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PAGE 5

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Sirmax reveals plans for US recycling unit

Italian compounder Sirmax has revealed plans to set up a recycled compounds operation in the US. The facility represents a $17m investment and will be built alongside its existing compounding operation at Anderson, which is located in Indiana.

The company has acquired a 14ha site for the 12,000m² plant, which will produce compounds from recycled resins for markets such as automotive, appliances, power tools and consumer goods.

The move has been supported by the Anderson city authority, which is offering more than $2m of support through tax increment financing (TIF) bonds. These are yet to be approved but are intended to cover some of the cost of development of the brownfield site and expansion of the rail freight spur and utilities.

"We are pleased to be able to expand our business presence here and foster the growth in the Anderson community, which is becoming the headquarters of our North America operations," said Sirmax Group Country Manager Lorenzo Ferro. "We are excited to be leading in today's needs to reduce plastic waste in the environment and provide second life to plastics cooperating with our global customers in the development of environmentally friendly materials and applications."

The investment announcement comes just four months after Sirmax acquired Italian plastics recycler Società Europea di Regenerazione (SER), which reprocesses around 20,000 tonnes of post consumer plastics annually. The new US facility will use SER expertise.

Sirmax claims to be Europe's largest non-integrated compounder and the world's fourth biggest technical PP compound producer. It generated sales of €300m in 2018 and forecast back in March a result of around €385m for this year.

› **www.sirmax.com**

PHOTO: SHUTTERSTOCK

US investment is Sirmax's second in the plastics recycling sector

Nouryon ups DCP in China

Nouryon has doubled production capacity for dicumyl peroxide (DCP) at its plant at Ningbo in China. The company said it can now produce up to 38,000 tonnes/year.

DCP is used in the manufacture of polymers for demanding applications such as shoe soles and insulation for high-voltage cables. The company said demand is growing particularly in the latter area for upgrading electricity networks and connecting offshore wind parks and other sources for renewable energy.

The move follows a recent expansion at Ningbo for dialkyl peroxide, another organic peroxide used in the manufacture of flexible polymer products. Nouryon has also recently announced or completed organic peroxides projects in India, Mexico and the US.

› **www.nouryon.com**

Asahi Kasei claims PA66 bead foam first

Asahi Kasei has developed what it claims is the first polyamide 66 bead foam, which it is targeting at high performance weight-saving and noise insulation applications in sectors such as automotive.

The new foam offers the typical heat, chemical and oil resistant properties of PA66 along with outstanding rigidity and noise reduction. Performance characteristics are said to be determined by bead shape; round beads provide rigidity for applications such as metal replacement in structural parts and spacers while "C" shaped beads optimise sound insultation making them suitable for engine covers.

Both bead types can be processed using steam moulding techniques on standard polystyrene bead moulding equipment, according to the company.

› **www.asahi-kasei.co.jp/asahi/en**

PHOTO: ASAHI KASEI

PA66 bead foams are aimed at the automotive market

ReadCo adds rental options

US-based Readco Kurimoto now offers a short term rental programme covering two of its Continuous Processors offering throughputs up to 900 kg/hr.

Available as a month-to-month lease with a typical monthly rate of 2-5% of the purchase price, the company says the scheme will allow customers in the plastics and chemicals sector to test machinery in actual operating conditions on-site, validate processes, and fully examine the impact of a move from batch to continuous processing.

It will also enable customers buying new machines to begin operation while their custom units are being manufactured. When ready, up to 60 days of rental payments may be applied to the purchase.

› **www.readco.com**

Clariant and Sabic suspend performance merger plan

Clariant and SABIC have temporarily suspended discussions aimed at creating a joint High Performance Materials business from the former's Additives and high value masterbatch operations and some of the latter's Specialties units. The decision has been made due to current market conditions, the two companies said.

Clariant added it will continue with the previously announced divestment of its Pigments business and that it will now also sell the entirety of its Masterbatches business by the end of 2020 (it had previously planned to retain the high value part).

Shortly before the suspension announcement, Clariant CEO Ernesto Occhiello – who joined Clariant from SABIC last year after it acquired a 25% stake in the Swiss firm – resigned "for personal reasons with immediate effect". Former CEO and chairman of the board Hariolf Kottmann has taken over his role until a replacement can be found.

Clariant said sales from continuing operations grew by 4% in local currency terms to CHF2.23bn (€2.0bn) in the first half of the year, thanks to higher volumes and pricing.

EBITDA before exceptional items for continuing operations fell by 2% to CHF355m (€323m). Kottmann described the half-year as "admittedly challenging", especially Q2 "which was additionally impacted by temporary negative influences and one-off occurrences".

The strongest business areas were Catalysis and Natural Resources. The discontinued Masterbatches and Pigments units were 2% down, "negatively impacted by the weakened economic environment".

› **www.clariant.com**
› **www.sabic.com**

Ultranox FDA use extended

The US Food & Drug Administration has granted an extension of existing approvals to the SI Group's phosphite antioxidant Ultranox 626 for use as a food contact substance in PP homopolymers and copolymers under Conditions of Use A-H, as listed in Food Contact Notification 1988.

Ultranox 626 is also used in homopolymers and copolymers of ethylene, and in elastomers and engineering compounds. The extension is specific to the material manufactured at the company's Morgantown facility in West Virginia in the US.

› **www.siigroup.com**

NEO Group moves ahead with BKG

Lithuanian PET resin producer NEO Group has commissioned four more BKG pelletisers at its site at Klaipedia, where it has started up a third production line.

The company, which now claims to be Europe's second biggest supplier of PET with 480,000 tonnes of production capacity, originally bought the pelletisers as part of a block of 12 when it commissioned the first two production lines. The machines, which were supplied with polymer diverter valves, gear pumps, water systems, pellet dryers, and controls, have been in storage since then.

"We simply opened the shipping boxes, assembled the BKG components, and plugged them in," said Ruslanas Radajevas, General Manager of the Klaipeda plant. "After 12 years in storage, everything ran extremely smoothly—no problems, no troubles."

› **www.nordson.com**

PHOTO: NEO GROUP

The NEO facility at Klaipeda in Lithuania

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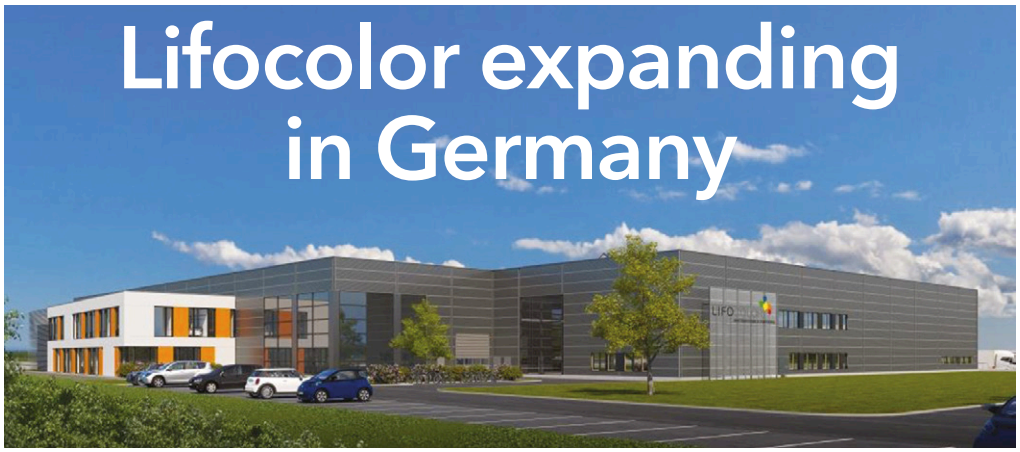
Lifocolor expanding in Germany

PHOTO: LIFOCOLOR FARBEN



Lifocolor's new German plant will add 6,000 tonnes of capacity

Thermoplastic masterbatch manufacturer, Lifocolor Farben has broken ground for a planned €20m expansion of its main plant at Lichtenfels, in the Upper Franconia region of Germany. The expansion will add 6,000 tonnes of annual capacity and is expected to take 18 months to complete.

Lifocolor said the original facility, which dates to 1986, has reached the limit of its capacity. The new investment includes construction of a 14,000m² building to house production, quality control, administration, warehousing and logistics. It will be located on a 30,000m² plot close to the existing plant, which will continue to operate.

According to the company, the new manufacturing unit will be geared to the needs of its core business segments and will use state-of-the-art technology. It will be able to produce 40% of its own energy needs, rising to 80% in the future, and will enable it to reduce CO_2 emissions per tonne of material manufactured by 40% on 2018 levels.

› **www.lifocolor.com**

Piovan buys in Korea

Italian ancillary equipment maker Piovan last month acquired Korean materials handling specialist ToBaPNC, which has a particularly strong position in the design and installation of powder transport systems for the plastics industry.

ToBaPNC has sales of around €4.5m and has manged projects Korea as well as the US, Vietnam and China, where it has worked largely with South Korean manufacturers setting up local market operations.

Piovan Group CEO Filippo Zuppichin said the ToBaPNC acquisition allows it to expand its international presence into a significant new strategic market and will give it much improved access to some of the world's leading electronics and automotive technology firms.

› **www.piovangroup.com**

Ampacet brightens up recyclate

Ampacet has introduced a new masterbatch specifically designed to improve the performance and visual appeal of post-consumer recycled PE in packaging applications.

Blue Edge 226 is said to increase film brightness by imparting a lighter, blueish tone "for a clearer, fresher look". It also reduces the risk of additional gel formation during production, according to Ampacet.

› **www.ampacet.com**

PolyOne and Gabriel-Chemie launch NIR-detectable blacks

PolyOne and Gabriel-Chemie have joined the growing number of colorant providers offering black products that can be sorted using the near-IR technologies employed in recycling operations.

Plastics containing carbon black absorb rather than reflect near-IR (NIR) light, so are not detected in automated sorting equipment in recycling plant and may end up destined for landfill or incineration.

PolyOne has launched the OnColor Infrared Sortable Black for Recyclable Packaging, which is available in liquid and solid form and in eight black shades plus custom colours. The range contains no carbon black pigment.

Gabriel-Chemie's NIR-reflective masterbatch is also free of carbon black. According to the company, it is food contact approved and laser markable and has no negative impact on mechanical properties compared to existing black options.

› **www.polyone.com**

› **www.gabriel-chemie.com**

PHOTO: POLYONE

PolyOne's Oncolor pigments aim to ease recycling

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Polymer majors report challenging first half

First half results from BASF, Covestro, Radici Group and Mexichem highlight increasingly challenging trading conditions, particularly in the automotive market.

BASF said "significantly weaker than expected industrial production" impacted both its volumes and margin development. It said this was particularly pronounced in the automotive sector, where production fell by 6% globally and by 13% in China. As a consequence, the company's preliminary Q2 sales figures were 4% down on Q2 2018 at €15.2bn; EBIT was 71% down at €500m due to much lower earnings in its Materials, Chemicals and Agricultural Solutions segments.

BASF said it now expects a slight decline in sales for the year as a whole and a 30% fall in EBIT before special items. At the start of the year, it had anticipated slight growth in each.

Covestro saw a 16.9% fall in group sales to €3.2bn. It said lower selling prices cancelled out a 1.1% increase in volumes in a situation of "ongoing intense competitive pressure and uncertainties in major sales markets". EBITDA was 53.4% down on an outstanding Q2 2018 at €459m, mainly from lower margins in the Polyurethanes and Polycarbonates segments.

Covestro also said the automotive market "developed much weaker than expected" but that construction was relatively strong. It confirmed its guidance for fiscal 2019 of core volume growth in the low- to mid-single digit percentage range and EBITDA of €1.5-2.0bn.

Italy's **RadiciGroup** reported an excellent 2018, with consolidated sales revenue up by 6% to €1.2bn and EBITDA up 16% to €185m. However, it said it is now feeling the effects of a slowdown that began late last year. RadiciGroup President Angelo Radici said he saw "stable margins despite the contraction in sales volumes" in the first half of this year but expected conditions to be "a bit tougher" in the second half, due in large part to global market uncertainty.

Mexichem reported a Q2 revenue decline of 7% to $1.8bn and an EBITDA fall of 12% to $372m. PVC and caustic soda market conditions "remained challenging", according to CEO Daniel Martínez-Valle. Sales in the Vinyls division were 8% down on Q2 2018 at $588m, with EBITDA down 29% to $105m, due to weaker margins and falling prices at that end of the vinyl chain.

› **www.basf.com**
› **www.covestro.com**
› **www.radicigroup.com**
› **www.mexichem.com**

Sibur partners with BASF

Russian petrochemical giant Sibur signed a memorandum of cooperation with BASF at the former's newly inaugurated PolyLab at the Skolkovo Innovation Centre, which is its main the main R&D hub and production centre.

