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Ascend buys BTP to add compounding in Europe

US-headquartered PA 66 specialist Ascend Performance Materials has acquired Netherlands-based compounder Britannia Techno Polymer (BTP), giving it its first wholly-owned compounding operation outside of the US. The value of the transaction has not been disclosed.

Tilburg-based BTP has been providing toll compounding services to Ascend since its formation in 2009, and to predecessor Solutia since 2006. The company currently has a production capacity of around 32,000 tonne/yr, around half of which is understood to have been used by its new owner.

"Ascend is a major portion of the activity that currently goes on at BTP," said Phil McDivitt, President and CEO of Ascend, who explained that the Ascend/BTP relationship went beyond the typical toll compounding arrangement. "We have toll compounding capacity in Asia and also other toll compounding agreements in Europe and North America. But the relationship with BTP is different. We have built our engineering plastics business in Europe in very close partnership," he said.


PHOTO: ASCEND PERFORMANCE MATERIALS

Ascend Performance Materials CEO Phil McDivitt (left) with BTP founder Andrew Leigh

The decision to acquire BTP is part of a strategy of establishing regional compound production, according to McDivitt. He said that the company's highly integrated PA66 production capabilities in the US allows it to be globally competitive in resin but compounding activity benefits from a more localised footprint.

Ascend's existing compounding capacity in the US is located at its sites at Pensacola in Florida and Foley in Alabama and these have been supplying some of its European requirements. "We will be scaling down the production coming from the US as we integrate the BTP facility," said Ascend Senior Vice President Scott Rook.

All BTP staff will be joining Ascend, including founder and Managing Director Andrew Leigh. "Andy will transition to become our Director of Compounding Technology. We expect him to play a key role in our compounding business on a global scale," said McDivitt.

› **www.btpolymer.com**
› **www.ascendmaterials.com**

Tronox reshuffles TiO_2 ops

Pigments and additives firm Venator has agreed exclusive rights with Tronox to buy the TiO_2 complex at Ashtabula in Ohio – currently part of the Cristal business – for $1.1bn, if Tronox is required to divest this to gain clearance for its takeover of Cristal by US authorities (the US Federal Trade Commission has challenged the deal).

The Ashtabula site produces TiO_2 pigments using the chloride process and accounts for 30% of Cristal's production capacity. The sale to Venator is part of a deal that will also see the company buy Tronox's European paper laminates pigments business and to transfer production to its facility at Greatham in the UK. Disposal of this business was a condition laid down by the European competition authority for approval of Tronox's Cristal purchase.

› **www.tronox.com**
› **www.venatorcorp.com**

Chromos wins 'oldest Leistritz' award


PHOTO: LEISTRITZ

Chromos, a masterbatch producer based at Samobor in Croatia, has been identified as the owner of the oldest Leistritz Extrusionstechnik extruder still in operation. The search was conducted as part of the Nuremberg, Germany-based extruder maker's 80th anniversary celebrations and began in March.

The machine is a ZSE 70 that was put into operation in 1973 and is still producing daily. The search produced emails from customers as far away as Singapore and Australia, the company added.

› **www.leistritz.com/en**

Left: Some of the Chromos team with their winning 1973 ZSE70 extruder

€5m expansion at Fainplast

Fainplast is expanding its production plant at Ascoli Piceno in Italy to increase capacity for polyolefin-based compounds for use in cables, especially for halogen-free products. Together with other planned investments, including the addition of two new compounding lines, the expansion will increase capacity by 50,000 tonnes/yr over the next five years.

PHOTO: FAINPLAST

The project includes the construction of a new building next to the existing factory. This will provide 7,000m² of new floorspace for warehousing and production equipment and a further 1,200m² for offices and laboratories. The total investment amounts to around €5m.

Fainplast is a major producer of compounds for cables, specialising in thermoplastic and cross-linkable halogen-free flame retardant compounds. The plant produced 90,000 tonnes last year, of which more than 70% went into the cables industry.

› **www.fainplast.com**

Colorfabb launches colour on demand for 3D filaments

Netherlands-based 3D print filament maker Colorfabb has launched a new service called Colour on Demand, which it has developed with German masterbatch firm Grafe to provide fast, small batch colour matches.

The aim is to offer custom colour production in volumes from 2kg. Until now, the company said, the colour palette was largely dictated by filament makers and individual colour development was only possible from 50 kg, a volume rarely needed in the 3D print market.

Colorfabb CEO Ruud Rouleaux said the company can also supply small custom colour batches of granules, with customers able to request test tiles in the desired colour to be injection moulded before placing an order.

› **https://colorfabb.com/**

Carolina Color buys Chroma

North Carolina, US-based Carolina has acquired Chroma, a producer of custom formulated masterbatch colours, dry colours, additive concentrates, and pre-colour compounds. The company, based at McHenry in Illinois, supplies the packaging, electronics, safety, automotive, recreational, medical and consumer products markets. Terms were not disclosed.

Carolina Color was itself acquired by private equity firm Arsenal Capital Partners in 2017. It has since acquired Breen and Hudson, taking annual sales to more than $150m. Company president Howard DeMonte said that Carolina Color will continue to acquire complementary businesses "with the single goal of meeting the colorant needs of both large and small plastic converters".

