approach

Equipment developer **Stratasys** has introduced several new proprietary high-temperature and chemical resistant thermoplastics for its FDM printers. Antero 840CN03 is a PEKK from Arkema for use with the Stratasys Fortus F900 3D printer that provides electrostatic discharge (ESD) performance for aerospace and industrial applications. Diran 410MF07 is a PA material formulated by Stratasys for the Stratasys F370 3D printer, offering the toughness, low friction, and low sliding resistance needed for tooling. An acrylonitrile butadiene styrene material with ESD properties – ABS-ESD7 – is also designed for tooling applications. It had previously been available on Stratasys Fortus printers but can now also be used on the Stratasys F370 3D printer.

The launch of the HP Digital Manufacturing Network in 2019 marked an expansion of **HP's** strategic alliances, bringing in partners BASF,

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IMAGE: STRATASYS



**Above:**  
**Covid-19 face shield parts in production on a Stratasys 3D print system**

Materialise and Siemens. The company released the HP Jet Fusion 5200 Series solution around the same time that it said incorporates systems, data intelligence, software, services and materials. It can process an Ultrasint thermoplastic polyurethane (TPU) grade, TPU01, developed by BASF and only available for use on the Jet Fusion 5200 Series and other HP Multi Jet Fusion printers (HP already offers thermoplastic powder materials including PA12 and PA11). BASF says Ultrasint TPU01 can be used for applications such as automotive parts, shoe soles, lattice design structures, shock absorption, tubes, wheels and ducts.

US-based resin distributor **M Holland** signed 3D printing thermoplastic material distribution agreements with Owens Corning, 3DXTECH, and **BASF** in 2018, which it has followed with the addition of 3D printing capabilities at its R&D center in Pennsylvania and its headquarters in Illinois. M Holland's 3D Printing Market Manager Helayanne Freedman predicts that, as additive manufacturing design concepts become more common, use of the technology is certain to increase. The increasing affordability and quality of open-source 3D printers will be key drivers. "We expect open source machines and the broad range of materials they use to continue to drive change and transformation in the additive manufacturing market in 2020," she says.

### Tackling Covid-19

The Covid-19 pandemic, which was in its earliest days as this article was being researched, demonstrated the ability of AM technology to deliver on short leadtimes. As soon as reports began to emerge of healthcare systems anticipating – and experiencing – shortages of personal protective equipment (PPE) for workers the plastics industry responded and additive manufacturing, with its

ability to make a new product from digital instructions, was one of the tools called on. AM facilities of all types, including university research labs, coalitions and collaborations, sprang into action.

At the time of writing, Stratasys was leading a coalition of more than 150 organisations producing 3D-printed visors and clear plastic face shields for hospitals and other organisations. Stratasys and its partners turned out 5,000 shields in the first week of production, with the first hospital shipments received on March 25, 2020. The coalition was ramping to produce more than 11,000 masks in the second week and 16,000 in the third.

Stratasys is also increasing its production of 3D printing materials for visors and face shields, and the company is offering free material licenses on many of its high-end printers used to make the visors during this time. The company also supported the CoVent-19 Challenge led by anesthesiology residents of Massachusetts General Hospital, in the US, that aims to develop a rapidly deployable design that can be used globally, including low-resource areas.

Other AM players are also playing their part in tackling Covid-19. HP and its partners have been validating and preparing designs for parts such as such as face masks, face shields, mask adjusters and hands-free door openers. These have been made available for download. And **Carbon**, which has developed the DLS [digital light sintering] technology for AM of thermosets, has designed a face shield and made the design and instructions open-source. It is also developing designs for a 3D-printed test swab.

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*Improved fire performance, halogen-free formulations, support for higher voltages, and greater production flexibility all feature among the latest cable compound developments, reports Mark Holmes*

# Fire and flexibility top cable industry developments

Global polymeric material demand for insulation and jacketing of cables is forecast to realise solid if not spectacular growth rates of around 4% annually to 2023. However, a multiplicity of trends are at work driving quite different prospects depending on geography, material type and cable end-use, according to **AMI Consulting's** most recent global cable sector report "Polymeric materials in the Global Cable Industry" (AMI is the publisher of *Compounding World*). Evolving regulations, greater concerns and differing interpretations over cable safety, development of new telecommunication networks, and investment in renewable energy are just some of the factors identified as driving change. Meanwhile, globalisation, economic and political developments continue to shape the market in the background.

In terms of polymer demand, one of the most significant material trends is the ongoing substitution of PVC compounds by PE, XLPE (crosslinked PW) and LSF0H/HFFR (Low Smoke Flame Retardant Zero Halogen/Halogen Free Flame Retardant) compounds. The move towards non-halogenated cables began in Europe more than a decade ago in response to concerns over the toxicity of fumes in the event of a fire. It has since been adopted in many parts of Asia although not North America, where HFFR formulations account only for around a few per cent of total demand.

Specific polymer demand is also influenced by the cable application. The AMI report identifies a growing need for Extra High Voltage (EHV) cables and submarine cables to carry electricity from offshore wind farms or from remote photovoltaic installations, for example, and this is fuelling greater use of XLPE compounds for insulation (although it notes that renewables investment is not expanding uniformly across all regions). The advance of fibre optic cable networks is also altering traditional demand patterns.

According to kneader extruder manufacturer **Buss**, the main growth area in its cable sector business at present is all types of halogen-free flame retardant (HFFR), including specialities such as highly flexible HFFR compounds with higher temperature ratings. In addition, the revision of the EU construction product regulations (CPR), with a focus on improved fire safety in particular, is likely to mean that new formulations with higher limiting oxygen index (LOI) will have to be developed. The company says it is also seeing an increasing demand for less 'prevalent' compounds, such as TPU or crosslinkable polyethylene (XLPE or PEX-A) for medium, high and EHV applications (insulation or semi-conductive layers) in DC and AC cables.

In high and extra high voltage (HV/EHV) applica-

**Main image:**  
**Halogen-free flame retardant formulations are in high demand in the cable sector, with the newly developed FR8101 jacketing PE from Borealis one of the latest examples**







IMAGE: BOREALIS

**Above:**  
**HVDC links**  
**to renewable**  
**energy projects**  
**such as offshore**  
**wind farms**  
**present new**  
**opportunities**  
**for the cable**  
**sector**

tions, a significant market for XLPE, there is a rise in use of DC cables and an increase of the nominal voltage of EHV cables in general (which presently exceeds 500kV). This puts increasing constraints on the cleanliness of the final compound. Current state-of-the-art technology for the production of insulation material for HV and EHV cables – commonly known as the soaking or absorption process – is reaching its limits in terms of product quality and cleanliness.

### Soaking developments

The XLPE soaking process is performed in two steps because the peroxide used for the crosslinking of the insulation during extrusion of the cable cannot be added to the melt during compounding (typical compounding temperatures are in the range 200-240°C while the peroxide decomposes at a temperature below 140°C, which would result in crosslinking of the polymer). Instead, the peroxide is added to the compound in a second process step by solid state absorption, which can be both time and energy intensive and a potential source of potential contamination.

Buss says it has developed an alternative and more efficient process for production of XLPE, which it calls LSHC (linear short hyper clean process). As the name implies, this is said to allow production of hyper-clean XLPE compounds for medium through to extra-high voltage AC and DC applications. In its LSHC process, Buss says it has developed a one-step process for insulation production that avoids the need for the solid-state peroxide absorption (soaking) stage. As a result, CAPEX of an LSHC production line is said to be up to 40% lower, while OPEX can be reduced by about 30%.

Cost and flexibility are also key in current cable compounding, Buss says. "There is presently a lot of pressure to reduce manufacturing costs by using more flexible and efficient compounding equip-

ment," says François Loviat, Head of Process at the firm. "On the one hand this can be achieved by maximising the throughput of compounding lines, and on the other by reducing the costs of raw materials while maintaining outstanding quality. The latter also puts more pressure on the compounding equipment as cheaper raw materials often implies a compromise on stability or ease of processing of the raw materials."