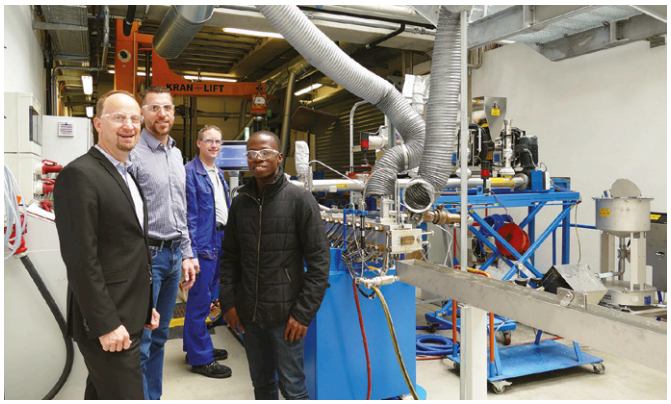
Under the agreement, the two firms will collaborate to use digital technologies in production and R&D, and to develop an innovative range of polymers using BASF's plastic additives. In addition, BASF will support the development of new technology tests at PolyLab and the companies will jointly develop new additives.

PolyLab will foster the use of recycled materials, and new PE and PP grades will be used on its pilot manufacturing lines.

› **www.basf.com**
› **www.sibur.ru**

Coperion bags biopolymer business

PHOTO: COPERION



Asahel Benin's David Romaric Tikou (right) with Coperion staff at its Stuttgart technical centre

Coperion has developed a custom laboratory compounding line to allow Benin-based plastic film maker Asahel Benin to develop a line of biodegradable and bio-based products.

The government of the west African country last year banned the use of PE bags, forcing Asahel Benin to look for an alternative to its virgin and recycled PE products.

Coperion developed a laboratory-scale compounding line to allow the company to develop bio-based formulations suitable for processing on its existing blown film equipment. The line is based around a ZSK 26 Mc^{18} twin screw extruder and is equipped with four feeders capable of handling powder, pellet, and liquids, as well as a water bath, air wipe and Type SP50 strand pelletiser.

› **www.coperion.com**

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Coperion owner buys Milacron

US industrial group Hillenbrand, owner of Coperion and a number of other manufacturing companies, has added Milacron to its portfolio in a cash and stock deal valued at around $2bn.

Milacron manufactures injection moulding and extrusion machinery, hot runner and melt delivery systems, and produces a range of fluids for metal processing. The company, which recently disposed of its Uniloy blow moulding machinery business, generated sales of $1.1bn last year.

The acquisition strengthens Hillenbrand's position in the plastics market, which will include materials handling and conveying systems, compounding technology, pelletising systems, injection moulding machines, hot runners, and both twin and single screw extruders.

Hillenbrand President and CEO Joe Raver said the deal "meaningfully transforms our portfolio and product offering by adding Milacron's leading technology solutions and sizable installed customer base to help us drive long-term growth."

The company says that a combination of manufacturing footprint optimisation and equipment cross-selling opportunities is expected to realise cost savings of around $50m over three years, with a $20-25m target set for the first 12 months.

› **www.hillenbrand.com**

Testing add-on at Altana

Specialty chemicals group Altana has bought US-based test equipment maker Paul N Gardner Company.

The business will be integrated into the Instruments Business Line of Altana's BYK Division (BYK-Gardner) and will continue to operate as Paul N Gardner. Both companies make instruments for assessing colour, gloss and physical quality of surfaces.

› **www.byk.com**

› **www.gardco.com**

PC/ABS blend powers ahead

Covestro's flame retardant Bayblend PC-ABS material is used in the frames and brackets for the lithium-ion battery modules of the E Stall Esslingen racing team's electrically-powered racing car.

The materials firm first supplied the team – which is led by students at Esslingen University of Applied Sciences and takes part in various events including the Formula Student Germany at Hockenheim Ring – in 2018. The company said it has developed a new blend for this year that offers 10% lower density while still providing the necessary mechanical, electrical and thermal properties and UL94 V-0 flame retardance.

E Stall Esslingen's electric race car battery uses Covestro flame retardant PC/ABS

PHOTO: E STALL ESSLINGEN

Covestro has added a new R&D tape line and hybrid injection moulding machines in Germany as part of an investment in its Maezio brand of continuous carbon fibre-reinforced thermoplastic (CFRTP) composites. The tape line is located at the company's Leverkusen laboratory and will develop new recipes for commercial production at its Markt Bibart facility. The injection machines are located there and in China.

› **www.covestro.com**

ECHA adds to SVHC Candidate List

The European Chemicals Agency (ECHA) has added four new substances to the Candidate List of substances of very high concern (SVHCs) for authorisation under the REACH regulation.

The four new SVHCs include the polymer antioxidant tris(4-nonylphenyl, branched and linear) phosphite (TNPP) with 0.1% or more w/w of 4-nonylphenol, branched and linear (4-NP). Both types are included for their endocrine disrupting properties.

The new additions also include 2,3,3,3-tetrafluoro-2-(heptafluoropropoxy) propionic acid (HFPO-DA), its salts and its acyl halides. This is used as a processing aid in the production of fluorinated polymers. The other additions to the list are 2-methoxyethyl acetate (which is not registered under REACH) and 4-tert-butylphenol.

Manufacturers and importers of these substances have until 16 January 2020 to inform ECHA, downstream users and, on request, consumes of any articles containing >0.1% w/w of any of them. If they reach the Authorisation List, permission will be required to continue using them after the specified 'sunset date'.

› **https://echa.europa.eu**

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PHOTO: ORION ENGINEERED CARBONS

Marine fuel rules hit carbon black

The rising price of marine fuel in anticipation of new 2020 environmental regulations is having an impact on carbon black prices, with both Orion Engineering Carbons and Birla Carbon North America announcing North American increases.

North American carbon black feedstocks are linked to marine fuel markets, where pricing has traditionally been indexed to US Gulf Coast High Sulphur Fuel Oil. As from January next year, the MARPOL 2020 regulation will bring in a 0.5% sulphur limit and marine fuel supply chain changes in advance of this are already pushing up prices.

As a result, Orion Engineered Carbons said in July it was upping prices by $0.08 per pound for rubber grade carbon black and $0.07 per pound for specialty grade carbon black produced and sold in North America.

Meanwhile, Birla Carbon has upped all North American carbon black prices by 9%. It is also changing all North American contract price formulas to index to the new US Gulf Coast 0.5% Sulphur Fuel Oil. Changes in other geographical markets will be announced and timed to local conditions, the company said.

› **www.orioncarbons.com**
› **www.birlacarbon.com**

Patent gain for Parx

Parx Plastics has been granted an Italian patent covering technologies to create antimicrobial and antibiofilm functionality on the surface of Vitamin E-blended Ultra-High-Molecular-Weight Polyethylene (UHMWPE) for orthopaedic prosthetic devices.

It aims to reduce post implant infection in hip, knee, shoulder, ankle, elbow and vertebral column joints.

› **www.parxplastics.com**

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Plasticiser sector marked by innovation and regulation

PHOTO: SHUTTERSTOCK

The PVC plasticiser industry has changed dramatically over the past decade as it has adapted to fast moving regulatory and consumer concerns and that process continues. Peter Mapleston looks at the latest developments

Few areas of the plastics industry can have seen such change – and regulatory and NGO attention – as the plasticisers sector. And those changes continue. The most obvious is the ongoing trend away from low molecular weight orthophthalate-based PVC plasticisers in favour of alternative chemistries. Many of these are bio-based; all offer more favourable environmental and health profiles.

In terms of physical performance, there is near nothing to touch diethylhexylphthalate (DEHP) as a commodity plasticiser. However, its poor toxicological profile means it is being banned in an increasing number of applications and the search has been on for some time for alternatives, preferably drop-in substitutes. **Eastman**'s latest development in this area is VersaMax Plus, a non-phthalate plasticiser that is said to mirror the performance of DEHP in dry-blends and plastisols. "You can upgrade your current non-phthalate formulation to achieve better performance, cost savings, and regulatory compliance – with a minimal reformulation," the company claims.

By providing comparable mechanical properties together with improved processing parameters, Eastman says VersaMax Plus provides advantages over other general-purpose plasticisers such as diisononyl phthalate (DINP), 1,2-cyclohexane dicarboxylic acid diisononyl ester (DINCH), dipropylheptyl phthalate (DPHP), and even its own Eastman 168 di-2-ethylhexyl terephthalate (DEHT). "Compared to general-purpose orthophthalate plasticisers, VersaMax Plus has equivalent or better performance characteristics in efficiency, fusion, viscosity, and dry times," the company claims (Figure 1).

Tom Markley, Senior Applications Development Scientist at Eastman, says that in recent testing VersaMax Plus has shown excellent performance in applications including antifatigue mats, coated fabrics, and graphic films and inks. The plasticiser is compliant with US food contact regulations and is particularly well-suited for food contact applications such as PVC gloves, hoses and tubing, and conveyor belting, as well as indirect food contact adhesives, he adds.

Evonik introduced Elatur DPT, a di(iso)-pentyl terephthalate, last year and says it enables fast and simple production of flexible PVC products. Commercial production of the new plasticiser began in May 2018 and a second production campaign began this January. "Feedback from

Main image: The plasticiser industry has adapted - and continues to adapt - to a fast changing regulatory environment with a raft of new introductions

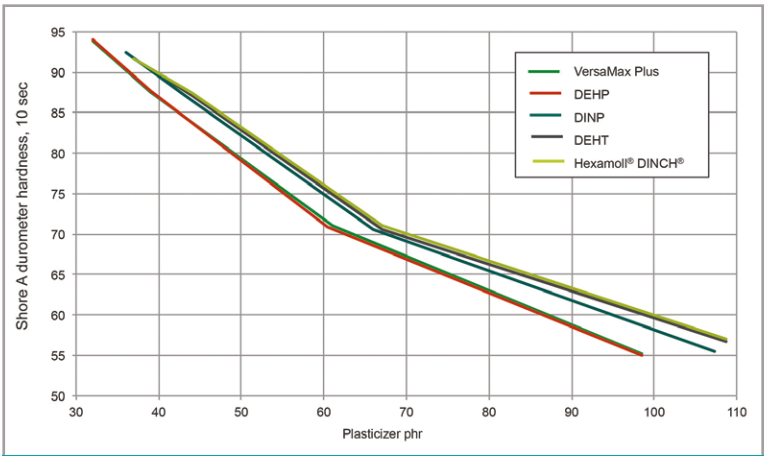

Figure 1: VersaMax Plus effectiveness measured by hardness compared to DEHP, DINP, DINCH and DEHT
Source: Eastman

customers has been extremely positive, particularly when the product is used in combination with Elatur CH (cyclohexanoate), and demand for the next few months is satisfyingly high," Evonik says.

Universal option

At **Lanxess**, Dr Thomas Facklam, Head of Application Technology, Polymer Additives, says the use of its Mesamoll as a universal non-phthalate plasticiser is well-known. "In view of its good gelling capacity with PVC, indicated by a low dissolution temperature of 120°C, Mesamoll can be used as a special plasticiser and is able to support technically in filling the gap left by the low molecular weight phthalates. The use of Mesamoll as a supplement for other plasticisers in compounds containing poor gelling plasticisers has proved highly successful," he says.

"One of the manifold uses of plasticised PVC is its use as a thixotropic agent for polyurethane compounds. In one-component PUR sealants, the plasticiser and the PVC influence the rheology and the mechanical properties. Demand also exists in this application for fundamentally high-performance and additionally phthalate-free solutions," Facklam says.

"It has been proven that Mesamoll, which is highly compatible with both PVC and the polyurethane used, is a very good alternative in 1K polyurethane applications. The remarkable resistance to saponification by chemicals or extreme weather conditions allows the development of products for demanding in and outdoor application like joint sealants in contact with concrete," he says.

Adeka points to its range of specialty plasticisers, of which it has no fewer than four. ADK Cizer C Series grades are linear and branched trimellitates, the ADK Cizer PN series comprises polymeric plasticisers, and the ADK Cizer RS series is intended for rubber. The company also produces epoxidized soya bean oils.

The Cizer C series trimellitates are said to provide superior heat aging resistance, low volatility, electrical insulation and oil resistance, making them especially suitable for wire and cable applications, films, sheets and automotive upholsteries. Polymeric PN series plasticisers offer low migration into other plastics and high resistance to oil extraction. "High viscosity polyadipates grades also demonstrate excellent oil resistance and are suitable for fuel hose uses and high-end applications in PVC and also rubbers," the company says.

Specialty developments

Grupa Azoty is also active in specialty plasticisers. The recent introduction of products under the Adoflex and Oxovilen banners are said to be the next step of the development of the OXO Segment at the company, and are based on its assembly of a range of non-phthalate specialty products. Previously, the company developed and started production of the first Polish-manufactured non-phthalate plasticiser, Oxoviflex. Capacity for that has increased in the last few months "thanks to which a leading position was reached in the group of European manufacturers," the company claims.

The Adoflex and Oxovilen products are manufactured in a new multifunctional 10,000 tonnes/yr plant at Kędzierzyn-Koźle in Poland. Adoflex is a bis(2-ethylhexyl) adipate with very good plasticising properties and is recommended for the production of food-contact materials (films in particular), due in part to its good toxicological profile. It maintains its properties at low temperatures. Adoflex can also used in the production of garden hoses, cables and coated fabrics. Depending on the application, it can be used as a main or functional plasticiser along with Oxoviflex.

Oxovilen is a di(n-butyl) terephthalate, which is characterised by fast polymerisation and low migration and gives greater flexibility to finished products. It is used, among other things, in the production of PVC liners as a functional plasticiser with Oxoviflex.