PHOTO: CAROLINA COLOR

Carolina Color adds Chroma to its color concentrate family

› **www.carolinacolor.com**

Encom invests in Indiana

US-based Encom Polymers is to invest close to $15m to upgrade its 5,300m² facility at Evansville in Indiana and to install its own compounding equipment.

The company, which has to date used toll compounders, plans to have its first compounding line in operation at the facility in September of this year. Its plans include an additional three production lines, a laboratory line, test laboratory and injection moulding machine.

Founded in 1999, Encom Polymers offers a broad range of technical compounds based on PP, PA, PC and ABS with a variety of mineral fillers and fibre reinforcements. Initially focused on automotive, it now supplies to the E&E, telecom and medical industries.

› **www.encompolymers.com**

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NEWS IN BRIEF...

Inovyn has announced the closure of the PVC recycling plant, **VinyLoop Ferrara**, in Italy, with immediate effect. The plant, a 60/40 joint venture with **Texyloop**, has been making a loss for the last 15 years but has now seen a collapse in demand for its Vinyloop-R recycled PVC product as a consequence of more stringent regulations on the plasticiser di-ethyl hexyl phthalate (DEHP).

› **www.inovyn.com**

The European Chemicals Agency, **ECHA**, is to establish a new database covering the presence of hazardous chemicals in articles. Part of the revised waste framework directive, it will comprise information submitted by companies producing, importing or selling articles that contain Candidate List substances. This information must be submitted by the end of 2020.

› **http://echa.europa.eu**

Velox is to distribute a new range of 3D printing materials in Europe from **SK Chemicals**. The Skyplete range includes a PLA-based biodegradable type with a heat deflection temperature of 100°C, as well as high impact and temperature resistant bio-copolyesters and food approved grades. The materials are aimed at filament producers and compounders.

› **www.velox.com**

› **www.skchemicals.com**

BASF details plans to lift Irganox capacity by 40%

BASF plans to increase its capacity for the antioxidant Irganox 1010 by 40% in response to growing global demand.

Expansions at its sites at Jurong in Singapore and Kaisten in Switzerland will come online in 2019 and early 2021 respectively. Capacity will double in Singapore as a result of additional production lines. Debottlenecking will up capacity at Kaisten by 30%.

BASF said it will also invest to improve asset reliability and further expand capacity at its site at McIntosh in Alabama, US. The scale of that expansion was not disclosed.

Irganox 1010 is a sterically hindered phenolic primary antioxidant for protection against thermo-oxidative degradation. It is mainly used in polyolefins but is also recommended for polyacetals, polyamides, polyurethanes, polyesters, PVC, ABS and elastomers, such as butyl rubber and synthetic rubbers.

In a separate move, BASF has confirmed it is considering a second *verbund* site in China, its seventh overall. Executive Board Chairman Martin Brudermüller and Lin Shaochun, Executive Vice-Governor of Guangdong province, signed a non-binding memorandum of understanding in Berlin, witnessed by German Chancellor Angela Merkel and Chinese premier Li Keqiang.

If the plan goes ahead, the new site would be BASF's largest ever investment, reaching $10bn by 2030, and the company's third largest site worldwide (only those at Ludwigshafen in Germany and Antwerp in Belgium would be larger). The first phase would include a 1m tonnes/year ethylene steam cracker, followed by plants for consumer-oriented products. The first of these are expected to open no later than 2026.

› **www.basf.com**

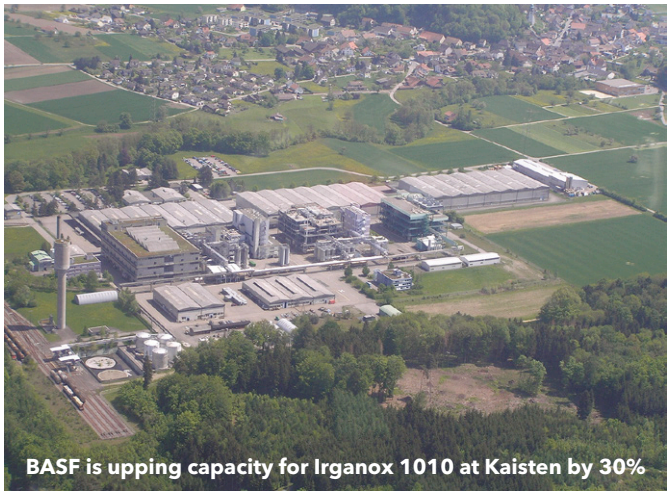

PHOTO: BASF

BASF is upping capacity for Irganox 1010 at Kaisten by 30%

KKR to buy LCY Chemical

Investment firm KKR has signed a share exchange agreement for a consortium it leads to acquire Taiwan-based polymers and chemicals maker LCY Chemical. The company will remain headquartered in Taipei and maintain its production network in Taiwan, China and the US.

LCY is particularly strong in PP polymers and PP-based TPVs and TPEs. Other products include methanol, solvents and electronic grade chemicals.