A lot of effort is also invested in improving the productivity of cable extrusion machinery. "This is mainly done by fine tuning the formulations in order to allow higher cable extrusion speeds. There is also a trend towards more flexible compounding lines, which can be used for different applications, such as PVC, polyolefin-based HFFR or TPU. This results from the need for compounders to produce a wide range of products and adapt quickly to changing demands," Loviat says. "In addition, a consequence of this need for flexibility is that the use of underwater pelletisers is gaining in importance over alternative pelletising technologies in cable compounding, despite the more significant investment required."

Buss says that its latest high performance compounding machine – the Compeo – is well suited to meet these flexibility demands. "Basically, this compounding extruder can be used for any application, from rubbers to engineering plastics, and from polyolefin based HFFR compounds to PVC," says Andreas Niklaus, Senior Process Engineer.

For example, the Compeo Kneader series can combine 2, 3 and 4-flight screw elements on the same machine. This allows users to benefit from the benefits of traditional 3-flight kneader technology, such as smooth kneading conditions for sensitive products, as well as the advantage of the higher throughput of 4-flight kneader technology. For special applications, such as reactive extrusion, the Compeo line-up features novel 6-flight elements. ➤



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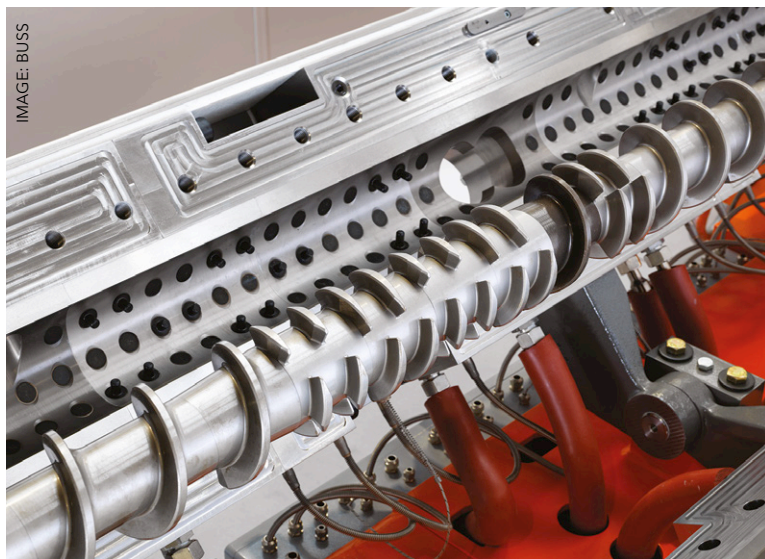
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**Above:**  
Compeo kneader compounders can combine 2, 3, 4 and even 6-flight screw elements to optimise shear and distribution

In addition, the Compeo series employs a new discharge unit in the form of a counter-rotating twin screw extruder that provides forced conveying and uniform pressure build up. Buss says this is particularly suitable for processing of sticky and/or abrasive products for underwater pelletising, especially in combination with melt filtration or direct extrusion. It provides multiple possibilities regarding configuration of process parameters, the company says, and together with the broad operating temperature range and conical twin screw discharge characteristics makes the Compeo machine suitable for many applications.

### Test to market

The Compeo and LSHC process technology have been developed within the Buss test centre over the past 2-3 years, during which they underwent several industrial scale trials, says Robert Hollosi, Process Engineer. "We are now investing significant effort to establish these technologies in the market. This means working very closely with customers, as well as partners, in order to fine tune our latest developments for the most demanding applications. In parallel, we are working on expanding the Compeo series for both very low and high capacities. There is a market need for both a new and more flexible laboratory machine, as well as for very high outputs, especially for PVC and HFFR."

Loviat cites the example of a project completed last year for a customer producing a sensitive and highly filled PVC compound that required outstanding dispersion and exhibited thixotropic behaviour making it particularly difficult to pelletise. "This compound could not be produced in a satisfactory way by any other methods, such as twin screw extrusion,

because of degradation, bad filler dispersion or pelletising issues. The Compeo could produce the compound successfully, due to the smooth but effective mixing made possible by a combination 2- 3- and 4 flight screw configuration. In addition, the efficient conveying characteristics of the conical twin screw discharge solved the pelletising issues encountered with gear pumps and single screw extruders. The machine was sold, start-up performed at the end of last year without any major issues, and a second machine for this customer is now under discussion," he says.

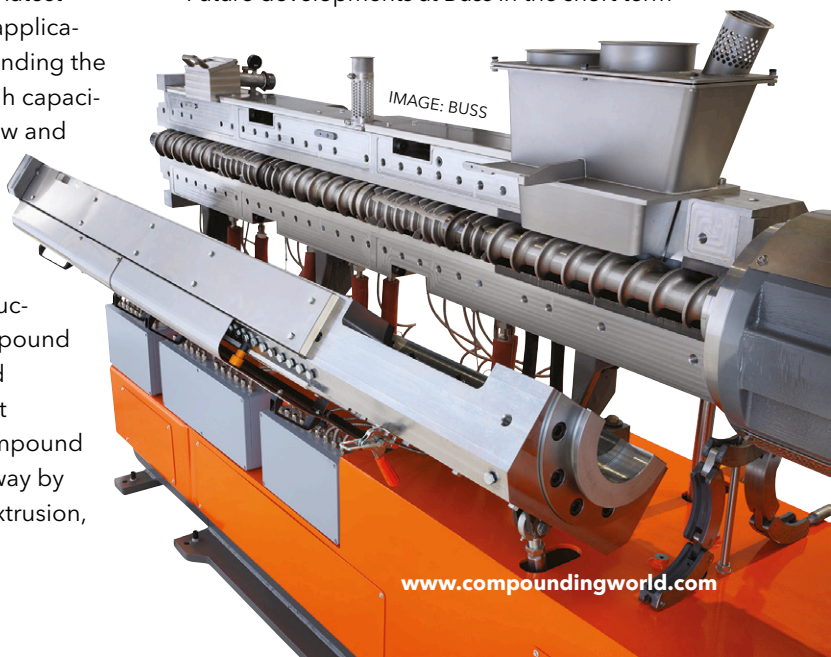
"We have also developed a process with one of our industrial partners for the production of a compound to be used in appliance cables, such as phone chargers and household electric devices. Cable material for this application should be flexible, robust, flame retardant and heat resistant," he says.

Loviat says to achieve the required flexibility an EVA grade with a high VA content is used as the raw material. The high MFI grades used are more typically employed as hot melts and are not suitable for traditional cable compound production. For this reason, the process usually is divided into two steps: in the first the melt is partly crosslinked to modify the rheology; in the second step the partly crosslinked product is compounded to the final cable compound.

"In this project we managed to streamline the production process by combining the partial crosslinking and compounding into one single step. The result was a ready-to-use, highly flexible cable compound containing close to 70% of flame retardant (ATH)," Loviat says. "This final material exhibits high flexibility, outstanding mechanical properties and can be used either as a thermoplastic or thermoset cable compound by applying the appropriate post-treatment."

Future developments at Buss in the short term

**Right:** Buss says it has developed new cable compounding processes on Compeo extruders in its test labs, which it is now rolling out to customers





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IMAGE: BOREALIS

**Above:**  
Borealis developed its HE1355 grade for ADAC-free production of foamed telecom cable insulation

include a new laboratory machine based on the Compeo technology. This machine, with an expected output of 50-100 kg/h, will be suitable for process development, formulation optimisation, as well as small batch production. In addition, there are plans for a machine with a screw diameter of 176 mm, which will allow an output of close to 10 tonnes/h.

### Firing up materials

In the materials area, **Borealis** and **Borouge** recently launched FR8101 to expand their existing portfolio of flame-retardant (FR) jacketing grades. This new, halogen-free solution is based on metal hydrate technology and is intended for production of low voltage building cables used in demanding environments. The companies say that FR8101 offers cable manufacturers a safer product with better performance while at the same time achieving increased production efficiency.

Cable jacketing made with the FR8101 PE grade is claimed to exhibit a reduced tendency to form flaming droplets, which is a potential contributor to fire spreading within buildings where cables are installed inside walls and roofs. Depending on the specific cable construction, FR8101 can achieve the best possible rating of 'd0' in the Construction Products Regulation (CPR) Euroclass scale for flaming droplets. This highest level of flame retardancy makes it possible for cable industry partners to fulfil the stringent CPR cable standards in Europe when using FR8101.