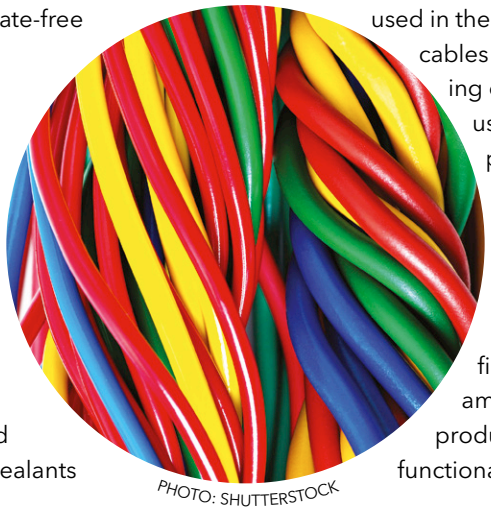

PHOTO: SHUTTERSTOCK

Right: Trimellitate plasticisers such as Adeka's ADK Cizer C series are finding application in wire and cable markets

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Grupa Azoty says more new plasticisers will be produced on the new production line (which will be officially opened next year). The company says its intention is to develop a wide range of innovative polyester non-phthalate plasticisers, including the use of bio-renewable succinic acid.

Fast-fusing plasticisers

Valtris Specialty Chemicals recently introduced Santicizer Platinum P-1700, the latest addition to its line of non-phthalate fast-fusing plasticisers. Based on cyclohexanoate technology, this grade is said to combine high solvating ability with extremely low volatility and excellent migration resistance (Figure 2). "Santicizer Platinum P-1700 can lower both formulation and production costs while improving final product properties," says Polymer Modifiers Business Director Mark Holt. "It is an effective replacement for traditional phthalate fast-fusing plasticisers as well as volatile non-phthalate plasticisers."

Valtris has also extended its line of bio-based plasticisers. Plas-Chek Platinum G-2000 is an epoxy soyate ester with an 85% certified bio-content. Holt describes it as an excellent general-purpose plasticiser with performance comparable to other non-phthalate general purpose products. "It offers good processing performance, excellent low temperature properties, and outstanding heat stability all while providing significant bio-content," he says. Plas-Chek Platinum G-2000 can be combined with a Santicizer plasticiser to meet specific processing needs if required.

PHOTO: GRUPA AZOTY

Above: Part of Grupa Azoty's new plasticiser plant at Kędzierzyn-Koźle in Poland

Perstorp, which already offers a DPHP marketed under the name Emoltene as well as a non-phtha-

late polyol ester plasticiser PETV (pentaerythritol tetravalerate) branded as Pevalen, is now preparing for the launch of Pevalen Pro, which is based on partly renewable raw materials. Pevalen Pro will be made available during Q4 2019.

Jenny Klevås, Global Marketing & Product Manager, says that while Emoltene is intended for outdoor applications exposed to tough conditions, including automotive exteriors, cables and roofing, Pevalen is suitable for close-to-human roles such as coated fabrics, flooring, food contact applications and gym products. "With Pevalen Pro we will be able to offer a superior non-phthalate plasticiser that can boost the environmental profile for flexible PVC, something that we truly believe is the right way forward," she says.

Pevalen Pro will be available with up to 40% renewable content as a first step, based on the mass balanced production concept. This involves mixing fossil-based raw materials and renewables but keeping track of their quantities and allocating them to specific products. "We believe that using the mass balance concept is the best approach to be able to make the production economically feasible," says Klevås. The product will be ISCC (www.iscc-system.org) certified, guaranteeing that the bio-based input is sustainably sourced. The certification also includes carbon footprint calculations.

Perstorp recently initiated a feasibility study investigating the possibility to recycle methanol, one of the ingredients used for producing Pevalen. The project, partly funded by the Swedish Energy Agency, involves construction of a new plant, the integration of raw materials, fuel, energy and residual streams and new logistical solutions for the methanol.

Proviron continues its focus on its phthalate-free bio-based products. "Over the last decade, Proviron noticed sufficiently diversified requests to justify the development of two general-purpose and two niche plasticisers," says Koen Engelen.

The company now offers a valerate plasticiser and what it calls an "upgraded epoxidised" plasticiser. The valerate plasticiser is intended for applications where weatherability and hydrolytic stability are critical. The upgraded epoxidised plasticiser is pitched for indoor applications "where biobased sourcing is seen as a marketing tool and a way to secure the supply," Engelen says. "In fact, besides being renewable, this epoxidised plasticiser delivers outstanding long-term stability and eases recycling."

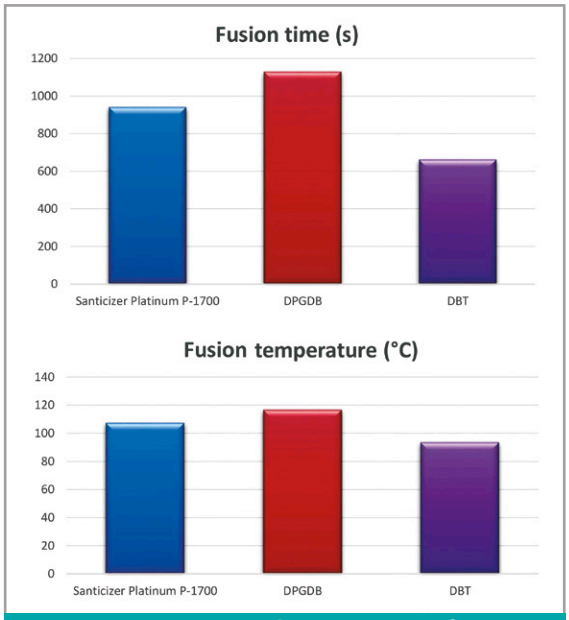

Figure 2: Fusion times and temperatures of Santicizer Platinum P-1700 compared with DPGDB (Dipropylene Glycol Dibenzoate) and DBT (Dibutyl Terephthalate)
Source: Valtris

Below: Perstorp's Pevalen PETV is suitable for food contact applications and is now offered in a part-renewable version

PHOTO: PERSTORP

Regulatory update

Alongside the new production introductions, the regulatory picture for the plasticiser industry also continues to develop. In July, the **European Chemicals Agency** (ECHA) confirmed industry expectations by announcing that it had submitted a recommendation to the European Commission to amend Authorisation List (Annex XIV of REACH) entries by adding endocrine disrupting properties of DEHP, BBP, DBP, and DIBP. Once the Commission decides on the amendment, some previously exempted uses (notably medical devices and food contact materials) will require authorisation. ECHA also recommends that the exemption for uses of DEHP in immediate packaging of medicinal products be removed from the Authorisation List.

European Plasticisers, the trade association representing plasticiser manufacturers in Europe, responded to the ECHA recommendations in mid-July. It said that: "consistent with better regulation, and in the interests of the circular economy, European Plasticisers calls on the

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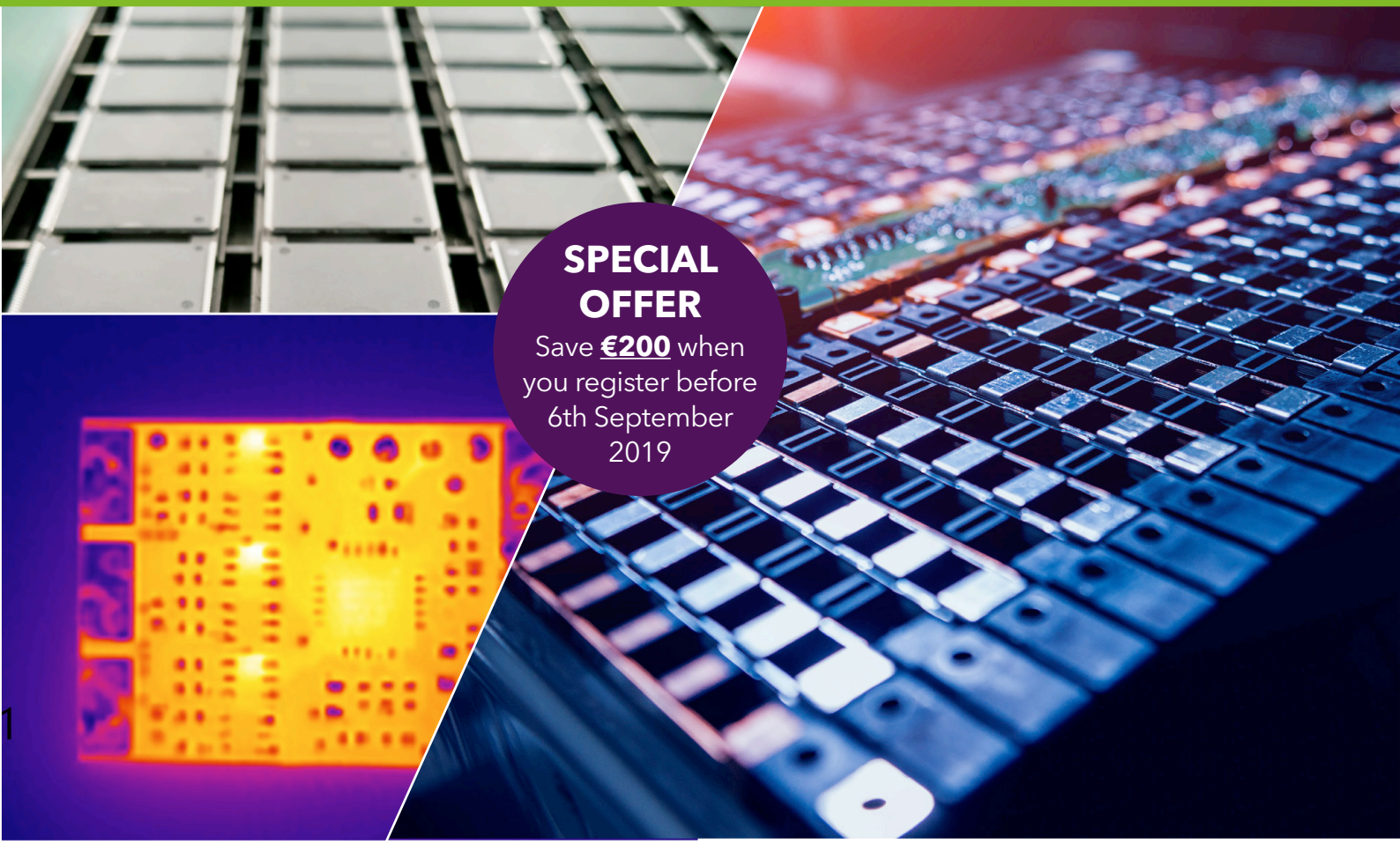

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European Commission not to adopt this recommendation from ECHA." It points out that DEHP, DBP, BBP and DIBP are already listed on Annex XIV due to Category 1B reproductive effects and further listings as endocrine disruptors are based on these same adverse effects.

"Since the substances have already been extensively regulated and phased out by this first listing on Annex XIV (and the Candidate List), the added value of second and third listings is very questionable given the limited benefits. We therefore question the efficiency and potential of this amendment to protect health and the environment since proper disposal and/or recycling are the appropriate risk management measures with respect to the environment, and health aspects are already addressed via the first Annex XIV listing which has led to the phase out and broad restriction of DEHP, DBP, BBP and DIBP in REACH related applications," the association says.

"Additionally, this amendment would further undermine the efforts of PVC recycling and the potential for a circular economy with respect to flexible PVC made with these plasticisers (mainly past use)," it adds.

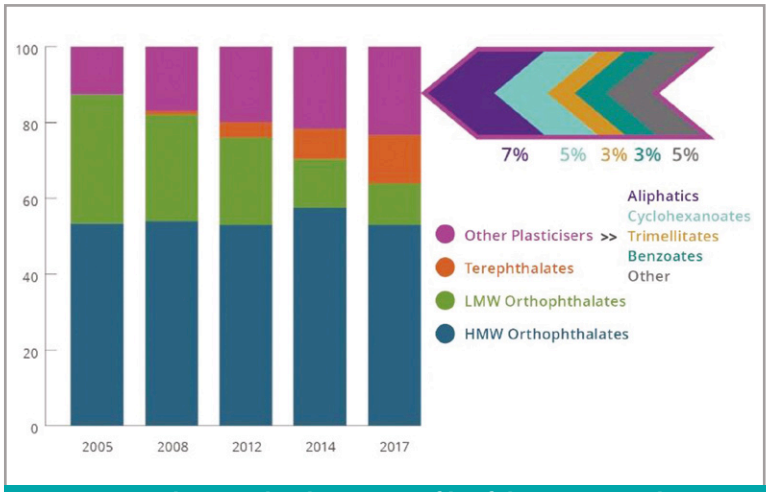

Figure 3: Data showing the changing profile of the European plasticisers market from 2005 to 2017
Source: European Plasticisers/IHS

As for DINP, another phthalate in some campaigners' crosshairs, ECHA's Risk Assessment Committee (RAC) concluded in March 2018 that it does not warrant classification for reprotoxic effects under the EU's Classification, Labelling and Packaging (CLP) regulation. ECHA concluded that DINP can be safely used in all current applications.