The KKR offer has been unanimously approved by the LCY board. Chairman T H Hong said it "delivers meaningful and immediate value to our shareholders, while also providing greater access to capital, operational resources and the time horizon needed to execute a strategy to drive long-term, sustainable value creation".

KKR said that it intends to "work closely with LCY's existing management team and employees to strengthen the company's business platform". Expansion in new and existing international markets, as well as in new verticals, are all longer-term possibilities.

› **www.lcygroup.com/lcy/en/**

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Wayne Miller, Vice President Manufacturing, Penn Color, Inc.

Jeff Zaskoda, Penn Color Plant Manager (left) and ENTEK's Bill Petrozelli at Penn Color's Milton, WI Facility

“Business has grown strongly and consistently for Penn Color, both for our thermoplastic and liquid dispersants businesses. We've added several new facilities and added capacity at legacy facilities, all in the support of growth related to our thermoplastic color and additive businesses.

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US machinery shipments up 15% in Q1 to $333m

Shipments of primary plastics machinery in North America rose by 15.1% year-on-year to reach $333.7m in Q1 2018, according to the Plastics Industry Association's Committee on Equipment Statistics. This is the fourth consecutive Q1 increase.

There was a marked difference between the values of shipments of injection moulding machinery and extruders, however. The former increased by 22.9% over Q4 2017, while single and twin screw extruder shipments declined by 14.6% and 27.1% respectively.

"Business confidence remains high, helped by corporate tax reform enacted last year. Plastics equipment shipments data are in sync with healthy corporate profits in the manufacturing sector, including the plastics industry," said the association's Chief Economist Perc Pineda.

Respondents to the survey identified construction, appliances and packaging as strong end use markets for the next 12 months. Their market outlook remains stable, with many expecting that an economy at full employment capacity will mean little change in consumption patterns.

› **http://plasticsindustry.org**

Borealis to buy recycler Ecoplast

Borealis is to buy Austrian plastics recycler Ecoplast Kunststoffrecycling, subject to required regulatory approvals.

Based in Wildon, Ecoplast processes around 35,000 tonnes/yr of post-consumer plastic waste from households and industrial consumers into LDPE and HDPE recyclates. These go mainly into plastic film market.

Borealis CEO Alfred Stern described the move as "a logical next step for us to expand our mechanical recycling capabilities, which are key to our sustainability and circular economy efforts". The company already owns MTM in Germany, which focuses on rigid injection moulding recyclates. Ecoplast is seen as complementary.

› **www.borealisgroup.com**

Birla invests in carbon black

Birla Carbon is to expand in multiple regions to address growth in the global carbon black market.

Birla Carbon COO John Loudermilk said in a statement the expansion "will enable us to serve a range of segments, including production capability for high value, differentiated products in the tyre, rubber goods and speciality markets."

The company will add a further 150,000 tonnes/year of capacity over the next 18 months by debottlenecking at sites in Egypt and Italy before the end of Q3, restarting a production line in Thailand by the end of Q4 and installing new production lines in India to start in Q4 2019.

The company said it is also prepared to add 120,000 tonnes/year of capacity at its newest site in China if demand requires.

› **www.birlacarbon.com**

NEWS IN BRIEF...

Ferro is expanding its production facility in Girardota, Colombia, by an undisclosed amount to meet demand for ultramarine blue and micronised iron oxide pigments. Ferro produces ultramarine blues, violets and pinks at sites in Spain, Romania and India as well as Girardota. Micronised iron oxide are produced exclusively at Girardota.

› **www.ferro.com**

Radici Group has appointed **Hromatka Group**, and its AECTRA Plastics and Plastoplan Polska subsidiaries, to distribute its range of PA and PBT engineering plastics in eastern European markets. The Italian company said it expects the new arrangement to strengthen its position across the region but particularly in Poland, Romania and Bulgaria.

› **www.radicigroup.com**

› **www.hgmag.ch**

Anellotech said it has shipped the first bio-based BTX aromatics from its TCat-8 pilot plant at Pearl River in New York State, US, to project partners IFFPEN and Axens for purification to bio-paraxylene. The company said the move is a major step forward in its bio-based PET bottle collaboration with consumer beverage brand Suntory. It said the TCat-8 technology can also produce toluene and benzene.

› **www.anellotech.com**

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Neste backs chemical recycling

Finnish petrochemicals company Neste said it is "exploring ways to introduce liquefied waste plastic as a future raw material for fossil refining".

An ongoing development project is expected to proceed to industrial scale trial during 2019. The company said it aims to use 1m tonnes/year of waste plastic in this way by 2030 (equivalent to near 4% of the current amount of plastic waste generated in Europe).

Matti Lehmus, EVP of Neste's Oil Products business, described the move as in line with the EU's Strategy for Plastics in a Circular Economy. He said it will support reduction in plastic waste and increase the level of chemical recycling. He said the latter is needed alongside mechanical recycling to meet EU targets of recycling 50% and 55% of plastic packaging by 2025 and 2030 respectively.

› **http://neste.com**

Chemical firms waiting for post-Brexit clarity

Two years after the UK's 2016 referendum, Europe's chemical industry still awaits regulatory clarity

PHOTO: SHUTTERSTOCK

As hopes for a negotiated Brexit deal appear to be waning, and the prospect of a disorderly UK-exit on March 29 next year looms, the chemical industry looks to be taking a wait-and-see approach and hoping that much-needed regulatory clarity will emerge soon.