According to Borealis, cable manufacturers have faced processing limitations when using conventional halogen-free flame-retardant (HFFR) cable compounds. For example, material decomposition during the extrusion process can mean lower production speeds and inferior cable performance.

**Right: Borlink XLPE from Borealis is used in this 525kV XLPE cable produced by NKT**



IMAGE: BOREALIS

The use of FR8101 is said to eliminate these issues and allows cable makers to run production lines at high speeds. When used with the Visico/Ambicat XLPE system, the new grade can allow customers to fulfil CPR requirements without having to use other FR insulation or bedding. Borealis says this means more efficient processing but also results in lighter cable designs that are easier to install.

Borealis has also launched HE1355, which it claims is the first high density polyethylene (HDPE) foaming solution for production of telecommunication cables that is free of azodicarbonamide (ADCA). The HE1355 has been developed to allow cable manufacturers to bypass issues arising from the planned inclusion of ADCA on the EU's Annex XIV of REACH (Authorisation List). This would require producers, converters, and other downstream users to seek special temporary permission for the use of the substance in production.

Borealis says HE1355 matches the technical performance of other chemically-foamed HDPE grades currently on the market. Like the company's current HE1345 and HE1344 grades, it is said to offer good processability and stabilisation, as well as providing the required toughness for fast multi-pair assembly. The optimal cell structure of HE1355 makes it suitable for applications such as foam or foam-skin insulation for telephone singles and data cables with a typical expansion of 35-40%, as well as for dry core and petroleum jelly-filled cables.

### HVDC application

In a further cable application, a high voltage direct current (HVDC) cable compound based on Borealis Borlink technology is being used in XLPE power cables qualified for the tender of the 'German corridor projects'. This undertaking will transport renewable energy from wind farms off the north coast of Germany to the country's southern areas.

Borlink LS4258DCE unfilled XLPE insulation compound and the HVDC Borlink LE0550DC semicon combination was initially launched in 2014. The company says it enabled the use of extruded cable technology at significantly higher voltage and transmission levels than ever before and paved the way for XLPE extruded technology to transmit renewable energy from remote sources to the grid.

Borealis also points to the recyclability of XLPE, saying that XLPE cable production waste and redundant cable insulation can be

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**Right: Hexpol TPE is targeting power and telecom markets with its Dryflex Cable product line**

sorted and ground for use as a filler in other PE and PP compounds. Power cable supplier NKT, for example, recently introduced recycled XLPE in the production of its cable drums.

Power and telecom cable sheathing is the intended target for a new range of thermoplastic elastomers from **Hexpol TPE**. The range, which is marketed under the Dryflex Cable brand, includes grades based on several polymer chemistries, including EVA, TPE and TPV technologies. The company says that this brings one of the widest ranges of properties and customisation possibilities to the market and gives cable manufacturers the flexibility to select the optimal solution for their application.

The Dryflex Cable range includes Low Smoke Halogen Free (LSHF) and Low Smoke Zero Halogen (LSZH) flame retardant compounds. The compounds are RoHS, SVHC and REACH compliant and halogen-free according to IEC 60754 Part 1/2. The line-up includes Dryflex Cable 52180 N for low voltage power or data cable applications and 51898 N for demanding applications requiring increased thermal and fluid resistance. All of the new compounds can be processed using standard extrusion equipment and are supplied ready to use. No post vulcanisation is required and any production waste can be reprocessed. Typical LOI values are in the range 28-42%.

The Estane ZHF line from **Lubrizol Engineered Polymers** are halogen-free thermoplastic polyurethane (TPU) grades for cable applications that feature low toxicity, low smoke and low gas conductivity. The company says that the versatility of Estane ZHF polymers expands the scope of applications that the new grades can be used in to include thin or coloured cables.

**Right: Teknor Apex sees 5G wireless infrastructure driving new demand for cables, particularly in the antenna area**

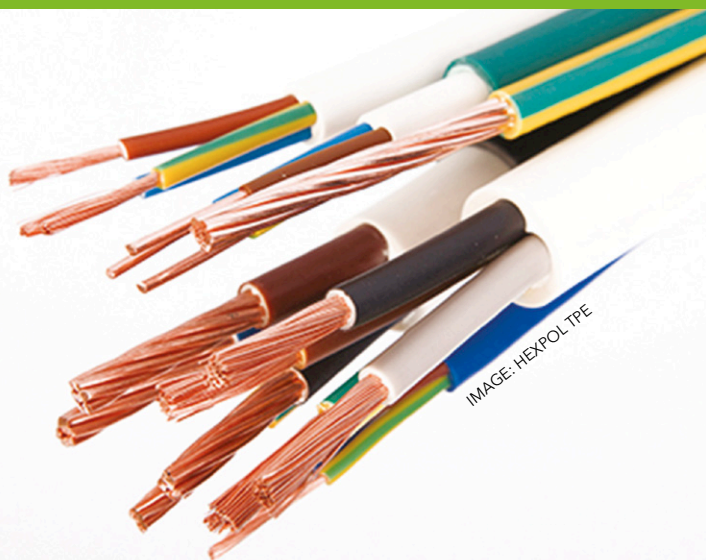


IMAGE: HEXPOL-TPE

The new range includes Estane ZHF 90AT8 NAT 02, which is claimed to be ideal for robotic and communication cables, while Estane ZHF 58202 NAT 02 is said to offer easy processing and low gas conductivity combined with good flame-retardant performance. Estane ZHF 58370 NAT 01 also has easy processability and extremely low gas conductivity in compliance with the IEC 62893 and EN 50620 standards for the charging cables of electric vehicles (EVs). Estane ZHF 58211 NAT 01 combines good thermal resistance and processing with flame retardance, while Estane ZHF 85AT8 MATT adds a matt surface finish.

"New emerging applications have demanding material requirements and international cable-related regulations are also becoming more stringent," says Fabio Morelli, New Business Development Senior Manager for Lubrizol Engineered Polymers in EMEA. "As an example, some Estane ZHF grades have been designed after a collaborative development process with key manufacturers of EV charging cables."

### "Wireless" opportunities

Despite being a wireless technology, developing 5G communications infrastructure is expected to drive considerable demand for cables. With this in mind, **Teknor Apex** has developed Apex PVC, Flex-alloy PVC elastomer and Halguard halogen-free low-smoke compounds for every component in the complex antenna cables required for the new system.

"With the advent of 5G, the wireless antenna market is evolving away from large coaxial cables and towards composite constructions incorporating control and fibre optic cables," says David Braun, wire and cable industry manager for the company's Vinyl Division. "These new constructions meet the needs of wireless telecom carriers, who are seeking to add new spectrum bands while lowering operating costs."

Compounds from Teknor Apex are pitched at a



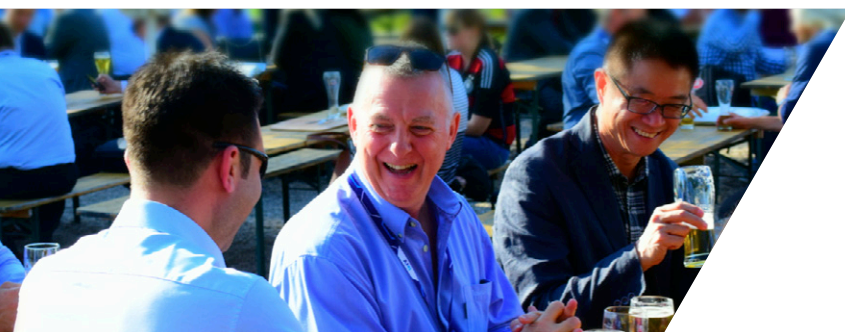
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IMAGE: BASF

**Above: BASF developed a custom additive package for Siechem for submarine cable applications**

number of 5G antenna cable applications. These include: buffers for high-speed data fibres at the core of the cable; jackets for the multi-fibre core; jackets for the bundles of 600V control cable surrounding the core; and sheathing for the entire construction. The company says compounds can be tailored to meet the different specifications of each wireless carrier, which may call for different levels of oil-resistance, UV-resistance, low- and high-temperature resistance, and wet- and dry-rated insulation performance. Its Halguard non-halogenated low-smoke grades for 5G, which are designed to provide an alternative to PVC, include a stress crack-resistant compound for jacketing over corrugated metal armour.