Challenges continue

But the battle goes on. For example, **ChemSec** – the International Chemical Secretariat – says DINP was added to its "SIN List" in 2008, and it has not found reasons to remove DINP from it. SIN stands for Substitute It Now. ChemSec describes the SIN list as "a comprehensive database of chemicals likely to be restricted or banned in the EU."

ChemSec is an independent non-profit organisation that advocates for substitution of toxic chemicals to safer alternatives. It is run with financial support from the Swedish Government, foundations, private individuals and other non-profit organisations. ChemSec says DINP was placed on the SIN List in 2008 because "reprotoxic effects and effects on development have been reported and it is a suspected endocrine disruptor."

European Plasticisers has contacted ChemSec to provide the latest scientific data and regulatory conclusions and says it is open for further dialogue.

Over in the USA, DINP suppliers are busy reinforcing their case. In May, the US **Environmental Protection Agency** (EPA) received a request from ExxonMobil Chemical, Evonik Corporation, and Teknor Apex (through the **American Chemistry Council**'s High Phthalates Panel) to conduct a risk evaluation for DINP. A request was also received from ExxonMobil to conduct a risk evaluation for diisodecyl phthalate (DIDP).

Speaking on behalf of the companies at the time, the ACC said the requests were submitted because industry has "full confidence" in the substances' safety, and that a confirmation of this fact by a regulatory body would be positive for businesses and consumers.

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PHOTO: POLYCOMPOUND

Reactive compounding may close the recycling circle

*Compounding extruders can provide an effective means for chemical modification of polymers. **Peter Mapleston** reviews some of the latest developments, including new recycling ideas*

The use of compounding extruders and co-kneaders as continuous chemical reactors offers interesting opportunities for those looking for innovative polymer performance modification solutions. Reactive extrusion provides a well-established route to production of different types of thermoplastic elastomers – TPVs in particular but also TPUs – and can also be employed for polyamides. More recently, it has been applied to the development of compounds with improved flame-retardant properties, and also – and this may yet prove to have the greatest long term impact on the plastics industry – to the creation of new high-quality polymer compounds from post-consumer recyclate. This article takes a look at a few of the most recent developments.

The **Institut für Kunststofftechnik** (IKT) at the University of Stuttgart in Germany has, over the years, built up considerable experience in the field of reactive extrusion, especially in the scope of increasing the molecular weight of a polymer to enable additional processing methods. One focus of its current research is the improvement of flame-retardant polyamides. "To increase flame retardancy, polyamides are usually compounded with additives like red phosphorus or halogen-nitrogenous or phosphoric molecules," says Sinja Pagel, a Research Associate at the IKT. "However, in order to achieve an acceptable flame retardance, very high amounts of these additives are necessary.

Main image: Reactive extrusion techniques allow polymers to be chemically modified to lift performance of both virgin and recycled resins

PHOTO: SHUTTERSTOCK

Above: IKT is researching ways to use reactive extrusion to bind flame retardant groups to PA polymers

This has negative effects on the mechanical properties of the polyamide or can lead to a surface migration if the additive is physically bonded to the polymer chain."

For this reason, the IKT has been cooperating with the German **Institute for Textile and Fibre Research** (DITF) in Denkendorf on a way to chemically bind additives to the polyamides, along with their compounding and processing. "The chemical binding can be achieved by means of binding the flame retardant into the polymer chain during the polyamide synthesis. However, after completing the synthesis, the flame retardancy molecules occupy many of the polyamide end groups. This in turn impedes the chain growth and leads to low molecular weights and low viscosities," she explains.

"As a result, these intrinsically flame-retardant polyamides can be processed into fibres very well, but they are unsuitable for classical plastics processing methods like injection moulding. To increase the viscosity and to enable more processing methods, a reactive extrusion with linear chain extenders like epoxides, oxazolines or (bis) caprolactames is helpful," she says.

The IKT and DITF researchers used a specially-modified co-rotating twin screw extruder with a clamshell-type openable cylinder to observe the reaction process of a linear chain extender with the flame-retardant polyamide over the whole length of the processing section. Rheological measurements proved that the viscosities of the produced compounds could be increased to the level of standard polyamides. Further testing has confirmed that the compounds can be processed via injection moulding.

Flame performance

In addition, Pagel says, a flame test showed that the chain extension did not affect the flame retardance. "The burning durations were significantly below the values of a standard-polyamide. Therefore, the IKT was able to provide the new intrinsically flame-retardant polyamide access to typical plastics processing methods," she says.

Reactive extrusion with molecular weight additives is possible with various polymers, including polyamides, and also with some biopolymers, most notably polylactide (PLA). "Due to the similar properties of polylactide to polystyrene, in the long term, polylactide might replace PS-based foams," Pagel says. "For now, the production of PLA foams with a low density and consistent cell morphology is difficult to realise. This is because of its low melt viscosity and strength as well as its sensitivity to hydrolysis and low crystallisation rate."

Working with the Department of Polymer Engineering (PE) at the **University of Bayreuth**, IKT has researched the influence of material properties on modification for foaming and on the characteristics of the final foam. Initially, the thermal and rheological properties of various PLAs were investigated with the focus placed on the molecular properties of the different PLA types – chain length, number of reactive end groups, and isomeric ratio, for example.

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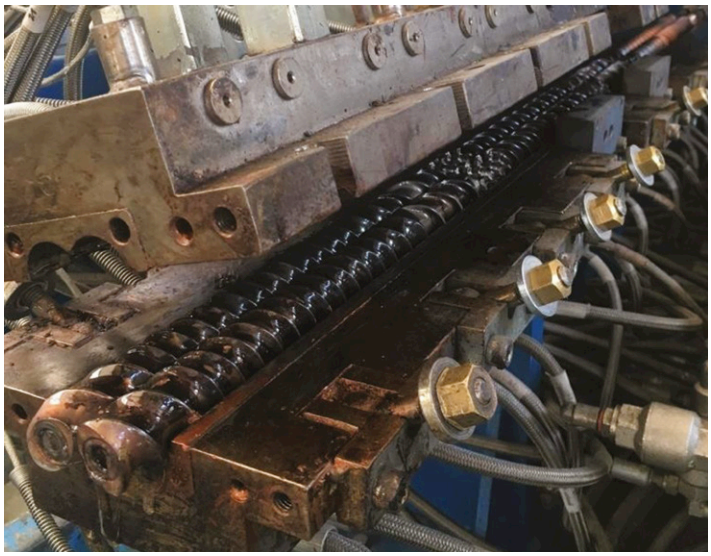

This specially modified twin screw extruder with easy-open clamshell barrel is used for reactive extrusion research at IKT

PHOTO: IKT

Bottles blow moulded in PLA modified using reactive extrusion at IKT

In the next stage of the work, selected PLA types were chemically modified using reactive extrusion with a multifunctional epoxide and then characterised. In all cases, the epoxide generated a partly cross-linked polymer structure. "The acid value and the thermal stability of the PLA especially determined the reaction process of the additive with the PLA" Pagel says. "However, secondary reactions can occur, which in turn can affect the later stages of the foaming process under certain conditions. The obtained compounds could be already processed to bottles via blow mouldings well as to foams with comparable properties to PS."

With reactive compounding technologies being applied to so many diverse applications, it is very difficult to identify market or material trends. At compounding extruder producer **Coperion**, Chemical Applications Business Segment Manager Oliver Beiser says that business in the reactive extrusion sector is quite inconsistent in terms of volume on a month-to-month basis. There are some indications, however, that as the circular economy takes shape and the need to use recycled plastics in high-performance applications grows, reactive compounding may provide an important solution to the problem.

Whatever the final application, Beiser says the common underlying theme of customers is a desire to improve efficiency in their operations by moving from discontinuous production in batch mixers to continuous production with twin-screw extruders. He says that twin-screws can make enormous differences to production schedules, with residence times of well under 10 minutes compared with many hours for traditional batch processing.

Reactive trials

Japan Steel Works (JSW) has been reinforcing its presence in Europe in recent years, with one of its focus areas being reactive extrusion. It opened an extrusion technical centre in Belgium in 2010 to carry out various trials for customers using the latest JSW lab extruder equipment. In 2012, the office became a local subsidiary, Japan Steel Works Europe, and two years ago the extrusion technical centre was relocated to Dusseldorf in Germany. JSW said this was to allow it to take on trials of more specialised projects such as reactive processing and devolatilisation and to improve accessibility of the facility to customers.

According to JSW Sales Representative

PHOTO: JSW

Right: This TEX25αIII twin-screw extruder is one of three units available for reactive extrusion trials at the JSW European technical centre

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Right: The MMAtwo project aims to use reactive extrusion to recycle some of the 300,000 tonnes of PMMA produced annually in Europe

Hayato Hobo: "The upgraded trial facility has been realised to conduct the wider range and more difficult trials in cooperation with the customers. We also hope to further strengthen our team here, for example with process engineers, in order to provide the advanced solutions against the growing requirements. Our strength is to be able to respond to customers' challenging requirements flexibly."

The technical centre is equipped with three laboratory extruders (TEX25αIII, TEX30α and TEX44αIII) for trial-based production of a wide variety of plastics material types. "The most challenging trial series would be, for example, chemically reactive processing and devolatilisation processing," says Hobo.

Upgrading acrylic

One area where JSW's expertise in reactive extrusion is currently being applied is in the **MMAtwo** project, funded under the European Union's Horizon 2020 research and innovation programme. The overall aim of this four-year project, which commenced last October and involves 13 partners, is to develop a new recycling value chain for polymethylmethacrylate (PMMA) based on production of second-generation methyl methacrylate (MMA) monomer by depolymerising post-consumer and post-industrial PMMA products.

According to the project organisers, JSW Europe provides the core technology of PMMA depolymerisation in its twin-screw extruder (similar technology has already been used in Japan). Within the MMAtwo project, JSW Europe will conduct PMMA depolymerisation trials on collected PMMA scrap in its extrusion technical centre with the goal of further improving the technology.

MMAtwo project organisers say that around 300,000 tonnes of PMMA are produced in Europe each year, representing a value of close to €1bn.

Below: Addisperse has developed an additive masterbatch to ease vis-breaking of recycled PP films and non-wovens

PHOTO: SHUTTERSTOCK

PHOTO: SHUTTERSTOCK

They say that although MMA can be obtained from the polymer by thermal depolymerisation, it is estimated that currently only 30,000 tonnes of waste is recycled each year. They also point out that most of this current recycling involves a lead-based process, which has the potential only to repolymerise the monomer obtained into low-quality PMMA. Furthermore, the focus until now has been on post-industrial PMMA, rather than end-of-life material "which represents the main share of the total PMMA waste stream which is either exported, landfilled or incinerated."

The PMMA recycling process will be validated at a TRL 7 scale (which means Technology Readiness Level 7 or a pre-commercial system demonstrated in an operational environment), enabling the possibility of a first commercial unit soon after the end of the project.

Polyamide recycling

Returning to the IKT, Pagel says reactive extrusion also has potential for use in polyamide recycling. "Polyamides are very suitable for recycling because of their high mechanical values and chemical resistance against many organic solvents," she says. Cast polyamides are especially suitable, she notes, due to the availability of large amounts of waste of this form of the polymer. Furthermore, cast polyamides have a higher molecular weight than typical polyamides synthesised through polycondensation.

"However, the high molecular weight degrades if the cast polyamides wastes are extruded without additives. This can be traced to the fact that the waste still includes residual catalyst from the synthesis. The degraded molecular weight results in a melt viscosity that is suitable for injection moulding but not for processing methods like blow or thermoforming," Pagel says.

"Again, reactive extrusion can solve this prob-

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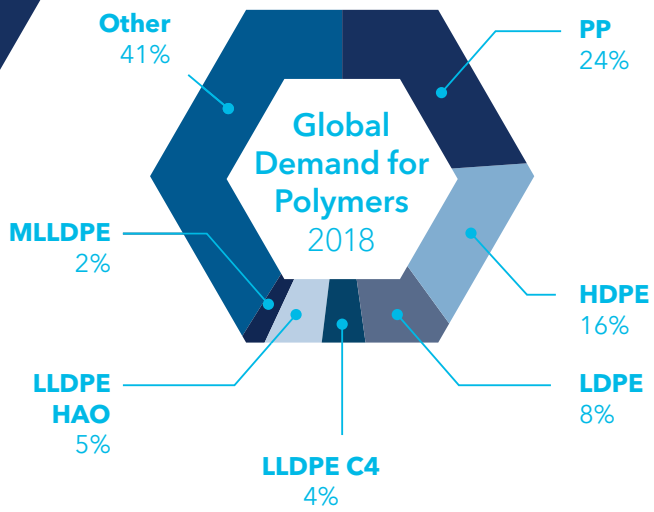

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lem. On the one hand, it is possible to use carboxylic acids in the compounding process. Carboxylic acids serve as a catalyst catcher so that the molecular weight degradation will be contained. On the other hand, one can use molecular weight increasing additives. Again, these additives serve as bifunctional linear chain extenders or as multifunctional polymeric backbones like a styrene maleic anhydride copolymer," she says. Pagel adds that this is considerably cheaper and more sustainable than crosslinking through electron irradiation or special polyamide variants including glass fibres.

The IKT has been able to increase shear viscosity in polyamides through reactive extrusion with both molecular weight-increasing additives and catalyst catchers. Additionally, it has been able to produce semi-finished products and to subsequently form them to components.