Data from the European Chemicals Agency (ECHA) shows that 5,343 of the 20,608 substances registered under the EU's REACH regulation are to UK registrants. In the absence of an agreement being reached between UK and EU negotiators, these will become "non-existent" on the UK's departure next year, meaning the substances cannot be on the market in the EU.

In most cases, transferring a registration from a UK to EU entity will be a fast process, according to an ECHA spokesperson, involving little more than an online application and payment of a fee. However, in some cases new applications will be required (where an EU-entity is to register a substance as an importer, for example) and this could take longer.

"So far we have not observed a large number of legal entity changes or changes in ORs [Only Representatives] from UK registrations," ECHA told *Compounding World*, suggesting UK registrants are waiting for clarity on the future legal position.

That's a view shared by Peter Newport, CEO of the UK's Chemical Business Association. "Companies are waiting to see what happens," he said. "Why pay a fee to move an OR from London to Berlin if you may not need to."

Newport agrees with ECHA that for larger companies a transfer will not present significant challenges. However, he said smaller companies may find it more difficult and some UK registrants have already set up ORs in the EU-27 in anticipation of a transfer. The CBA is itself considering relocating the OR work carried out by its regulatory facilitation division, ReFac, to an EU-27 office.

European chemicals industry association Cefic said it is "in the process of developing our recommendations" for EU-27 members but could not yet provide concrete details.

› **www.echa.europa.eu**
› **www.chemical.org.uk**

Colour Tone reformulates for PVCu

UK-based masterbatch maker Colour Tone has secured a new patent covering its Vynacol PVCu polymer-specific masterbatch colouring system, including formulation developments supporting the move to the smaller "prill" format.

Prill-format particles need less energy to disperse and allow more accurate dosing at low addition levels, according to Colour Tone Director Tony Gaukroger. However, the original Vynacol formulations launched back in 2000 would not process or disperse well in the smaller format.

"This improved masterbatch is available in both formats for ease of mixing and homogenisation. It also offers significantly improved melt rheology control for consistent processing of more highly loaded formulations," he said. Maximum loadings have increased from 50% to up to 65%.

Colour Tone, now part of UK technical compounder Luxus, has achieved considerable success with its polymer-specific PVC masterbatch, according to Gaukroger, who says that, unlike universal products based on plasticiser or wax carriers, it does not compromise the PVC recipe.

› **www.colourtone-masterbatch.co.uk**

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Exxon starts giant Texas cracker

ExxonMobil has started up its giant 1.5m tonnes/yr ethane cracker at Baytown in Texas in the US.

The new cracker will provide ethylene feedstocks to the PE lines at the company's Mont Belvieu site, which commenced operation late last year and have a combined capacity of 1.3m tonnes/yr.

"Our new ethane cracker will help us meet the growing global demand for high performance plastic products that deliver key sustainability benefits such as lighter packaging weight, lower energy consumption and reduced emissions," said John Verity, President of ExxonMobil Chemical.

› **www.exxonmobil.com**

Proposed EU decaBDE limits raise concerns

EuRIC, the umbrella organisation of the European recycling industry, has raised concerns over a key aspect of the European Commission's recast of its Regulation EC/850/2004 covering persistent organic pollutants (POPs) and its potential impact on WEEE recycling.

The organisation said that most of the updates to the Regulation will provide better clarity and legal certainty. However, it said the European Parliament's proposal to set an "unintentional trace contaminant" level at concentrations of 10 mg/kg (0.001 wt%) for the flame retardant decaBDE in substances, mixtures, articles or as constituents of the flame-retarded parts of articles, gives rise for concern.

PHOTO: SHUTTERSTOCK

European recyclers are concerned over European Parliament's proposed decaBDE trace limit

This limit already applies to other polybrominated diphenyl ether (PBDE) flame retardants listed in the Regulation, but with a derogation for "the production, placing on the market and use of … articles and mixtures containing below 0.1% of [PBDE] by weight when produced partially or fully from recycled materials".

The derogation – 100 times higher than that proposed for decaBDE – is vital for the recycling industry, EuRIC said, because "it is simply not possible to guarantee a level of 10 ppm in recycled plastics from waste electrical and electronic equipment (WEEE) and end-of-life vehicles (ELVs).".

If the proposed new limit is enforced, recycling plastics from WEEE or ELVs in Europe will end, the association warned.

› **www.euric-aisbl.eu/**

Project aims to define 'recyclable'

Plastics Recycling Europe (PRE) and the Association of Plastic Recyclers (APR) in the US have teamed up to develop a global definition governing the use of the term 'recyclable' in the context of plastic packaging and products.

The associations lay out four conditions that should be met for a product to be considered recyclable: It must be made with a plastic that is collected for recycling and has market value and/or is supported by a legislatively mandated programme; It must be sorted and aggregated into defined streams for recycling processes; It can be processed and reclaimed or recycled with commercial recycling processes; The recycled plastic becomes a raw material that is used in the production of new products.