Italian company **Padanaplast**, which specialises in crosslinkable polyolefin (XLPO-HFFR) compounds for wires and cables, has expanded its range with a number of grades that meet the stringent needs of electric mobility in the automotive industry. These include a new experimental grade, Cogegum GFR 1709-27, which has been specifically developed for ultra-flexible T4 battery cables for next generation EV powertrains. The company's Cogegum GFR 1401-76 and GFR 1401-190 grades comply with most relevant automotive cable standards, including ISO 6722 Class C and SAE J 1128, and are intended for T3 primary insulation. They are said to be optimised for technical performance and cost-effective production. Polidienne G grades are EN 50620 compliant and are already being used as insulating materials for EV charging cables. All grades are crosslinked using silane-grafting technology and use a non-halogenated flame-retardant system.

### Submarine protection

Plastic additives from **BASF** are being used to improve the manufacture and functionality of underwater cable sheathing. Siechem Wires and

Cables, a leading manufacturer and exporter of marine and shipboard cables in India, has developed submarine fibre optic cables using a tailor-made BASF plastic additives package comprising of an Irganox antioxidant and light Chimassorb and Tinuvin light stabilisers.

Siechem's deep-water fibre-optic cables comprise optic fibres, copper power conductor and steel wire protection membrane sheathed in an outer layer of HDPE, which is crosslinked using the electron beam (EB) process to improve thermal, chemical, barrier, impact and other mechanical properties. According to BASF, its antioxidant and light stabiliser package is optimised to ensure highly efficient crosslinking and improved durability during service life. The additives also reduce colour formation and provide processing stability during pelletisation and extrusion of the HDPE resin.

### Adding capacity

**Magnifin Magnesiaprodukte** says it has concluded preparatory work for the construction of a second production site to meet growing global demand for high-purity, halogen-free magnesium hydroxide fire retardants from sectors such as cable production. Its Magnifin coated and uncoated magnesium hydroxides flame retardants are used in a wide range of polymer applications, especially in thermoplastic materials and elastomers requiring processing temperatures in excess of 200°C. Typical applications include energy and LAN data cables and automotive wire and cable.

Magnifin Magnesiaprodukte is a 50/50 joint venture between Martinswerk, part of the Fire Retardant Additives (FRA) business of Huber Engineered Materials, and Veitscher Vertriebsgesellschaft, which is part of RHI Magnesita. The company has not disclosed the location for the new plant but has said it will manufacture the same product portfolio that is currently produced at the Magnifin Magnesiaprodukte site at Breitenau in Austria.

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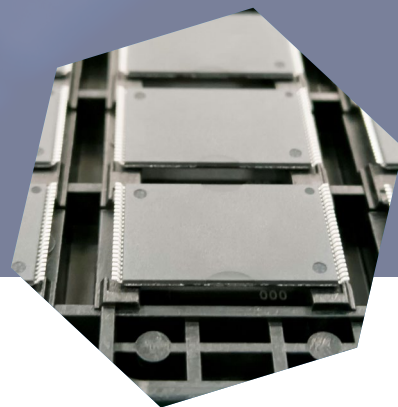
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*A wealth of new materials have been launched by engineering thermoplastics suppliers, some with sustainability in mind and others that push performance boundaries. Peter Mapleston reports*

# Extending limits for ETPs

The European Commission's adoption of its Circular Economy Action Plan in March was the latest evidence – if more was needed – that sustainability is now a critical consideration for all manufacturing sectors. The plastics industry is prime among them, so it is no surprise to see that suppliers of engineering thermoplastics are putting a special emphasis on sustainability issues in their latest product introductions. That focus shows itself in many ways, ranging from use of renewable materials and recycled content through to in-service benefit claims (such as fuel and emission savings due to lighter weight).

During last year's K show in Germany **Covestro** presented a recent concept for post-consumer recycled (PCR) polycarbonate waste and its use in the electronics industries. "Polycarbonate is far too valuable to be disposed of after just one use," says Kayla Wu, marketing manager for electronics applications for Covestro polycarbonates in the Asia-Pacific region.

The closed material cycle it presented began with production of transparent polycarbonate at Covestro, which was then supplied to a manufacturer of five-gallon water bottles, the bottles delivered to a water supplier, where they were filled then sent on to consumers. According to Covestro, each bottle can be reused for up to 50 times then, at the end-of-life, is returned to the bottle manufacturer via the water producer using

the same value and supply chain. The bottles are then shredded, cleaned and sorted. The quality of the post-consumer recycle is checked and granulates produced then used by Covestro to produce a polycarbonate blend for OEMs manufacturing products such as laptops, copiers, printers, mobile chargers for smartphones and other electronic devices.

Covestro says this closed concept offers significant advantages over previous recycling approaches for thermoplastics. "The collection and material sorting of post-consumer products has often been a challenge in the past," it says. "Fluctuations in quality have also often stood in the way of effective and economical recycling. However, all partners can benefit from the new concept and the business model behind it."

**Main image:** With a high weld strength and long-term temperature resistance up to 230°C, Ascend's Vydyne XHT performs well in under-hood parts like integrated air intake manifolds



PHOTO: COVESTRO

**Left:** Covestro says PCR polycarbonate can be blended and used by OEMs manufacturing products such as laptops



**Right: Covestro showed this headlamp concept made in PC and PC/ABS at K2019**



PHOTO: PETER MAPLESTON

### Novel lighting

Covestro also displayed a novel concept headlight produced in different types of polycarbonate or PC/ABS (apart from the siloxane scratch-resistant coating) that incorporate specific functional attributes as well as simple recycling. Paul Platte, Senior Marketing Manager, Automotive with Covestro in the US, says the headlight incorporates no fewer than nine novel technologies that facilitate assembly and also disassembly, since only the electronics need to be removed before the thermoplastic parts can be recycled all together into new PC-based blends.

The headlamp includes an outer lens in polycarbonate that is laser welded to a frame in a Bay-blend PC/ABS blend (eliminating any adhesive bonding) that is part of a two-component moulding, the other component being the housing/reflector in a thermally conductive compound. All electronics are placed either in or on the housing/reflector, Platte says, so heat is conducted directly

into the conductive material, eliminating the need for aluminium heat sinks. One LED chip is insert moulded into place. "The compound is not as conductive as aluminium, but we can keep the LEDs at within two degrees of where they would be with aluminium," he says. This leads to a reduction of 40% in weight and a 20% cost reduction.

One of the new materials used in the headlamp is Makrolon DS 801, which is claimed to provide particularly high dimensional stability. This is a filled material but, by using variotherm mould temperature control technology, it is possible to achieve surface roughness to match an unfilled grade. Makrolon LED 2245 ST is used for the opaque headlamp bezel, providing good aesthetics as well as the transparency to radar required for the LIDAR system. This is achieved with Makrolon LED 2245 ST. A further polycarbonate with good light diffusion forms part of another two-component moulding used to evenly spread out light from a strip of some 70 LEDs.



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Another polycarbonate major, **Mitsubishi Engineering Plastics**, says it is receiving more and more requests for recycled content in compounds, including grades for high end products such as laptop computers, as well as for sockets and power distribution components. It also offers grades with post-industrial and post-consumer recyclate coming from products such as large water bottles. Its Xander products, for example, contain 30 or 50% PCR.

### Bio-polycarbonate

Mitsubishi also offers a bio-based polycarbonate, Durabio, derived from plant-based isosorbide. It is said to offer better clarity than conventional polycarbonates made from bisphenol A, as well as has higher scratch resistance. The company says it considers the material to effectively represent a new material category. It enables production of parts with high surface properties without the need for painting. For example, it is said to be possible to achieve piano black surfaces straight from the mould. Any solid colour can be achieved, and the resin also has good resistance to UV radiation and chemicals.