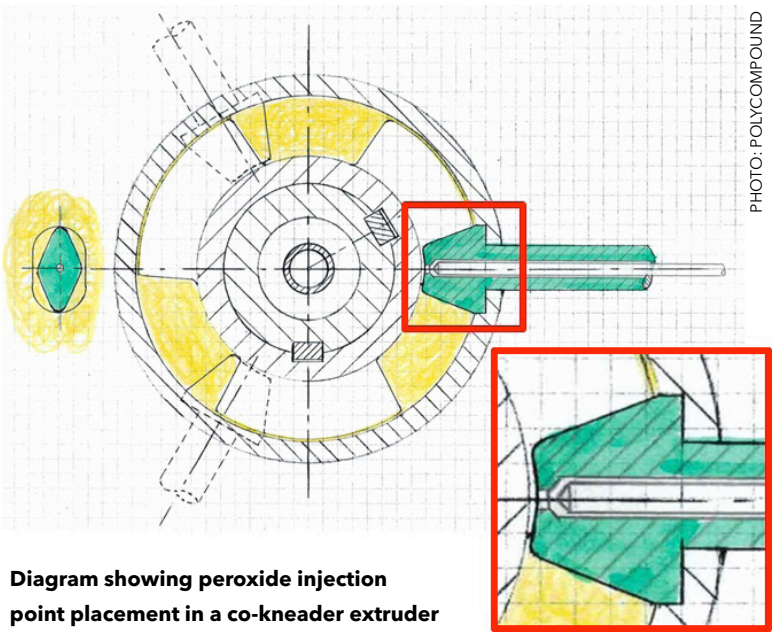

PHOTO: POLYCOMPOUND

Diagram showing peroxide injection point placement in a co-kneader extruder

Solutions for waste PP

The growing – some might say almost vital – need to find new solutions for recycling post-consumer plastics is creating extra force for development of chemical recycling technologies. Not all of them will involve use of compounding extruders as reactors, but it is quite possible that a number will. The MMAtwo project mentioned earlier is one example but another area of post-consumer recycling that involves reactive compounding is in upgrading polypropylene waste. For this application, **Addisperse**, a producer of speciality additive masterbatches, has recently begun offering a peroxide masterbatch, eNCORE NC 220 C, which contains a proprietary nano-additive that aids in vis-breaking polypropylene. Technical Director Paul Albee says the nano-additive improves dispersion of the masterbatch in the polypropylene, improving the uniformity of the action of the peroxide.

The principal target application for the new masterbatch is in recycling post-consumer waste derived from sheet, film, and non-wovens and turning it into a compound with a higher melt flow index suitable for injection moulding. Albee says there has been increasing activity, certainly in the US, in this area since China closed its doors to imports of post-consumer plastics waste.

Albee says the development of the new masterbatch dates back four years or so when the company, responding to requests from potential customers, began studying the benefits of nanotechnology to aid the dispersion of additives based on calcium

PHOTO: STEER

Right: Steer is fine tuning its Omega series extruders for high quality TPV production

and zinc that are usually difficult to disperse in PP. The application with peroxides came about almost by accident, he says.

The new masterbatch is said to provide the same effect as regular peroxide masterbatches at addition rates some 20-25% lower. The pelletised product is claimed to have "exceptional" storage stability: Albee says it will not crystallise or fuse together during shipping or storage, even under extreme warehouse storage conditions.

Crosslinking peroxides

Swiss compounder **Polycompound** is also working with peroxides, but in its case, it is creating polyethylene compounds (filled and unfilled) that are subsequently crosslinked, typically during production of cable and tubing, using the Sioplas process. This employs a mixture of peroxide and silane to produce a polymer with vinyl silane grafts that is subsequently crosslinked in a separate process once the cable or tube has been extruded. Crosslinking occurs via silane groups grafted onto the PE, with the function of the peroxide being to break the PE chains to provide locations for the grafts. The company also grafts maleic anhydride (MAH) onto polymers (including polyolefins, PVdF, and others). Once again, peroxide is frequently used as the polymer chain opener.

Polycompound operates exclusively with co-kneader technology. Grafted compounds can be produced on twin-screw extruders, but Peter Imhof, Head of Sales at the firm, says co-kneaders provide greater flexibility over where the peroxide, which it normally uses in liquid form, can be injected. It can do this directly into the melt at various positions along the co-kneader extruder using a pump. "This provides us with the control we need over the distribution of the peroxide in the compound," he says. "We only have a very small temperature window to work in, so this is crucial for a good compound."

Staying below the temperature limits required with peroxide can be very difficult during a normal compounding operation, Imhof explains. This is why a two-step process is very often used, separating peroxide addition from other compounding steps. However, he says with appropriate equipment such as a well-configured co-kneader, it is possible to stay within the limits in a one step process, which enables cost savings to be made.

One of the best-known examples of the use of reactive compounding is in production of thermoplastic vulcanisate (TPV) elastomers, which incorporate partially crosslinked EPDM rubber in a polypropylene matrix. However, according to twin-screw extruder producer **Steer**, achieving good dispersion of the elastomer in the polypropylene using a twin-screw extruder is not a simple task.

"Steer understood this problem faced by several compounders globally and decided to offer an industry solution," says a company spokesperson. "By deploying its patented FGT technology and know-how, Steer will be able to disperse elastomer in thermoplastic polymer without causing degradation."

Key challenges

The main challenges to overcome, according to the company, are: achieving an optimum dispersion of EPDM and crosslinking agent in the PP; and avoiding the shear peaks that can otherwise cause degradation of the elastomer. In developing its solution, Steer used an Omega 40H Class (L/D 60) lab extruder for R&D trials. It calibrated materials and configured screws specifically for the extruder. "Use of DSA & FKB elements provides gentle dispersive mixing along with elongation mixing of elastomer and cross-linking agents, reducing peak shear without shift in desired properties," Steer says. "Steer special elements will help in obtaining final uniform pellets without any degradation."

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Let the countdown to K2019 begin! Here, and on the following pages, we take a look ahead to the global plastics industry's essential event – and provide useful links to help you get the most from your visit

Getting ready for K2019

The world's largest plastics trade fair is little more than 10 weeks away; K2019 will take place at the Messe Dusseldorf show ground in Germany on 16-23 October 2019.

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

Regular K visitors may wonder about the 18 halls, which is one less than in 2016. The explanation is that Hall 2 has disappeared, subsumed into a new and much larger Hall 1 that now covers 12,000m^2. The southern entrance is also being updated but will not be quite ready for K.

Attendance in 2016 was slightly up on the previous event in 2013 – by around 14,000 visitors to 232,053. Messe Dusseldorf will be hoping for further growth although the plastics market is certainly less buoyant than three years ago.

One of the big challenges facing the sector is sustainability, so expect to see much around recycling, waste management and the Circular Economy throughout the exhibition. Other key themes will include digitalisation in the form of Industry 4.0 smart technologies and additive manufacturing.

The Science Campus, designed to allow business to exchange ideas and information with academia, will also make a return to this year's event.

Compounding World magazine at the show

Compounding World will be exhibiting at K2019 on stand C11 in Hall 7. By paying a visit, you can find out more about all of our digital plastics magazines and apps.

The stand is run by our parent company AMI, which will be showcasing its latest industry directories and market reports, as well as its many international conferences and next year's European and US Compounding World Expos.

In the run up to the K2019 event, *Compounding World* will be publishing detailed previews of the innovations that will be on show.

Look out for the K Preview Issue in September and the K Show Special in October. You can follow the news as it happens on our Twitter feed **@Plasticsworld** and we will also be reviewing the event in detail in our November and December editions.

If you are exhibiting at K, please let us know about the products you will be showing. Send your press releases to the editor, Chris Smith at **chris.smith@ami.international**. Full details of our special coverage of K, including advertising rates, can be found in our **media pack**.

Dates: 16-23 October 2019 **Venue:** Dusseldorf Fairground, Dusseldorf, Germany
Hours: 10:00 to 18:30 daily **Organiser:** Messe Dusseldorf **Website:** www.k-online.de

Click for information

Use our hand-picked selection of weblinks to make sure you have a productive and enjoyable visit to K2019

BUY YOUR TICKETS

Purchasing your tickets online in advance can save you up to €47. A three-day ticket bought online costs €108 instead of €155 when purchased at the exhibition. One-day tickets are €49 in advance or €75 at the show. Order your tickets now by clicking **here**

GET K ON YOUR SMARTPHONE

Lots of useful K 2019 data is now available on your smartphone or tablet, including exhibitor and product databases, exhibition plans, travel information, hotel listings, city guides and restaurant reviews. To download the app, visit the page **here**, which has links to either the AppStore (for iPads and iPhones) or Google Play (for Android devices). There are also instructions for users of BlackBerry mobile devices.

BOOK YOUR HOTEL

Dusseldorf's hotels quickly fill up for the eight days of K and the best options go early. Find out what's still available and make your reservation as soon as possible at the official **website**

MAKE THE MOST OF DUSSELDORF

After a hard day at the show you will have earned some relaxation time. Make the most of your evenings in the city by checking out the restaurants, pubs, bars, culture and entertainment on offer.

This official guide has useful listings as well as guides to the sights and neighbourhoods: **http://bit.ly/DusseldorfGuide**

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

And if the Altstadt and its 260 pubs get too crowded, try heading to the Media Harbour, for its modern architecture and venues, which include restaurants, bars and clubs. Find out more about the area's attractions here: **http://bit.ly/K2019mediaharbour**

ORGANISE YOUR TRAVEL

Dusseldorf is well connected and getting around the city is easy thanks to its excellent public transport network. And don't forget that your admission ticket for the exhibition allows you to use the local buses and trains for free. Full details of this offer can be found in the Messe Dusseldorf travel guide along with lots of information about travelling to and around the city. It also contains plenty of useful maps. Download the guide from **here**

CHECK OUT THE EXHIBITORS

With more than 3,000 exhibitors to choose from and a total exhibition area of more than 170,000m², it makes sense to plan your time at the show before you head off. The good news is that you can search for participating companies by name and by product using the daily-updated online K2019 database.

To search by company, click **here**

To search by products, click **here**

You can also locate companies using the interactive floorplan which can be found **here**

SOAK UP SOME CULTURE

There is more to Dusseldorf than K – it is the capital of North Rhine-Westphalia, after all. The city is home to more than 100 galleries and museums but the biggest is the Museum Kunstpalast, located in the centre of the city near Königsallee. During the fair, the Kunstpalast's special events include: a retrospective of Dortmund-born artist Norbert Tadeusz, including around 40 paintings and works on paper; and an exhibition of art created in the former East Germany.

Find out more here

TRY THE RETAIL EXPERIENCE

If retail is your thing – and especially designer goods – then Dusseldorf will not disappoint. Königsallee – known as 'Kö' to locals – includes many of Europe's leading fashion names and is likened with Knightsbridge in London or Fifth Avenue in New York. But neither of those locations can boast a setting to match the tree-lined man-made 'river' that runs through this premium shopping district. Catch the flavour here: **http://bit.ly/K2019konigsallee**

DON'T FORGET THE ALTBIER!

Regular K visitors will already know that Dusseldorf's local brew is the Altbier, a malty copper-coloured ale of around 4.5% strength produced using a special top-fermented lagering method. The name translates as 'old beer' but is actually derived from the Latin word 'altus', which means 'high' and refers to way the yeast rises during brewing. Try it out in one of the city's on-premise brew-pubs. Details of these and a short history of Altbier can be found here: **http://bit.ly/K2019altbier**

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WPC growth continues

Made from recycled plastics and wood waste, WPCs appeal for their sustainability but rely on different additives for their durability. Jennifer Markarian looks into the growing US market

PHOTO: AMERICHEM

Main image: Improved performance and keener prices are ensuring growth for WPCs in North America

There is much talk today about improving product sustainability by using recycled plastic content and bio-based materials. Well, wood-plastic composites (WPCs) have been quietly doing just that since the 1990s.

WPCs are typically made from post-consumer recycled plastic – such as polyethylene from grocery bags or milk jugs although PP and PVC is also used – compounded with wood fibre or wood flour (a waste product). They are most widely used in building and construction products such as decking and railing, but are increasingly finding roles in furniture, flooring, automotive, and even consumer goods. One of the most recent applications for WPC is as a backing or cushioning material for luxury vinyl tile (LVT) flooring.

Natural fibre composites (NFC) are similar to WPC and are also used in a variety of applications. However, as the name implies, NFC products use various types of natural fibres in place of wood fibre in their formulations.

The "eco-friendly" message of WPC and its benefit of low maintenance (along with quality that has improved over the past decades) are helping drive growth of composite decking and related products in the US in particular. The ongoing trend of building "outdoor living spaces" is another factor in that growth, as is the move on the part of several manufacturers to introduce WPC decking that is closer to the price of pressure-treated lumber.

US-based WPC manufacturer **Fiberon**, for example, introduced its lower-priced Good Life decking line in 2014. The profiles have a WPC core with a protective HDPE cap on three sides (the company claims that the capped WPC market segment is growing at nearly 10% annually).