PHOTO: PLASTIC RECYCLERS EUROPE

We have the logo; now the goal is to define "recyclable"

"The use of the term 'recyclable' is consistently used with packages and products without a defined reference point," said APR President Steve Alexander. "At the end of the day, recyclability goes beyond just being technically recyclable."

Ton Emans, PRE President, added that there have been many recent announcements about legislative measures on plastics products and pledges by industry actors to make their products recyclable. "We welcome these commitments and encourage others to follow. Nevertheless, clear and universally endorsed definitions and objectives are needed," he said.

The stated aim in doing this was to "provide a consistent metric to guide the efforts of sustainability for plastics in the circular economy". It is also seen as a step to harmonise the worldwide plastics recycling industry. Comments from industry and other stakeholders are invited.

› **https://plastics-recyclers-europe.prezly.com**

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PHOTO: EASTMAN

The plasticiser industry – and its customers – continue to face regulatory pressure. It is responding with better science and an array of new plasticiser options. Peter Mapleston finds out more

Plasticisers – science and regulation

The PVC industry has been battling detractors for decades. For a long time, the big issue was VCM (vinyl chloride monomer). Today, it is phthalate plasticisers. Opponents have their sights focused on low-molecular weight types in general and diethylhexylphthalate (DEHP) in particular, but other plasticiser types have been caught up in the action too. Some plasticiser producers may have breathed a sigh of relief at the EU's recent decision not to classify diisononyl phthalate (DINP) as reprotoxic. But DEHP still faces stormy weather and recent moves could spell the end for it in one key market, at least in Europe. Meanwhile, beyond the legal sector, researchers are hard at work developing new – and possibly better performing – plasticisers. This article takes a look at some of the latest regulatory and technical developments.

This March, the Risk Assessment Committee (RAC) of the **European Chemicals Agency** (ECHA) rejected a proposal by the Danish environmental authority to classify the plasticiser diisononyl phthalate (DINP) as reprotoxic. "Overall, RAC concluded that no classification for DINP for either effects on sexual function and fertility, or for developmental toxicity is warranted," it said in a statement. This means that classification in neither Category 1B nor Category 2 will not be required.

"This brings to a close a regulatory process which lasted over three years from the original Registry of Intent from Denmark, followed by a public consultation, a year-long assessment of the proposal by a RAC rapporteur and co-rapporteur, culminating in a conclusion by the full RAC committee in March 2018," says Michela Mastrantonio, Manager at trade association European Plasticisers. "The RAC opinion provides a further extensive regulatory assessment of DINP, demonstrating that there is no need for hazard classification and supporting that DINP is safe for use in current applications. We are confident this brings a strong reassuring message to the industry, the value chain and consumers on the safety and sustainability of DINP and flexible vinyl articles as well as other products made with DINP."

DINP producers **Evonik Performance Materials** and **ExxonMobil** both welcomed the decision. Evonik had participated intensively in technical discussion on the classification of DINP, says Dr Hendrik Fischer in Product Stewardship at Evonik. "The RAC's evaluation confirms the results of our many years of research in this area: DINP can be used with complete safety in all of its various

Main image: Medical bags are one of the key battle grounds for plasticiser producers