**SABIC** also now has a polycarbonate based on a certified-renewable feedstock. This is a tall oil, which can be used as a feedstock in the company's crackers. Tall oil is a by-product of the Kraft process of wood pulp manufacturing from mainly coniferous trees. The PC is around 60% bio-based, determined using the mass balance concept. It is said to provide a reduction in carbon footprint of up to 50% and has a fossil depletion reduction potential of up to 35%. SABIC says the new PC will be produced initially at its manufacturing facilities in Bergen op Zoom in the Netherlands, and it plans to make it globally available.

A new addition to SABIC's conventional PC and PC blend line is Xenoy HTX, which is aimed at crash absorbers, body-in-white components and structural reinforcements. The company says it has just

closed its first application for the PC/PBT blend, which is said to be ductile down to -30°C while also able to resist e-coat oven temperatures.

Xenoy HTX is available in unfilled and glass-filled grades. It offers significant weight savings compared to steel and aluminium, SABIC says, and can provide a drop-in alternative for PA66 compounds and alloys. The unfilled resin is modified to absorb significant energy and withstand plastic deformation in the event of a crash so the company is targeting the material for use as a lightweight metal replacement solution in new safety applications, including side rockers designed to offer protection for battery modules mounted to the floor of EVs.

### Structural gains

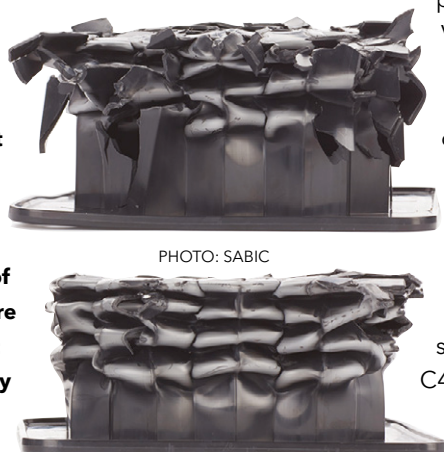
SABIC has demonstrated the structural lightweighting capabilities of the new technology with a 3D printed prototype of a rocker panel reinforcement incorporating a honeycomb structure designed for EV battery side protection. It says such hybrid honeycomb designs with the Xenoy HTX compound have the potential to save up to 60% of the weight normally associated with traditional multi-piece steel or extruded aluminium crash countermeasures, without compromising on dimensional stability, rigidity and mechanical strength.

Some 15% of the engineering thermoplastic market will be catered for by either bio-based or recyclate-based materials by 2030, according to **DSM**. It says its ambition is to have a bio-based or recyclate-based alternative for every product in its range by that time (with the aim to have at least a 25% bio/recyclate content). "The portfolio of sustainable alternatives will leverage a toolbox of different technologies and approaches such as fermentation, mechanical recycling and mass balance accounting of bio-based and/or chemically recycled feedstock," says the company.

Moving towards this goal, DSM has launched bio-based grades in its Arnitel TPE-E and Stanyl polyamide 46 portfolios. Joost d'Hooghe, Vice President Polyamides at DSM Engineering Plastics, says they will deliver the same functional performance as its conventional portfolio. "This will enable our customers to easily shift to a more sustainable solution without having to requalify materials," he says.

The new Stanyl grades are already available with the globally-recognised sustainability certification ISCC Plus. The C4-based part of the polymer is bio-based; like SABIC, DSM is currently using tall oil as a feedstock.

Parts designed with honeycomb or "top hat" structures in SABIC's unfilled Xenoy HTX can absorb significant energy and withstand plastic deformation in the event of a crash. An impact test of two parts, after they had been run through the e-coat car body coating process, demonstrates the material's high degree of energy absorption over a wide temperature range. The upper part (right) was tested at -30°C and shows good ductility and energy absorption compared with the lower part tested at room temperature





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**Right: Vodyne ThermaPlus brings PA66 cable ties into higher temperature areas, including under the hood**

DSM already offers bio-based polyamides in the form of EcoPaXX PA410 and ForTii Eco. At the moment, it is the C10-based section of these materials that is bio-based, derived from castor plants.

### Performance polyamides

Away from renewables,

**Ascend Performance Materials** has

launched new grades in its signature Vodyne polyamide 66 family. With under-hood temperatures in cars powered by internal combustion engines continuing to rise, Ascend has developed the Vodyne XHT line, which currently includes R735XHT and R535XHT grades.

The R735XHT grade incorporates a new additive chemistry that Vikram Gopal, Ascend's Senior Vice President, Technology, says offers "fantastic" performance in terms of retention of properties between 170 and 230°C. The new copolymer and additive chemistry is said to provide multi-stage heat stabilisation and is intended for applications such as charge air coolers and air intake manifolds subject to very high temperatures. The grade also provides resistance to acids, good knit-line strength, and reduced moisture uptake. It is currently being sampled with customers.

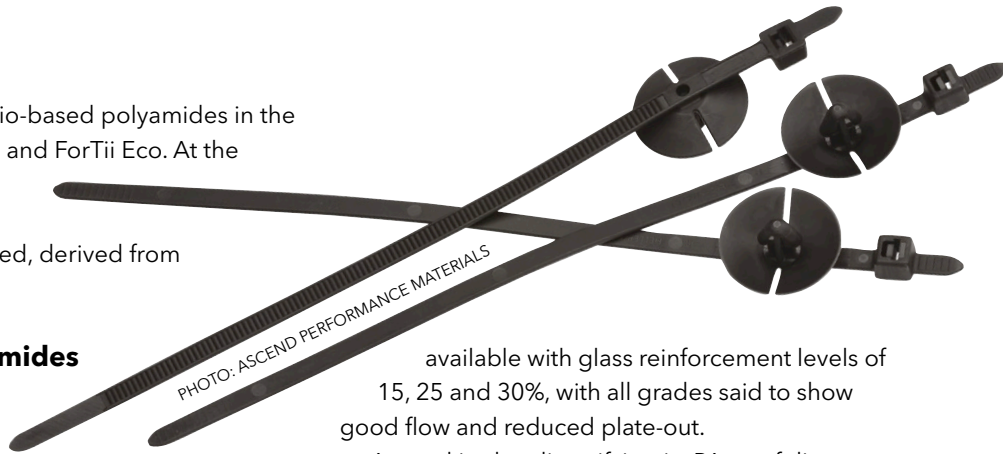
Vodyne R535XHT is based on PA66 homopolymer and is also heat stabilised to improve ageing properties (although performance in this respect is not quite as good as the 735 grade).

Also new is Vodyne ECO 500, a reinforced, non-halogenated FR PA66 for use in circuit breakers, power disconnects, and electric and hybrid vehicles. The new grade, currently in development, exhibits a UL 94 V-0 rating at less than 0.4mm, glow wire flammability index of 960°C, and a comparative tracking index of greater than 600V. It will be

**Below: Ultrason P2010 is a new high flow PPSU from BASF aimed at demanding thin wall parts**



IMAGE: BASF



available with glass reinforcement levels of 15, 25 and 30%, with all grades said to show good flow and reduced plate-out.

Ascend is also diversifying its PA portfolio beyond products based on PA66 with its new long chain PA610 and PA612 grades. Gopal says these materials are intended for applications that require resistance to calcium chloride and hydrolysis, and where improved elongation is required. He cites the example of battery seals, cable ties, automotive cooling and fuel connectors, and sporting goods.

At **DuPont Transportation & Industrial**, Global Marketing Director Eugenio Tocalino says automobile electrification is an important opportunity for the company. "A lot of the technology we developed in the E&E space, for connectors, for consumer electronics, we are now bringing to automotive," he says.

Tocalino says there will be a big space for engineering thermoplastics in EVs, especially in the transition period to fully electric vehicles when there will be a large number of hybrid vehicles on the road, providing so-called "double content" for materials in and around the internal combustion engine and also the electric motor and battery pack. He cites new thermal management systems for lithium ion batteries as one example. Dimensional stability of materials will be very important, he says, indicating that this will likely mean that PPAs will be favoured for battery cases.