"WPC based building products, such as composite decking specifically, continue to convert market share in North America, Europe and Asian markets due to their durability and sustainability characteristics versus real wood," says Fiberon Vice President Innovation Peter D Kotiadis. However, he points to significant differences in formulation in these different regions. "Leading manufacturers in the United States and Canada rely on a deck core formula which is primarily recycled polyethylene, whereas Europe leans more towards the use of polypropylene based streams. Fillers can also vary, with rice-hulls and bamboo flour being very common in Asia, versus hardwoods and softwood fillers elsewhere."

Kotiadis also highlights the different geometric and aesthetic requirements. "Streaked co-extruded 'solid' rectangle boards prevail in North America as compared to uncapped hollow-cored boards which are more popular in foreign markets," he says.

Planning growth

The Enhance Basic line from **Trex** was also introduced as a lower-cost option and is expected to play a part in its ambitious growth plans. "Demand trends indicate the conversion from wood has

PHOTO: FIBERON

Above: Fiberon WPC profiles are capped on three sides with HDPE

accelerated at a faster pace than expected with our recent introduction of the Enhance decking products. This has required that we accelerate our planned capacity expansion by one year," says Trex President and CEO James E Cline.

As a consequence, in June this year the company announced plans to invest approximately $200m between 2019 and 2021 to increase production capacity of WPC profiles by approximately 70%. The investment will include a new facility at its existing Winchester site in Virginia and additional production lines at its Fernley facility in Nevada.

It may seem surprising but Trex claims to be one of the largest PE recyclers in the US, using plastic grocery bags as well as other PE films – such as bread bags, dry-cleaning bags, and shrink and stretch wrap – in its decking. Earlier this year, the company announced a new name for its retail recycling collection program: NexTrex. It said it hopes this will "elevate awareness and further expand its reach by engaging even more retailers and collection sites."

Right: MoistureShield WPC products are made with up to 95% recycled content

Trex says its manufacturing process reuses "nearly 100 percent of runoff" and salvages more than 500m pounds (227,000 tonnes) of plastic film and reclaimed wood each year. In April, the company was named the "greenest" decking in the Green Builder Media's 2019 Reader's Choice Awards for the ninth year in a row.

AZEK Building Products is also expanding. In April, the company officially opened the TimberTech Recycling Plant in Wilmington, Ohio, to recycle HDPE – from post consumer shampoo bottles, milk jugs, and plastic wrap – to produce the core of its TimberTech capped composite decking. The company says its goal is to recycle up to 200m pounds (90,000 tonnes) of waste material by 2020.

Following its acquisition by US-based CRH Company's Oldcastle APG in 2017, Advanced Environmental Recycling Technologies Inc has been renamed **MoistureShield**. This is also the name of its composite decking, which is made from 95% recycled wood fibre and PE and includes uncapped and capped WPC variants. The company recently introduced two new colours using its CoolDeck technology, which it says reduces heat absorption by up to 35% compared to conventional capped WPC.

Additive options

One factor in the growth in demand for WPCs is the improved performance and in that additives play a crucial role, whether for production of compounded pellets or directly extruded into parts such as deck boards. Stabilisers (antioxidants) prevent polymer degradation during processing and end use. Coupling agents are frequently used to improve adhesion of the polymer to the wood or natural fibre. Because formulations are typically 50–75% wood or even more fibre/flour, lubricants and processing aids are crucial for aiding dispersion as well as improving extrusion and reducing the energy to process. And, since many WPC applications are intended for long-term outdoor use, UV stabilisers and pigments are also key parts of the recipe.

A variety of negative issues can result from moisture absorption by the wood – or natural – fibres. This risk is minimised in "capped" profiles, where an all-polymeric cap layer formulated specifically for weatherability is co-extruded over a core WPC layer. Concentrating additives in the outer layers is also more cost-effective, although the co-extrusion process is more complex.

Americhem's e-Cap is a branded, custom-designed, pre-coloured compound designed to meet

PHOTO: MOISTURESHIELD

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Right: Consumers are requesting WPC colours that mimic trends in indoor flooring surfaces, says Americhem

the functional requirements of WPC. The latest addition to that line is an HDPE high-performance compound for capping WPC that features the ability to control gloss and achieve rich, dark colors and scratch performance.

"Our eCap product allows customers to offer a more realistic wood appearance, darker colors, better weathering and durability while working with their preferred base resin," says Mike Fair, Americhem's Market Segment Manager for Architecture."eCap can also help end-use products achieve better impact resistance, improved resistance to moisture whitening, scratch and mar resistance, adhesion of cap to substrates, and potentially a Class A fire rating."

In addition to bold colours and improved scratch and mar performance, Kelly Gager, Americhem's Development Manager Building & Construction, sees requests for unique variations that mimic trends in interior flooring, such as distressed or hand-scraped looks. Control of gloss is also important, and colorants that provide a white-washed appearance (such as grey and grey blends) are also in demand. Flame retardance and control of static build-up are other demands in WPC met by additives.

The high levels of fibre content in WPC and NFC products require coupling agents, which create a chemical bond between the wood or natural fibre and the polymer, says Matthias Stuecke, Deputy General Manager at **Mitsui & Co. Deutschland**. He sees companies increasing the percentage of wood fibre in some compounds up to as much as 90% wood content. The company offers its PA-BOND line of maleic anhydride-based coupling agents, produced by Polymer Asia in Vietnam, for such applications. The additives reduce water absorption and improve flexural, impact, and/or tensile values in WPC, says Stuecke. Mitsui also offers stabiliser additive packages for WPC.

PHOTO: WACKER

Right: Wacker's Genioplast Additive for WPC was developed with the Wood Competence Centre in Austria

PHOTO: AMERICHEM

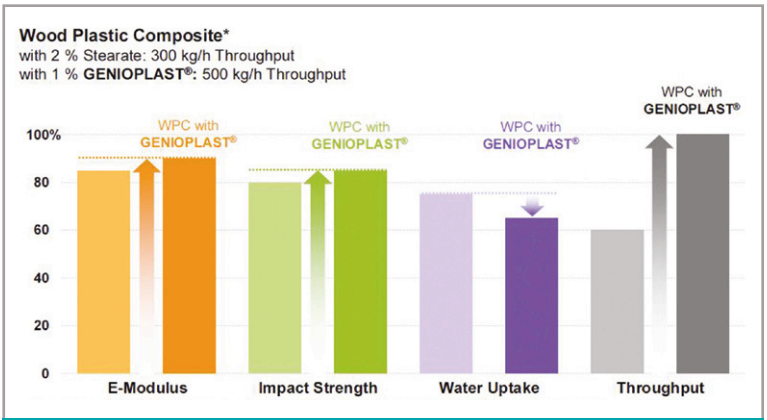
Improving flow

Struktol Company of America's Struktol TPW 617 and TPW 618 lubricants are designed for WPC processors that need to reduce viscosity and improve flow through the die without negatively affecting mechanical properties or functional requirements, such as adhesion to capstock compounds. The company says the new products work at loading levels up to 50% lower than other commonly used lubricants.

Struktol has also introduced Struktol FPC 420, a low surface gloss, full-cap compound with improved scratch and mar resistance, and Struktol FPC 230, a masterbatch for polyethylene cap materials designed to provide low surface gloss, scratch and mar resistance together with substrate adhesion. Both products can be supplied with or without Struktol's proprietary UV stabilisation package.

Although lubricants and coupling agents are often both used in WPC formulas, the combination can sometimes cause processing variability, according to Kevin Janak, Director of Application and Product Development, Coatings and Composites at **Lonza**. In a presentation given at AMI's Wood-Plastic Composites conference in November 2018, he explained that the company has experimented with a number of developmental lubricants to determine if coupling agents could be eliminated, or their use minimised, while still maintaining acceptable water repellency.

The researchers' thinking was that a reduced level of coupling agents would benefit processing. Lonza's experiments showed that an interaction exists even with non-metal-based lubricants, and that the presence of a talc filler sometimes causes negative interactions with lubricants. Experiments with a developmental, non-metallic lubricant in a formulation with talc did show lower water absorption, he said. ❯



Effect of Genioplast Additive for WPC on mechanical properties, moisture absorption and throughput in WPC production compared to typical stearate lubricant
Source: Wacker

Better processing

Wacker has developed processing aids designed specifically for WPC in collaboration with the Wood Competence Center, which is based at Linz in Austria, and introduced a first Genioplast Additive for WPC, based on a thermoplastic silicone elastomer, at K2016. The additive, which is supplied as a masterbatch, acts primarily as a lubricant to reduce the coefficient of the plastic component of the blend and thus reduce the internal and external friction during extrusion. Using the additive enables more stable processing with reduced energy input, allowing a higher throughput to be achieved.

The company says that an additive addition of just 1% provides good lubrication, compared to 2-6% additions of conventional lubricants (typically stearates) to achieve the same effect. Tests also showed that in a mixture of 36-37% polypropylene and 60% wood flour, a 1% addition of the additive increased throughput by 65%.

"The copolymer consists of a polar unit that attaches to the wood particles via hydrogen bonds. The non-polar silicone chain projects outwards, which improves the sliding of the functionalised wood particles past each other," according to the company.

In addition to improved processing, the Genioplast additive optimises dispersion of the wood or natural fibre in the polymer and improves compatibility between the fibre and the matrix polymer. These improvements enhance mechanical properties such as impact strength and flexural toughness, the company says. Wacker says that the Genioplast WPC additives have also been shown to reduce water absorption, which improves long term weathering resistance.

AFI Global, which does business as Addisperse, is developing a pelletised masterbatch containing a peroxide pre-dispersed in a polymer carrier that is intended to allow highly accurate feeding of peroxide for low-level controlled crosslinking. "Cross-linking creates better adhesion between the wood-fibre filler and the HDPE component of the composite. This improves flex strength, which can allow production of thinner boards," says Paul Albee, Vice-President of Technology at the company. He says that peroxide for crosslinking polymers may be provided as a liquid or as a crystal isolated on a powder, but that the pelletised form developed by Addisperse is easier to use in typical WPC processing. The product is currently in field testing.

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Facing the challenges of wear and abrasion

Screws and barrels must stand up to the full rigours of the compounding process and today's demanding formulations are intensifying those challenges. However, there are solutions at hand, writes Mark Holmes

As formulations move to ever more demanding polymers and additives, twin-screw compounding extruders are being called on to withstand increasingly extreme processing conditions, abrasive fillers and corrosive volatiles, as well as accommodating the unpredictable nature of some recycled plastics. The brunt of the challenge is borne by the extruder screws and barrels, which are expected to handle these new demands without compromising on performance or process flexibility.

In terms of development, compounding extruder manufacturers and suppliers of replacements parts alike are fine tuning their screws and barrels to perform at their peak in any processing applications. At the same time, they are hoping to improve processing characteristics while extending serviceable lifetimes and simplifying changeover and maintenance times.

In terms of wear, the very high screw-to-barrel loadings found in twin screw compounding machinery can cause both adhesive and abrasive wear at the interface, according to **Nordson Corporation**. "The potential for wear and corrosion is especially great in processing rigid PVC and other halogenated materials, plastic/wood composites, and highly filled compounds," says Walter Smith, Senior Extrusion Application Engineer, who adds that one key approach to meeting these challenges and extending the working life of the plasticating system is to use screws and barrels with super-hard surfaces.

"Compatibility of screw and barrel is especially critical in counter rotating twin-screw extrusion," Smith says. "Nordson Corporation's bimetallic barrels with the Xaloy X-800 lining last up to four times as long as barrels with standard nitrided alloys (Nitralloy), providing greater resistance to abrasive fillers and corrosive volatiles. As a companion to this lining, Nordson recommends use of Xaloy 830 screw surfacing."

According to Nordson, both of these Xaloy materials are composites consisting of super-hard tungsten carbide particles uniformly dispersed in a nickel alloy matrix. In abrasion tests with 20,000 wear cycles, a Nitralloy barrel combined with a molybdenum screw hard-surfacing exhibited nearly double the wear of an Xaloy X-800/Xaloy X-830 combination, as measured by volume loss of barrel material. In addition, the wear resistance of the Xaloy X-800 barrel was said to be consistent throughout its depth, whereas hardness

PHOTO: COPERION

Main image: Improving wear resistance of screws and barrels is critical to ensure viable compounding of often highly abrasive high performance fillers

PHOTO: NORDSON

Above: Nordson's X-800 barrel lining technology can extend lifetime by up to four times over standard nitride alloys

and wear resistance progressively decreased with depth into the Nitralloy material. An even greater difference was apparent in tests of corrosion in 20% HCl, where the Nitralloy barrel suffered more than four times the corrosive wear.

Of course, replacing a barrel is costly so, in addition to supplying completely new Xaloy X-800 twin barrels, Nordson says it can also reline existing worn barrels. Using a proprietary process, Nordson can produce new twin liners that can be fitted into a bored-out casing. A perfect custom fit is achieved, ensuring optimal heating and cooling of the polymer during processing.

Screw evolution

The evolution of twin-screw extruders for compounding applications has resulted in today's machines operating at ever increasing screw speeds and torque density in order to achieve the higher productivity levels required, according to Adam Dreiblatt, Director of Process Technology for **CPM Extrusion Group**. "While the machine design has advanced over recent decades, the co-rotating and self-wiping conveying screws and kneading elements developed by Rudolph Erdmenger have remained essentially intact as described in the original patent from the 1950s," he says.