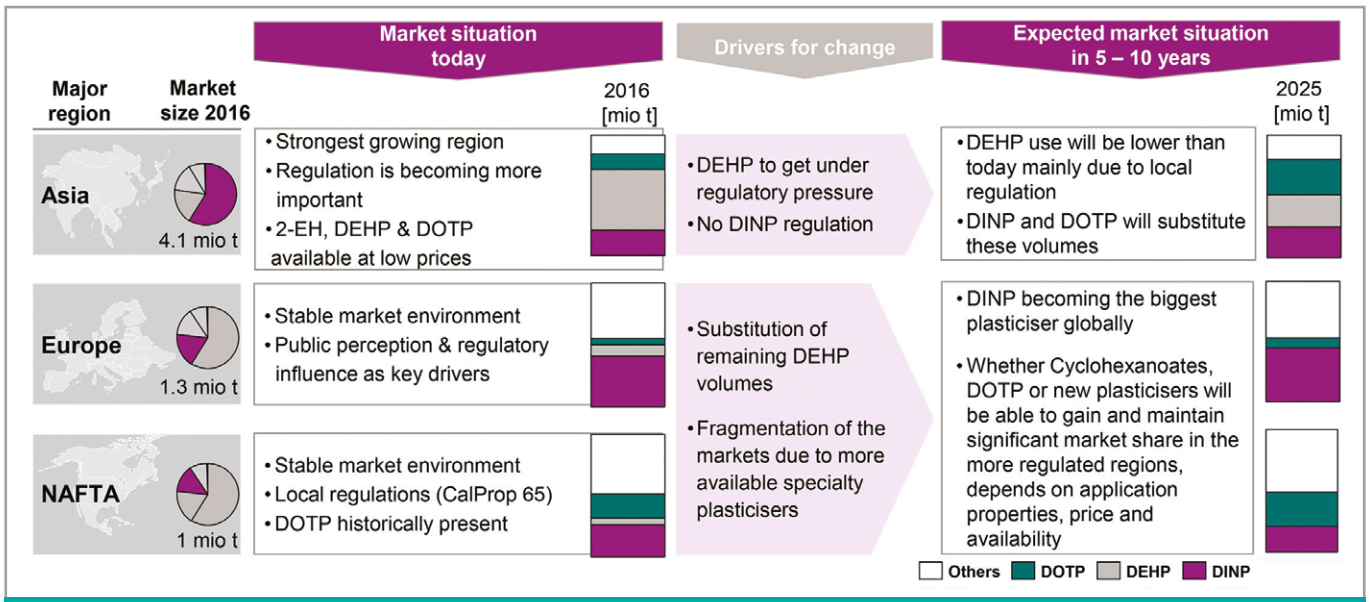
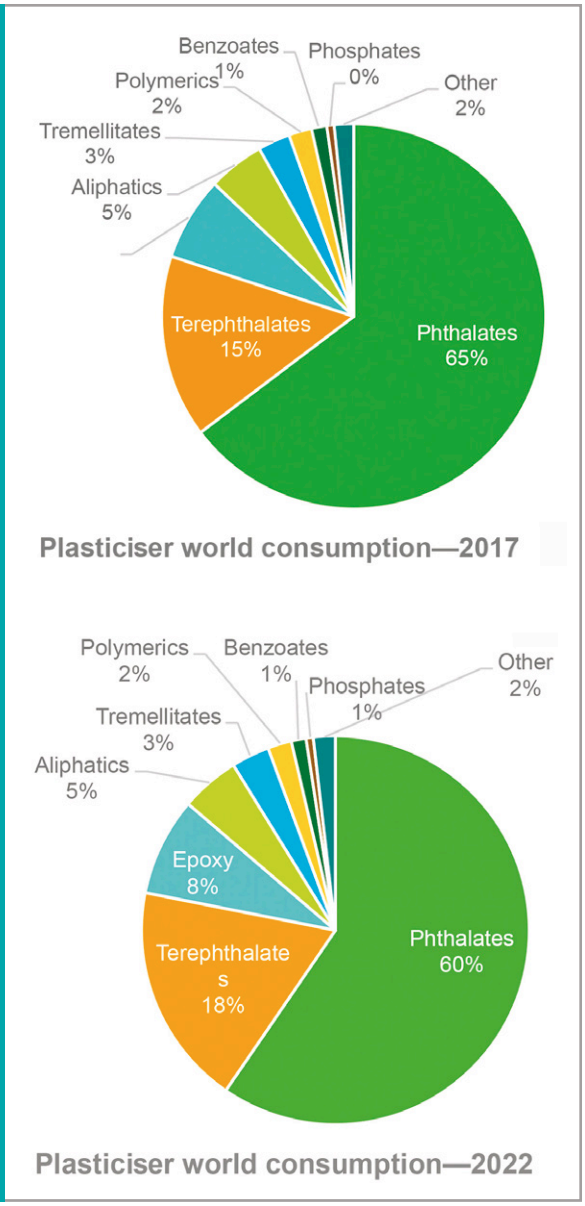


Figure 1: The challenges and drivers for change for plasticisers in the three key world regions differ significantly
Source: Evonik, ICIS, IHS, Roland Berger, Tecnon

Figure 2: The global plasticiser market is changing. Phthalates continue to dominate but the trend is towards non-ortho-phthalates and high molecular weight types. Annual growth is around 3%



Source: IHS Markit, Eastman

applications and contributes toward improving our everyday lives."

Nigel Sarginson, Oxo Europe REACH and Product Stewardship and Regulatory Affairs Advisor at ExxonMobil, echoes that sentiment: "DINP is one of the first plasticisers and chemical substances to have gone through such extensive reviews by regulators with the conclusion of no classification and no further risk management measures required, and confirms DINP as a major safe and sustainable general-purpose plasticiser in Europe (approximately 50% of the plasticiser market) and globally," he says.

LMW regulation

European Plasticisers has also been commenting on the public consultation initiated by ECHA on the future update of entries in Annex XIV (the Authorisation List) of four low-molecular-weight (LMW) phthalates, DIBP, BBP, DBP, and DEHP.

When the consultation was announced, ECHA said: "The Commission is preparing to amend the Authorisation List with the additional intrinsic properties of these four substances. This update means that some uses which until now have been exempted may require authorisation, such as: i) uses of the four phthalates in mixtures in concentrations above 0.1 % w/w [so far the concentration limit has been 0.3 % w/w]; ii) some uses of DEHP [for example in food contact materials or medical devices] that will no longer fall under the generic exemptions from the authorisation requirement due to the endocrine disrupting effects on the environment of DEHP."