Meanwhile, **BASF** has added a new low-viscosity grade to its Ultrason polyphenylsulphone (PPSU) family. Ultrason P2010 is claimed to display improved flow behaviour in injection moulding while maintaining the typical mechanical performance of PPSU materials, including very good notched impact strength, high chemical resistance, and inherent fire resistance. The company says that the new grade's Charpy notched impact strength is almost ten times higher than other amorphous high-temperature materials. The transparent polymer is also resistant to high temperature steam sterilisation process and is approved for food contact in the EU and the US.

The lower viscosity means part thicknesses can be reduced. BASF says the ability to fill moulds at lower pressures and temperatures also leads to process energy savings. It sees the new polymer



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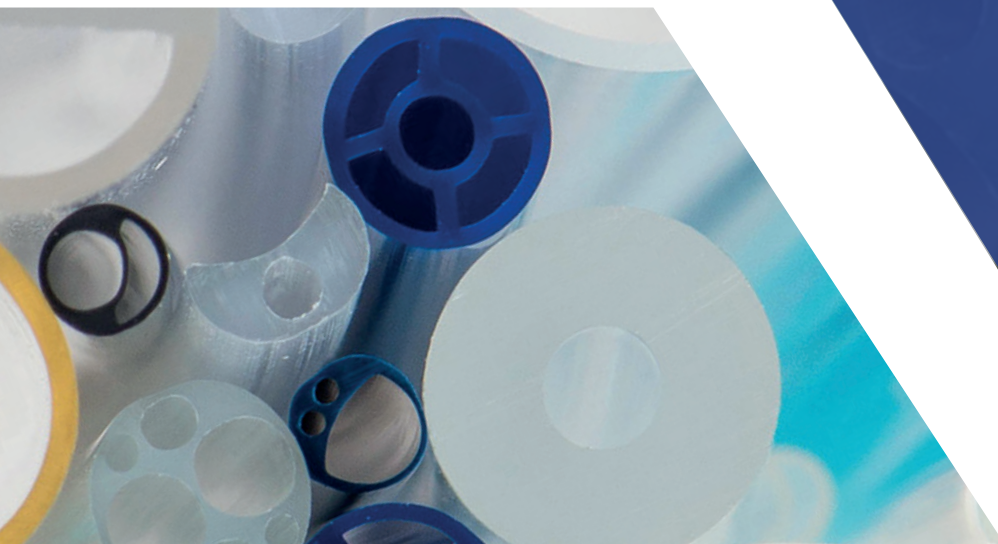
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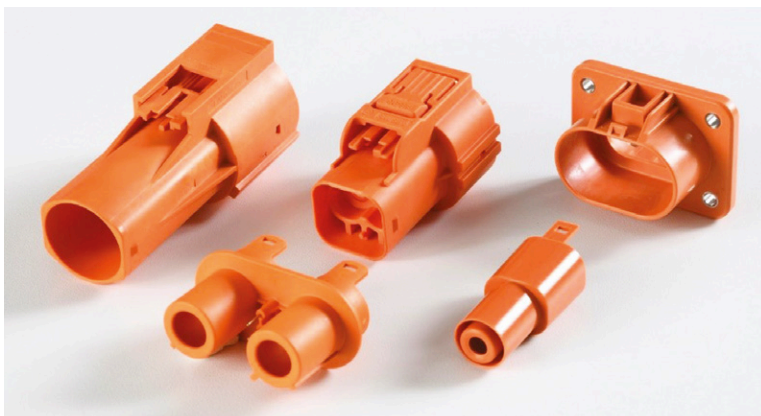
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PHOTO: DOMO CHEMICAL



**Above:**  
High-voltage  
connectors  
made with  
Technyl Orange  
from Domo

being used to manufacture large and complex-shaped thin walled components such as catering dishes and heat-resistant containers, as well as aircraft seat and lighting parts, air vents and overhead luggage compartments.

### Portfolio expansion

At the K show last year, Solvay Performance Polyamides introduced several new additions to its Technyl range of PA compounds. The European part of that business was sold in January of this year to Domo Chemicals to comply with EU regulatory clearance of BASF's acquisition of Solvay's global PA business, which was originally announced in 2017. Domo will add the Technyl grades to its product offering for the EEA and Swiss markets (the acquisition included a two-year geographical restriction.)

Technyl Orange is a new range of fire-resistant products for high-voltage automotive components in electric vehicles, including cables, connectors, charge plugs and sockets, converter housings, sensors and insulators. Many such parts are currently made using materials coloured using masterbatch at the injection machine but Gérald Durski, Strategy and Marketing Director at Domo Chemicals, says pre-compounding the colour into the polymer gives better colour stability and compatibility with flame retardant packages, as well as enabling features such as laser marking.

The materials are available in RAL 2003 and include various halogen-free grades based on Technyl One and Technyl Star technologies. Some grades offer UL94 V-0 flammability ratings at wall thickness as low as 0.4mm; all are formulated for low mould deposit and offer a comparative tracking index (CTI) of at least 600V.

**Right: The  
Skeleton  
all-plastics  
brake pedal  
produced by  
Carbody using  
Technyl Max PA**



PHOTO: DOMO CHEMICAL

The Technyl Blue range has been extended with new grades specifically designed for hybrid and fully electric vehicles (EVs/HEVs). Based on PA66/PA610 polymer technology, the new materials are intended for parts in cooling circuits and air-conditioning systems; the range now also includes extrusion grades. "Electrified vehicles present an increased number of complex interconnected cooling systems," says Didier Chomier, Global Marketing Manager for Automotive.

Technyl Blue D 218CR V50, for example, competes with polyphthalamides and polyphenylene sulphide and is said to provide total system cost advantages. "It offers high mechanical strength, design flexibility, excellent surface aspect and easy processing for applications including thermostat housings and water pumps," says Durski.

Also new is Technyl Max, an advanced PA formulated for optimal modulus and fatigue behaviour that is currently being used by Carbody in a 60% glass reinforced grade for production of its Skeleton all-plastic brake pedal. The part features a rod-shaped composite structure which is over-moulded with the new PA compound.

Previously, Domo says plastics brake pedals have required a metal insert to pass rigorous mechanical tests but the new pedal can resist forces up to 3,000N (the average force applied in case of emergency braking is around 500N). Modulus is 20GPa, compared to around 15GPa for competing materials, and fatigue resistance is between four and ten times better. A 50% glass reinforced grade is available now with a 70% version under development. In addition to car pedal systems, Technyl Max is being targeted at semi-structural components such as transmission and motor mount cross beams, air shutter grills and seat structures.

**RadiciGroup's** latest high temperature addition is Radilon NeXTreme. Erico Spini, Global Marketing Manager of RadiciGroup High Performance Polymers, says the material was initially developed for automotive applications "for which it is well suited as it features exceptional heat ageing resistance in air at 230°C." Two grades are currently on offer for injection moulding: 35% glass fibre reinforced (RV350HHR 3800 BK) and 50% glass-fibre filled (RV500HHR 3800 BK). Typical applications for these materials include air induction system components requiring considerable heat resistance.

### Welded assembly

As miniaturisation of E&E components continues,



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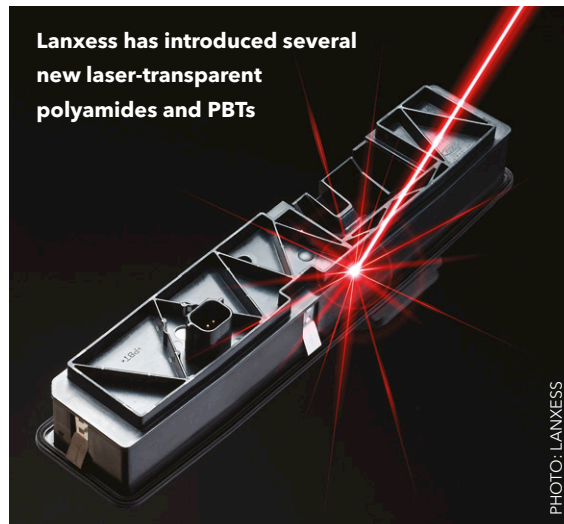
the potential for use of laser transmission welding grows, according to **Lanxess**, which claims it allows complex geometries to be produced in a cost-efficient and resource-friendly manner. The company has added three new products to its existing selection of LT (laser-transparent) Durethan polyamides and Pocan polybutylene terephthalates (PBT).