"When operated at current screw speeds of up to 1200 rpm – the first generation twin-screw extruders were limited to screw speeds below 300 rpm - conventional kneading elements used for melting and dispersive mixing create localised pressure and shear peaks that result in over-heating of the polymer and degradation of properties. This phenomena is a direct result of the self-wiping Erdmenger profile," Dreiblatt explains.

"The current focus is to design elements that minimise or eliminate these shear and pressure peaks, allowing machines to operate at high screw speed without adversely affecting the performance of the compounded material. One such development by Extricom Extrusion, now part of CPM Extrusion Group, utilises an asymmetric screw profile that was originally developed for the RE RingExtruder. Replacing the traditional Erdmenger self-wiping elements with the new patented 'T-Profile' elements has been demonstrated to dramatically reduce specific energy and localised overheating of the polymer."

Dreiblatt says these new element designs retain the self-wiping characteristic in the intermesh and barrel surface by manipulating the tip clearances in a non-symmetric arrangement and have been successfully scaled-up from Extricom's laboratory to machines running at up to 6 tonnes per hour in RE RingExtruder applications such as PET recycling (bottle-to-bottle). In such applications, the T-Profile kneading elements are said to be able to achieve a lower IV drop than is possible with traditional kneading elements. In rubber compounding, where traditional kneading elements can generate excessive temperatures, a reduction in specific energy up to 35% has been documented using these new asymmetric element designs.

"T-Profile kneading elements are now being deployed on twin-screw extruders with equally successful results. In one example, compounding of high viscosity polymer – HDPE pipe compound with fractional melt flow – on a 92 mm twin-screw is limited in screw speed to avoid shear degradation of the compound. Direct replacement of traditional kneading elements with T-Profile elements allows the machine to operate at higher screw speed without increasing melt flow," he says. "In this case, the production rate was increased by 20% at the higher operating speed while maintaining the compound specifications."

The T-Profile design can also be applied to conveying elements, where Dreiblatt says the asymmetric profile provides channel-to-channel material exchange (effectively mixing) within the varying tip clearances. "Application of T-Profile conveying elements for devolatilisation improves degassing efficiency by varying the melt film thickness with each revolution of the screw while under vacuum," he says. "Reduction in VOC can be achieved by replacing traditional conveying elements with these new designs that provide a high degree of surface renewal."

The T-Profile elements represent one of several new High Performance Element (HPE) designs developed at Extricom for the RE RingExtruder. ›

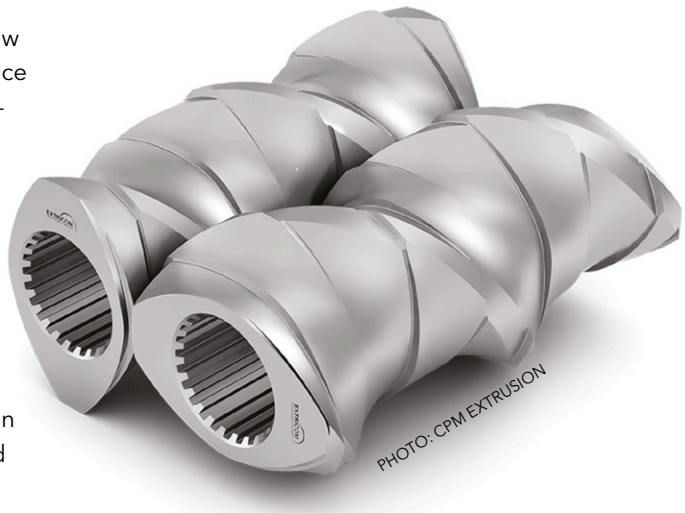

PHOTO: CPM EXTRUSION

Right: CPM is using assymetric screw profile know-how developed for the Extricom line of ring extruders in its T-Profile conveying element designs

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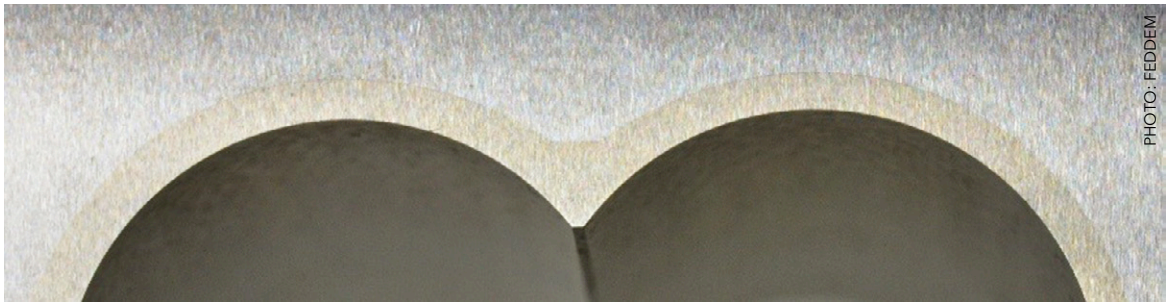

Right: Feddem claims its seamless barrel armouring technology prevents ingress of potentially-damaging corrosive gases

"The results from field trials using T-Profile elements on twin-screw extruders are very encouraging" says Dreiblatt. "We are identifying the most challenging applications on twin-screw extruders to validate the portfolio of HPE and to duplicate the successes we have seen on the RE RingExtruder."

Seamless innovation

German extruder manufacturer **Feddem** has been working hard on technologies to extend the lifespan of armoured extruder barrels and screws. According to Klaus Hojer, Business Development/ Account Manager at the company, there are a number of applications and situations where this is of utmost importance. "These include abrasive and corrosive applications, such as when mixing high ratios of inorganic fillers and reinforcements, as well as when high process temperatures are required," he says. "In addition, they can be of use for supporting high quality compounding processes through putting up the least resistance to heat transfer in and out of the process through the barrel walls."

In combination with Feddem's proprietary FEM screw elements for gentle mixing, these armoured parts can keep the performance of the compounding line within a tight quality range for the longest period possible, which is critically important for Industry 4.0 type installations. Lower rates of wear of barrel and screws clearly means a longer component lifetime but there are also significant financial and output advantages for operators in extending the intervals between barrel and screw maintenance work.

"Currently, most compounding extruders employ wear inserts that are shrink-fitted into the barrel segments. Mainly during the heating phase of the barrel, the shrink-fit may lose its tight connection and the efficiency of heat transfer from the barrel body into the insert suffers considerably," says Hojer. "After considering alternatives, Feddem decided to stay with applying an armouring layer to the inner surface of the barrels. In its latest format the armouring of the main barrel borings and the opening for top/side feeding or side vacuum join seamlessly. Thus, the inside of the barrel cavity is protected against seepage of corrosive liquids and gases into interface gaps between armouring of the main borings and armouring of the side opening. This prevents long term corrosion of the barrel body's carbon steel material."

Hojer says that future developments at Feddem will include exploring new options in screw design for further reducing energy consumption in the compounding process and reducing machine wear.

In order to increase operating times and to reduce maintenance costs, **Coperion** says it focuses significant research and development activities on materials for screw elements and barrels. "This refers to the development of material combinations with increased service life and optimised properties in terms of corrosion and wear resistance. The large variety of screw configurations and their behaviour in the process section, as well as material properties in general, are taken into consideration to meet the increasing demands for more corrosion and wear resistant materials," says Franziska Hagel, Engineer Research and Development, Materials Science at Coperion.

"The increasing use of highly abrasive fillers or recyclate for engineering plastics, which can have big deviations in shape and hardness, in combination with the increasing power of today's high performance extruders to achieve the most efficient operating window, demand constant further improvements. Development of new compounds or use of different raw materials, for example special chemicals as additives, are an additional challenge for the materials of construction. This is one of the reasons why Coperion has improved the standard wear and corrosion protection material for barrels, especially for liners. The development from material WP 043 to WP 043+ is reflected in optimised mechanical properties, especially in the damage tolerance and corrosion behaviour. The improvements were achieved through changed manufacturing technology that optimised the microstructure," Hagel says.

In addition to new materials, execution of wear measurements is becoming increasingly important,

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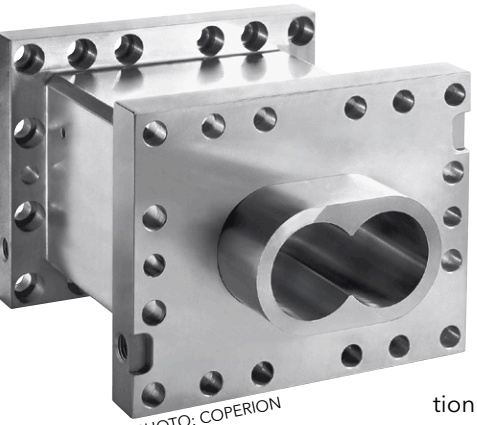

PHOTO: COPERION

Above: The enhanced WP 043+ barrel lining developed by Coperion is said to offer improved damage tolerance and corrosion resistance

she says. "This is to reduce long and unplanned shut down times due to worn components in the extruder and avoid negative effects to the high compound quality. Lifetime estimates and predictions for our components like screw elements and barrels are becoming increasingly important in order to be able to plan production interruptions and overhaul of machines more effectively."

The company currently offers two measurement options based on either plate capacitor or laser technology (the latter offering a video option to provide crack detection as well as measurement). Neither requires dismantling of the barrel although the internal surfaces must be clean and the screws pulled. When used as part of a regular maintenance programme, barrel measurement data can be used to map wear progress.

Alternative profiles

Coperion has also been exploiting the potential gains available from the use of non-conventional screw profiles. Its Involute screw and kneading elements depart from the constant radius and gap of the classic Erdmenger profile, allowing elongational stress on the melt to be varied. They are said to be particularly effective in processing of highly-filled polyolefins where they can provide greater throughput rates, handle higher loadings, and achieve better dispersion and homogenization.

Tests carried out in the company's own test laboratory in Stuttgart using machines fitted with Involute elements showed an output increase from 550 kg/h to 900 kg/h when processing a 70% $CaCO_3$ filled PP on a ZSK 58 Mc^{18} machine. Trials on a ZSK 92 Mc^{18} extruder processing 80% $CaCO_3$ filled PE saw output increase from 2,200 kg/h to 3,000 kg/h.

PHOTO: COPERION

Right: Involute screw elements from Coperion allow elongational stress to be adjusted, improving performance in highly-filled applications

The extrusion division of **KraussMaffei** is adding four new high performance ZE Blue Power compounding extruders to the range. Set for launch at K2019, the new machines represent a continuous scale-up of smaller machine sizes in the current KraussMaffei range. From a process-engineering point of view, the four large extruder variants – 98, 122, 142 and 166 mm – are identical with the smaller sister models and offer the same screw and barrel modularity. This includes a wide range of 4D and 6D barrel sections and various side feeder and degassing units. Exchangeable oval liners provide a cost-effective alternative for extremely wear-intensive processes.

A number of minor design modifications have been implemented by KraussMaffei to allow for the size of the new extruders. Housing elements are connected by means of screw unions instead of clamping flanges, for example, while cartridge heaters are replaced by ceramic heaters.

Detailed information on the design and performance of the new series will be available at the K2019 exhibition. In the meantime, Matthias Sieverding, President of the Extrusion Technology Segment at KraussMaffei, says: "The results obtained in first trials using a high-filled polypropylene formulation with 50% of an only 1 micron fine talc were perfectly in line with our expectations."

KraussMaffei says the extension of the ZE BluePower series means it can now offer tailored extruders for any type of application, allowing it to replace all its previous twin-screw extruder series. The combination of large free volume and high specific torque enables universal application of the ZE BluePower for compounding engineering plastics and even highly filled formulations. Due to the 1.65 O_D/I_D diameter ratio, free volume is increased by 27% compared to the previous ZE UT extruder series. In addition, the ZE BluePower features a 36% higher torque density of 16 Nm/cm^3.

C A Picard International has developed tailor-made products and services for preventative maintenance for production improvement. These include a Barrel Measurement Device (BMD) for providing accurate barrel wear information and analytical reports. In addition, the company has developed the Flexible Dismantling System (FDS) with PLC control to dismantle screw elements from the shafts efficiently with full protection of the screw elements and shafts, without injury risk to workers.

CLICK ON THE LINKS FOR MORE INFORMATION:

- **www.nordson.com**
- **www.centuryextrusion.com**
- **www.feddem.com**
- **www.coperion.com**
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Film and Sheet EXTRUSION

AMI's third North American Polymers in Flooring conference takes place in Atlanta in September. We take a look at the speaker and topic line-up

PHOTO: SHUTTERSTOCK

Flooring innovation in focus in Atlanta

The US city of Atlanta will host the third North American edition of AMI's Polymers in Flooring conference on 17-18 September. The event will again provide an unmatched forum for the region's polymer flooring industry to discuss technical and market trends and will bring together an international line-up of expert speakers to explore new developments in product design, materials and additives and to learn about the demanding requirements of architects and interior designers.

Resilient flooring is used across multiple applications in North America, extending from residential, through commercial and industrial, to healthcare and sports & leisure. Market demand is robust and market shows no signs of slowing for innovative products.