European Plasticisers says that the European

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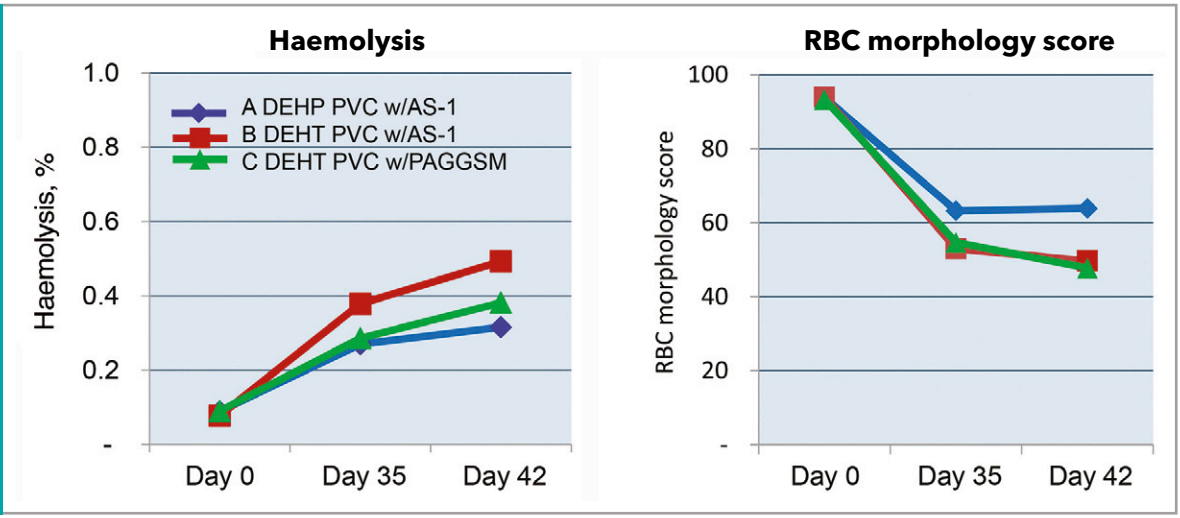

Figure 3: Haemolysis and morphology results from blood stored in bags of PVC plasticised with DEHP and DEHT (AS-1 and PAGGSM are preservative solutions)

Source: Eastman

plasticiser market "has already adapted to the regulatory and market pressures with an important major shift from the use of these classified LMW phthalates to the use of non-classified high molecular weight (HMW) phthalates and other plasticisers.

One close observer of the industry says that the major move away from LMW phthalates to non-classified HMW phthalates – and more recently to non-phthalate plasticisers – has been a 25-year process requiring an investment that probably amounts to more than €6bn by the industry in manufacturing process and plant, applications support for customer conversion, as well as investment in toxicology and environmental testing, regulatory and expert evaluations of the data, not forgetting conduct of LCA studies and extensive support for recycling via the VinylPlus sustainability initiative.

European Plasticisers does point out though that, "given that the four LMW phthalates are already regulated and Authorisation as well as Restriction procedures are ongoing, we believe that their double listing for the same adverse health effects in animals and inclusion in the Authorisation List for their ED [endocrine disruption] properties is unnecessary overregulation, and puts excessive burdens on the industry, weakens policy predictability and hence undermines the European industry from investing and staying competitive in a global market.

"Due to the fact that some uses of DEHP (for example in food contact materials or medical devices) will as a result no longer fall under the generic exemptions from the authorisation requirement, the update of the Annex XIV list will oblige DEHP producers, medical devices producers and recyclers of flexible PVC to face a new challenge regarding the Authorisation process."

Medical moves

In the medical sector, DEHP remains the plasticiser of choice in many applications. And the reason is simple – it provides a property set that is nigh-on unbeatable. That position may not be unassailable, however. Speaking at *Compounding World* publisher AMI's Medical Fluid Bags 2018 conference in Cologne in June, Dr Angelika Langsch, Senior Manager of Regulatory Affairs at **BASF**, said regulators increasingly believe there is a lack of justification for exposing sensitive new-born children to DEHP.

French law already prohibits the use of tubes containing DEHP in paediatrics, neonatology and maternity. Countries in the Arabian Gulf also recently notified the WTO of their intention to essentially ban DEHP in all medical devices from 22 July 2021. And a ban on DEHP in blood transfusion products came into effect in South Korea this June. "Medical device producers need a competitive and technically suitable alternative plasticiser," said Langsch.

In addition, European Medical Device Regulation 2017/745 – which came into force in May 2017 and has a three-year transition period – says medical devices "need a specific justification if containing substances above 0.1% (w/w) with the following properties: CMR Cat 1A or 1B (carcinogenic, mutagenic or toxic to reproduction); or endocrine disrupting properties for which there is scientific evidence of serious effects to human health."

For a long time, the European Pharmacopoeia has listed only DEHP as a suitable PVC plasticiser for medical devices. That changed on 18 January this year, when four more plasticisers – DINCH, BTHC, TOTM and DEHT – were added.

BASF produces DINCH, which (like DEHT) exceeds REACH requirements. Langsch cited studies that demonstrate its suitability for use in various medical devices, such as bags for infusion

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solutions, enteral nutrition, and blood. Blood bags made with PVC plasticised with DINCH have been approved in at least one European country for several years. "CE-marked medical devices based on alternative plasticisers are already in use not only on the European market, but are also available in Asia and North America," Langsch said.

At the same conference, Dr Martin Stimpson, Market Development & Account Manager at **Eastman Chemical** UK, looked at the suitability for DEHT (which Eastman manufactures as well as DEHP) for blood bags. He started by noting that one of the reasons why DEHP has been so favoured historically by bag makers is that, in addition to doing an excellent job as a plasticiser, it also stabilises the red blood cell (RBC) membrane, resulting in reduced haemolysis and good shelf life.