"The new materials possess a range of important properties that allow them to be used in a broader range of applications," says Claudia Dähling, an expert in technical plastics at Lanxess. "Potential applications include components for electrified vehicle drives and driver assistance systems as well as devices for the Internet of Things."

Pocan B3233XHRLT is a new 30% glass fibre-reinforced PBT with "excellent" resistance in a hot and humid environment, as demonstrated in the SAE/USCAR-2 Rev. 6 long-term tests of the American Society of Automotive Engineers, says Dähling. "Materials like these are almost unprecedented on the market because standard additives for hydrolysis stabilisation generally cause the laser transparency of PBT to deteriorate significantly."

Most flame retardants also diminish the laser transparency of thermoplastics, Dähling adds. They are, however, needed for components in battery systems for electric vehicles. "With Durethan BKV30FN04LT, we can offer a corresponding compound based on PA6," she says. It uses a halogen-free flame-retardant package that gives the compound a UL 94 V-0 rating. The leaves hardly any deposits in the tool and provides a high tracking resistance of 600V (CTI A, Comparative Tracking Index, IEC 60112) making it well suited for components for high-voltage batteries and plugs.

Pocan TP150-002 is a 30% glass fibre-reinforced PBT compound exhibiting a laser transmission (980nm) of 13%, which Dähling says is around double the transparency of most other laser-transparent PBT product types.



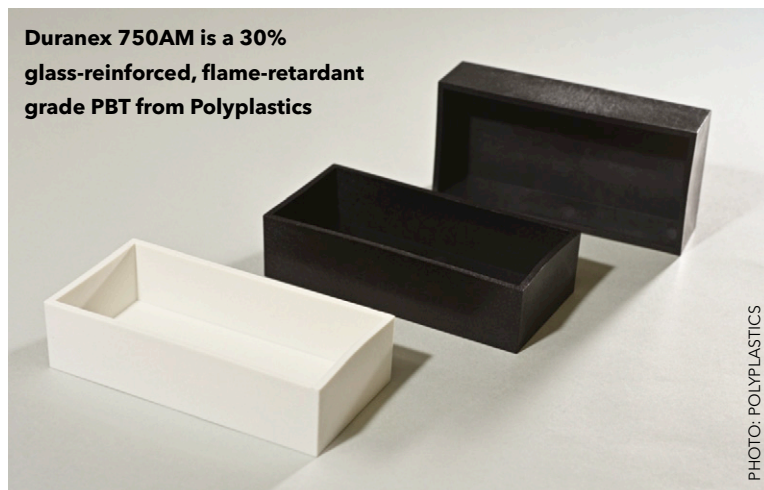
**Lanxess has introduced several new laser-transparent polyamides and PBTs**

PHOTO: LANXESS

Recently, **Polyplastics** launched a new flame retardant Duranex PBT grade that it says has the outstanding electrical properties traditionally found in PBT while also offering low warpage, high rigidity, and heat and hydrolysis resistance. Duranex 750AM is a 30% glass-reinforced compound said to be well suited to automotive applications such as communications devices and high-pressure parts for EVs and HEVs.

"Until now, it has been difficult to satisfy requirements for both flame resistance and hydrolysis resistance because hydrolysis resistance typically decreases with the addition of a FR component," says the company. "There has been an increasing demand for FR materials in the automotive market for use in communication devices and high-pressure parts for EVs and HEVs. These materials must also meet the auto industry's need for high durability and outstanding formability. Duranex 750AM and other PBTs also meet the demands of electrical and electronics applications."

Other new products from Polyplastics include a Duracon acetal (POM) for fuel pumps, grades with improved slip and wear and – made available for the first time outside of Asia – an acetal for medical applications.

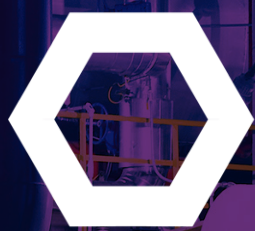


**Duranex 750AM is a 30% glass-reinforced, flame-retardant grade PBT from Polyplastics**

PHOTO: POLYPLASTICS

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- > [www.m-ep.co.jp/en](http://www.m-ep.co.jp/en) (Mitsubishi EP)
- > [www.sabic.com](http://www.sabic.com)
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- > [www.radicigroup.com](http://www.radicigroup.com)
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# Chemical Recycling

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Marriott Hotel  
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Explore the potential of chemical recycling to turn waste plastics into new materials.

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- Network with industry experts
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## KK KOMPOUNDING: COMPOUNDS



This 16-page brochure details the compounding capabilities of India's KK Komponding Tech Giant (Technovinyl Polymers), which produces a variety of TPEs and TPVs, TPU alloys, engineered PP compounds and halogen-free cable compounds.

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## COPERION: STS EXTRUDERS



Coperion's STS Mc11 line of twin screw extruders provides performance at a competitive price. This brochure describes the full features of the range, from the newly launched 80 kg/h 25mm diameter laboratory model to the 4,200 kg/h 96mm version.

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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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## LEISTRITZ: MASTERBATCH SYSTEMS



Additive and colour masterbatch production places specific demands on compounding equipment. This 16-page brochure from Leistritz explains how its ZSE 35 iMAXX masterbatch twin screw extruder rises to the challenge.

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## STRUKTOL: WIRE AND CABLE



Struktol Company of America has developed a range of polymer additives for processing of wire and cable. Products are available to help improve surface quality, reduce viscosity, and to lift quality and throughput.

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## BAY PLASTICS: STRAND PELLETISERS



Bay Plastics provides strand pelletisers and associated equipment to handle just about for any application. This four-page brochure details its full range of pelletisers, wet and dry-cut slides, water baths, air knives and dewatering units.

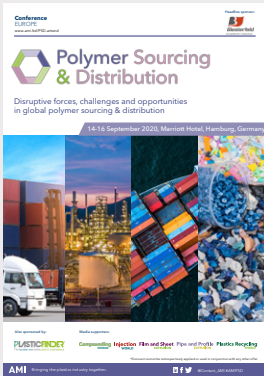
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# Learn more about AMI's upcoming conferences

Click on the relevant brochure cover or link to download a PDF of the full conference programme

## POLYMER SOURCING & DISTRIBUTION



AMI's event specifically created for companies at every stage of the European commodity polymer and engineering resins supply chain, the Polymer Sourcing & Distribution conference will take place in Hamburg, Germany, on 14-16 September 2020.

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## POLYMERS IN FLOORING USA



Taking place in Atlanta, GA, USA on 16-17 September 2020, Polymers in Flooring provides the forum for the North American resilient flooring industry to debate technical, market and product design trends as well as advances in materials, additives and production.

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## PLASTICS RECYCLING TECHNOLOGY



AMI's third Plastics Recycling Technology conference will take place on 16 - 17 September 2020 in Vienna, Austria, bringing together international experts to discuss advances in plastics recycling systems, ranging from sorting and cleaning through to compounding.

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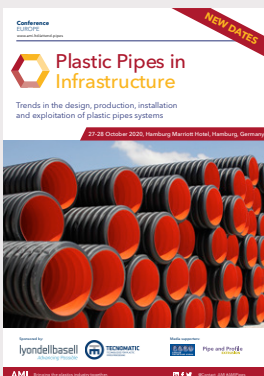
## PERFORMANCE POLYAMIDES EU



Taking place in Düsseldorf in Germany on 30 September to 1 October, AMI's fifth Performance Polyamides conference will explore the latest advances in PA compounds for demanding applications in markets such as automotive, E&E and construction.

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## PLASTIC PIPES IN INFRASTRUCTURE



The eighth Plastic Pipes in Infrastructure conference takes place in Hamburg in Germany on 27-28 October 2020. This established international event covers the latest developments in pipes for drinking water supply, gas transmission, drainage and sewerage and district heating.