Novel high-quality flooring products are being enabled by material developments, design innovations and processing advances, which together are changing customer perception and winning market share from other flooring types. At the same time, the industry is introducing new standards, facing regulatory changes and continuously looking to improve materials, design and sustainability to appeal to consumers.

Polymers in Flooring 2019 will be opened by **Bruce Zwicker**, CEO at **Zwicker Advisory** in the US, who will present an overview of market trends, product demand and key issues facing the global flooring industry. His opening presentation will be followed by a panel discussion focusing on key industry issues, including shifting product demand and global market trends. Zwicker will take part in that panel, along with **David Altman**, Director of Research & Development at **HTMX Industries**, and **Herb Upton,** VP Hard Surfaces at **Shaw**.

Stabilisation trends

The conference will then move on to explore some technical issues, with a full session addressing stabilisation. This will be opened by **Dr Timo Seibel**, Head of Group Product Development at **Chemson Group** in Germany, who will highlight the performance, processability and sustainability of solid CaZn and CaOrg stabilisers in flooring applications. Next up will be **Kimberly Kern**,

Main image: The North American resilient polymer flooring market will be examined in detail at AMI's Polymers in Flooring conference in September

Expert panellists and speakers sharing their insight at Polymers in Flooring in Atlanta in September include, from left, Shaw VP Hard Surfces Herb Upton, Baerlocher USA Global Market Manager PVC Flooring Kimberly Kern, HMTX Industries Chief Sustainability Officer Rochelle Routman, and Tarkett Product Stewardship Director Dhruv Raina

Global Market Manager for PVC Flooring at **Baerlocher USA**, who will speak about additive consideration for stone plastic composite (SPC) formulating. Then **Gary M Sadowski**, Technical Service Manager at **Valtris Specialty Chemicals,** will explain how VOCs can be reduced in vinyl flooring formulations through the use of liquid and/or powder stabiliser systems.

The next session will discuss changes in regulation and certification impacting on the flooring industry. **David Altman**, Director of Research & Development, and **Rochelle Routman**, Chief Sustainability Officer, from **HMTX Industries** and **Stanley Mathuram**, VP of Global Business Sales and Marketing at **SCS Global Services**, will provide a joint presentation highlighting the latest developments in certifications and standards affecting the multilayer flooring industry. The trio will be followed by **Anna Lasso,** Senior Product Manager at **UL Environment**, who will explain how Environmental Product Declarations (EPDs) in the flooring industry are being driven by demand for greener products.

The green theme runs on into the final session of the day, which focuses on sustainability – a topic that is becoming more and more important to consumers and flooring manufacturers alike. **Dhruv Raina**, Product Stewardship Director at **Tarkett**, will open the session with an explanation of the concept of "impactless" flooring, identified as the application of innovative design to create flooring that complies with the latest circular concepts. Then **Dr Xudong Wang**, Professor at the **University of Wisconsin-Madison**, will bring the first day to a close with an introduction to harvesting energy from polymeric flooring and how its benefits can be exploited.

Design matters

The second day of the conference starts with a session addressing design. It opens with a case study of the Maryland School for the Blind renovation project, which will be given by **Christine Colombo**, Architect, Design and Facility Consultant at **L Fishman & Son.** She will explain how design ideas were translated into flooring choices. Then **Amy Sickeler**, Design Principal at **Perkins & Well**, will explain how evidence-based design objectives can influence flooring choices in healthcare environments. And finally, **Daan De Keyzer**, Technology Manager at **Beauflor USA,** will close the session with a discussion of design objectives.

The next session of the conference returns to technology topics. **Dr Manoj Nerkar**, Technical Service and Development Scientist at **Dow Plastics Additives**, will detail the processing and characterisation of foam core layers in rigid luxury vinyl tiles (LVTs). **Jens Krebber**, Director International Business Development & Marketing at **Olbrich** in Germany, will explore technological solutions that address demands for reduced production times. And **Scott Grant**, Engineering Manager at **Ecopuro**, will speak about using technology solutions to maximise financial returns.

In the final afternoon session, **Dr Burke Nelson**, Research Fellow at **Microban International**, will speak about the benefits of built-in antimicrobial protection in flooring applications. And **Nicolas Gehring**, Global Sales Manager PVC at **Mixaco** in Germany, will talk about challenges and solutions for mixing recipes for stone plastic composite (SPC) flooring.

About Polymers in Flooring USA 2019

Polymers in Flooring 2019 takes place at the Westin Buckhead Atlanta hotel in Atlanta, GA, USA, on 17-18 September. The event brings together an international line-up of expert speakers to discuss market trends, next generation production and material technologies, regulatory and certification changes, sustainability trends, and design issues.

Outside of the formal presentations, the conference also includes an expert panel discussion while the two lunches, daily coffee breaks and complimentary first day cocktail reception ensure plenty of opportunity for networking and informal discussion. To find out more about this popular industry event, visit the **conference website** or contact Conference Organiser Olga Osipova: Tel +44 (0)117 314 8111; Email **olga.osipova@ami.international**

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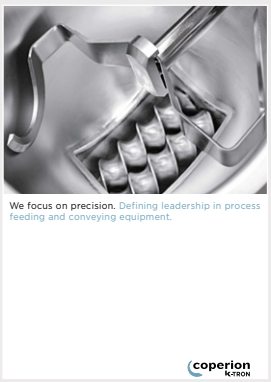

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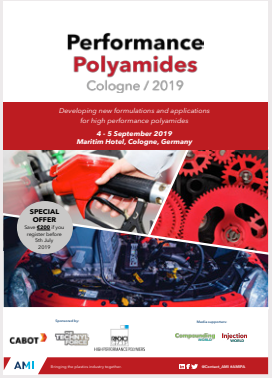

The fourth edition of AMI's Performance Polyamides conference takes place in Cologne in Germany on 5-6 September 2019. It focuses on technological developments and leading-edge applications for high performance polyamides.

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AMI's Masterbatch conference has been the meeting point for this international industry since 1987. The 2019 event takes place in Vienna in Austria on 10-12 September and provides an unmissable learning and networking opportunity.

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POLYMERS IN FLOORING USA

The third North American Polymers in Flooring conference takes place on 17-18 September in Atlanta, GA, USA, providing a forum to explore the latest market trends and new developments in product design and production technology.

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The 4th edition of the Polymer Testing & Analysis conference, taking place on 18-19 September 2019 in Düsseldorf, Germany, will gather together laboratory staff, researchers and R&D professionals who develop, test and analyse new polymer materials.

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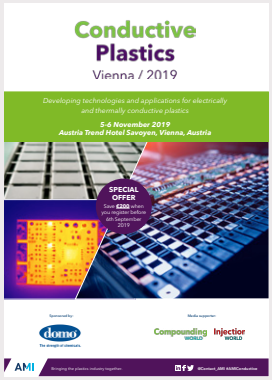

AMI's Conductive Plastics conference takes place for the fourth time in Europe on 5-6 November 2019. It is the place to learn about formulation, processing and application of both electrically and thermally conductive thermoplastics. The event takes place in Vienna.

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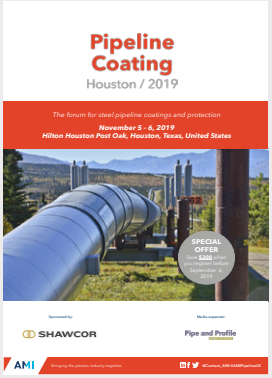

AMI's fourth Pipeline Coating Houston conference takes place on 5-6 November 2019. It will bring together North American pipeline operators, contractors, pipe coaters, researchers and specifiers to discuss the latest sector trends and technologies.

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Shanghai PRET Composites, China

Head office:	Shanghai, China
President of Board:	Mr. Wen Zhou
Ownership:	Limited Company
No. of employees:	900
Sales 2018:	€466m
Capacity 2018:	200,000 tonnes
Plant locations:	Shanghai, Jinshan, Jiaxing and Tongliang, China
Profile:	Founded in 1993, Shanghai PRET Composites (PRET) commenced compound production in 1998 and has since expanded its capacity to its current volume of around 200,000 tonnes per year. PRET is structured with three regional manufacturing subsidiaries: Shanghai PRET New Chemical Material, Zhejiang PRET New Material and Chongqing PRET New Material, which are located in Jinshan, Jiaxing and Tongliang respectively. The company was listed on the Shenzen stock exchange in 2009.
Product line:	The major part of PRET's compound product line falls into six key catgories – modified PP, ABS, PC/ABS blends, LFTs, PA and LCPs. Its products are used across all industries, with the automotive, telecommunications, and electrical industries among its main markets.
Product strengths:	PRET invests heavily in scientific research and innovation in order to be at the forefront of technological achievement and material developments. With the automotive industry as a main end market, it meets the standards required to supply many major global OEMs. The company has 160 patent applications and holds 106 granted patents, including one PCT patent issued in the US.

To be considered for 'Compounder of the Month' contact Elizabeth Carroll: elizabeth.carroll@ami.international

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Compounding for 3D printers
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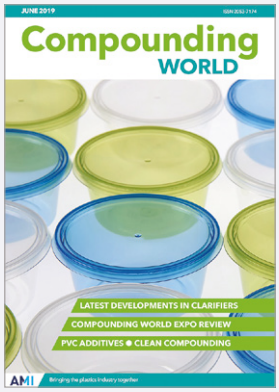

Compounding World June 2019
The June edition of Compounding World leads with a feature on how advances in clarifying and nucleating agents are improving resin quality. Features also cover functional fillers, PVC additives and clean production.

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Injection World July/August 2019
The July-August issue of Injection World looks at technology enabling injection moulders to use more recyclate. Plus features on packaging and masterbatch and analysis of tethered caps regulation.

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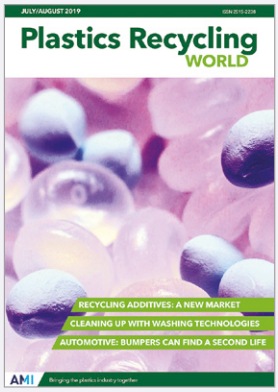

Plastics Recycling World July/August 2019
The July/August edition of Plastics Recycling World takes a detailed look at the growing range of additives available to plastics recyclers. It also explores new developments in washing equipment and reviews a major US car bumper recycling project.

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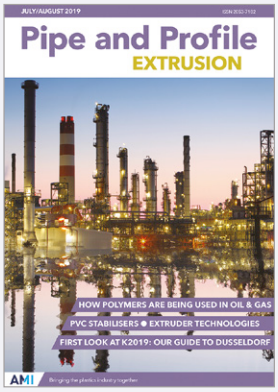

Pipe and Profile July/August 2019
The July-August edition of Pipe and Profile Extrusion looks at how polymer pipes are being used in the offshore oil and gas sector. Other features cover extruder innovations to be shown at K2019 and developments in PVC additives.

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Film and Sheet July/August 2019
The July-August edition of Film and Sheet Extrusion looks at the accelerating research into bioplastics applications, plus stretch and shrink film, masterbatches, bag-making machinery and a Visitor Guide to K2019.

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GLOBAL EXHIBITION GUIDE

2019	**2-4 September**	Interplastics-Kazan, Kazan, Tartarstan	www.k-globalgate.com
	5-7 September	Utech Asia, Guangzhou, China	www.puchina.eu
	18-21 September	T-Plas / Tiprex, Bangkok, Thailand	www.tplas.com
	16-23 October	K 2019, Dusseldorf, Germany	www.k-online.com
	17-19 October	Plastics, Printing & Packaging, Dar-es-Salaam, Tanzania	www.expogr.com/tanzania/pppexpo
	25-28 November	Plastivision Arabia, Sharjah	www.plastivision.ae
	27-29 November	Plastics & Rubber Vietnam	www.plasticsvietnam.com
2020	**13-16 January**	Saudi Plastics & Petrochem, Riyadh	www.saudipp.com
	16-20 January	Plastivision India, Mumbai, India	www.plastivision.org
	21-23 January	Swiss Plastics, Lucerne, Switzerland	www.swissplastics-expo.ch
	28-31 January	Interplastica, Moscow, Russia	www.interplastica.de
	24-26 February	Plastics, Printing & Packaging, Addis Ababa, Ethiopia	www.expogr.com/ethiopia/pppexpo
	11-13 March	Expo Plasticos, Guadalajara, Mexico	www.expoplasticos.com.mx
	26-28 March	MECCSPE, Parma, Italy	www.mecspe.com
	7-13 May	Interpack, Dusseldorf, Germany	www.interpack.com
	3-4 June	Compounding World Expo Europe, Essen, Germany	www.compoundingworldexpo.com/eu/
	13-17 October	Fakuma, Friedrichshafen, Germany	www.fakuma-messe.de

AMI CONFERENCES

4-5 Sept 2019	Performance Polyamides, Cologne, Germany
10-11 Sept 2019	Smart Packaging, Hamburg, Germany
10-12 Sept 2019	Masterbatch 2019, Vienna, Austria
17-18 Sept 2019	Polymers in Flooring USA, Atlanta, GA, USA
18-19 Sept 2109	Polymer Testing & Analysis, Dusseldorf, Germany
25-26 Sept 2019	Compounding World Asia, Bangkok, Thailand
5-6 November 2019	Medical Tubing, Minneapolis, MN, USA
5-6 November 2019	Conductive Plastics, Vienna, Austria

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

www.ami.international

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