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## PLASTICS REGULATIONS EUROPE

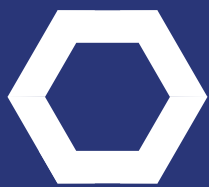


The fourth edition of AMI's Plastics Regulations Europe conference takes place in Cologne on 2-3 November, providing attendees with up-to-date insight into legal and regulatory developments from chemicals regulation and food contact materials through to recycling.

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To see our full line-up of more than 50 plastics industry events over the next 12 months, please visit [www.ami.international/events](http://www.ami.international/events)





# Plastics Regulations

**November 3, 2020**

**The Huntington Convention Center  
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Responding to new and future regulatory developments that will impact the plastics supply chain



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## Take advantage of your time in Cleveland

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- Learn from industry experts about new and impending regulations in areas such as TSCA, EU REACH and CLP, FDA Food Contact Notification Program
- Gain insight into global plastics legislation and regulatory updates
- Discover how to protect and future-proof your business
- Understand the real implications of forthcoming legislation in practical terms
- Network with international regulatory, compliance and legal professionals

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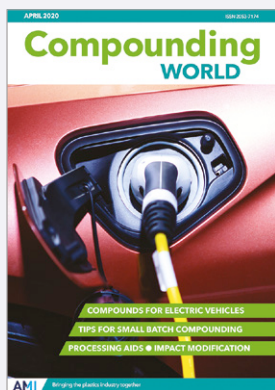
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## Compounding World April 2020

The April edition of Compounding World takes a look at the opportunities for compounding companies as car makers turn their attention to electric vehicles. Other features cover small batch compounding, impact modification and innovations in lubricants.

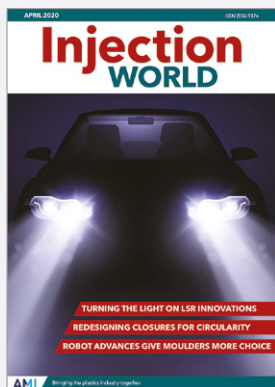
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## Compounding World March 2020

The March 2020 edition of Compounding World shows how suppliers of twin-screw extruders continue to find ways to get more from this flexible machinery. Plus features on long-fibre thermoplastics, simulation and monitoring odour, and regular news on plastics compounding.

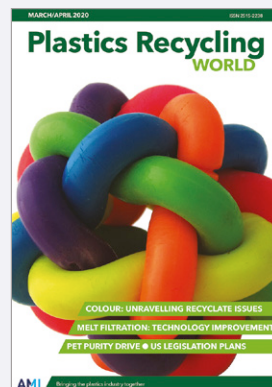
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## Injection World April 2020

The April issue of Injection World looks at the growth in applications for liquid silicone rubber moulding as suppliers introduce innovations. Plus features on robots and caps/closures.

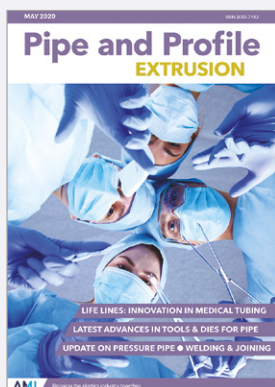
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## Plastics Recycling World March/April 2020

The March/April edition of Plastics Recycling World looks at the challenges of effective colouring, plus the latest developments in melt filtration and PET recycling. It also updates on US recycling legislation moves.

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## Pipe and Profile May 2020

The May edition of Pipe and Profile Extrusion magazine examines some of the latest developments in the medical tubing sector. It also looks at innovations in pressure pipes, pipe dies and pipe joining technology.

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## Film and Sheet April 2020

The April edition of Film and Sheet Extrusion looks at how chemical recycling could help boost recycling rates for film and sheet waste. Plus in-depth features on agricultural film, recent advances in flat die technology and the latest in slitters and winders.

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## GLOBAL EXHIBITION GUIDE

2020	<b>3-6 August</b>	Chinaplas, Shanghai, China <b>CANCELLED</b>	<a href="http://www.chinaplasonline.com">www.chinaplasonline.com</a>
	<b>8-10 September</b>	Feiplar, Sao Paulo, Brazil	<a href="http://www.feiplar.com.br">www.feiplar.com.br</a>
	<b>9-11 September</b>	Plastics, Printing & Packaging, Dar-es-Salaam, Tanzania	<a href="http://www.expogr.com/tanzania/pppexpo">www.expogr.com/tanzania/pppexpo</a>
	<b>9-13 September</b>	Taipei Plas, Tapei, Taiwan	<a href="http://www.taipeiplas.com.tw">www.taipeiplas.com.tw</a>
	<b>29 Sep-1 Oct</b>	Interplas, Birmingham, UK <b>POSTPONED</b>	<a href="http://www.interplasuk.com">www.interplasuk.com</a>
	<b>6-9 October</b>	Plastpol, Kielce, Poland <b>NEW DATE</b>	<a href="http://www.targikielce.pl">www.targikielce.pl</a>
	<b>6-10 October</b>	IPF Japan, Tokyo, Japan	<a href="http://www.ipfjapan.jp">www.ipfjapan.jp</a>
	<b>7-8 October</b>	Compounding World Expo Europe, Essen, Germany <b>NEW DATE</b>	<a href="http://www.compoundingworldexpo.com/eu/">www.compoundingworldexpo.com/eu/</a>
	<b>13-17 October</b>	Fakuma, Friedrichshafen, Germany	<a href="http://www.fakuma-messe.de">www.fakuma-messe.de</a>
	<b>4-5 November</b>	Compounding World Expo USA, Cleveland, USA	<a href="http://www.compoundingworldexpo.com/na/">www.compoundingworldexpo.com/na/</a>
	<b>10-13 November</b>	Plastimagen, Mexico City	<a href="http://www.plastimagen.com.mx">www.plastimagen.com.mx</a>
	<b>23-26 November</b>	All4Pack, Paris, France	<a href="http://www.all4pack.com">www.all4pack.com</a>
2021	<b>1-5 December</b>	Equiplast, Barcelona, Spain <b>NEW DATE</b>	<a href="http://www.equiplast.com">www.equiplast.com</a>
	<b>5-8 December</b>	Plast Eurasia, Istanbul, Turkey	<a href="http://www.plasteurasia.com/en">www.plasteurasia.com/en</a>
	<b>9-12 January</b>	Arabplast 2021, Dubai, UAE	<a href="http://www.arabplast.info">www.arabplast.info</a>
	<b>25 Feb-3 March</b>	Interpack, Dusseldorf, Germany <b>NEW DATE</b>	<a href="http://www.interpack.com">www.interpack.com</a>
	<b>13-16 April</b>	Chinaplas 2021, Shenzhen, China	<a href="http://www.chinaplasonline.com">www.chinaplasonline.com</a>
	<b>4-7 May</b>	Plast 2021, Milan, Italy	<a href="http://www.plastonline.org/en">www.plastonline.org/en</a>
	<b>17-21 May</b>	NPE 2021	<a href="http://www.npe.org">www.npe.org</a>

## AMI CONFERENCES

<b>14-16 September</b>	Polymer Sourcing & Distribution, Hamburg, Germany
<b>16-17 September</b>	Polymers in Flooring North America, Atlanta, GA, USA
<b>16-17 September</b>	Plastics Recycling Technology Europe, Vienna, Austria
<b>16-17 September</b>	PVC Formulation Asia, Bangkok, Thailand
<b>30 Sept-1 October</b>	Performance Polyamides Europe, Dusseldorf, Germany
<b>12-14 October</b>	Polyolefin Additives Europe, Cologne, Germany
<b>20-21 October</b>	Oil & Gas Non-Metallics Europe, London, UK
<b>27-28 October</b>	Plastic Pipes in Infrastructure Europe, Hamburg, Germany

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**PLASTICS RECYCLING**  
WORLD EXPO

**POLYMER TESTING**  
WORLD EXPO

**7 - 8 October, 2020**  
**ESSEN, GERMANY**

**PLASTICS EXTRUSION**  
WORLD EXPO

**COMPOUNDING**  
WORLD EXPO

**4 - 5 November, 2020**  
**CLEVELAND, OHIO**

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