Although DEHP and DEHT are structurally and functionally similar, DEHT (di-(2ethylhexyl) terephthalate), which the company markets as Eastman 168 SG, "is distinct from a metabolic and toxicological standpoint," Stimpson said.

Stimpson presented results from an Eastman-supported study, which revealed that all RBC products stored in DEHT plasticised bags showed haemolysis under 1% after 42 days' storage (Figure 3). Pointing out that further work with a larger sample size is needed to validate performance, he said that, based on this initial study, "the clinical performance of Eastman 168 SG suggests it should be considered a lead alternative plasticiser for PVC blood bags."

In addition, he said that fresh frozen plasma (FFP) products stored in DEHT-plasticised bags for up to one year tested the same as products stored in DEHP-plasticised bags. "Based on this data, Eastman 168 SG is a potential replacement for DEHP in FFP storage bags," he said.

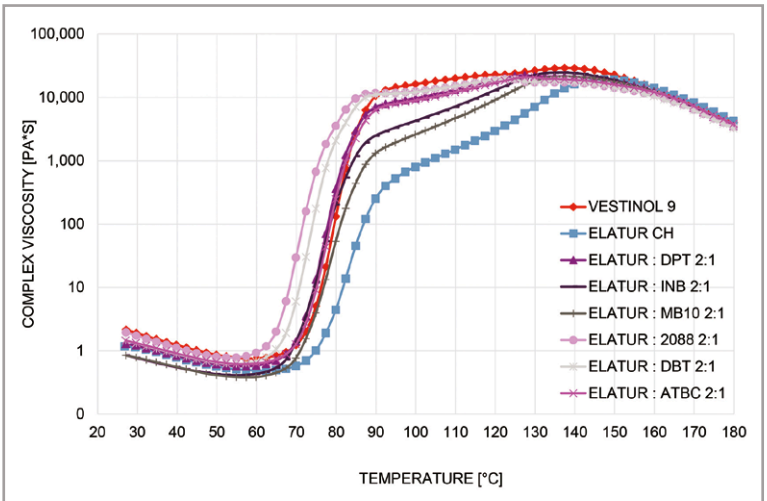

Figure 4: Gelation behaviour of an Elatur CH / DPT mixture (2:1) is almost on the level of DINP (Vestinol 9 is DINP; INB is isononyl benzoate; MB10 is isodecyl monobenzoate; 2088 is a reaction mass of several olefin glycol dibenzoates; DBT is dibutyl terephthalate; ATBC is acetyltributylcitrate
Source: Evonik

The scientific case

Back at ExxonMobil Chemical, Global Technical Plasticiser Advisor Didier Naert is campaigning for the use of "sound science" to make the case for plasticisers (preferably DINP, possibly in combination with MB10 to reduce viscosity and boost gelation and low temperature flexibility). He says because PVC and plasticisers are not chemically bound, but rather develop intermolecular forces such as dipole-dipole interaction, dispersion forces, and Van Der Waals forces, an optimum balance between polar and non-polar groups is needed to keep the two together. Ortho-phthalates like DEHP and DINP excel in this regard, with their polarised heads and non-polar tails, with polarising ester groups in the middle. Alternatives such as hydrogenated phthalates, terephthalates, adipates, citrates, and modified vegetable oil all fall short in at least one aspect, he says.

"Based on structural interaction and chemical structure, terephthalates or other alternatives are not able to cover the range of performance offered by HMW phthalates," according to Naert. "There is an ever-increasing need for plasticiser mixtures; specialty additives are shifting the flexible PVC industry into a foggier and more costly environment."

Consumer products and also technical articles have to be sustainable, Naert said. "Focusing on being non-phthalate does not mean that such plasticisers are automatically more sustainable. From raw material selection up to recycling, many considerations come into play when selecting sustainable plasticisers. We believe that the overall DINP attributes and performance makes it well positioned to address such considerations."

Alternative options

But DINP producers are not putting all their eggs in one basket. Discussing innovations to meet regulatory and economic challenges at AMI's PVC Formulation 2018 conference in Cologne in April, Dr Hinnerk Becker, Head of Marketing Segment Plasticisers at Evonik Performance Materials, introduced Elatur CH cyclohexanoate. He said this is a non-phthalate alternative to DINP. Its properties can be boosted by fast fusers, also made by the company.

Becker pointed out that DEHP stands out for its high gelation power. DINP, the best alternative to DEHP, has lower gelation power, and other alterna-

Right: Emery Oleochemicals produces low-migration plasticisers that comply with legislation on substances for indirect food contact

tives such as cyclohexanoates and DOTP have an even greater need for fusing agents. Evonik's answer to the problem is Elatur DPT di(iso)-pentyl terephthalate (Figure 4).

Among various advantages cited for this product is its very low content of volatiles and semi-volatiles (VOCs and SVOCs). "Most of the current fast fusers at least partly contain SVOCs, Becker said. "Elatur DPT is over 99% VOC and SVOC-free." Elatur DPT also has very good cold storage properties, with no freezing down to –20°C.

Elatur DPT is registered under REACH and Evonik began producing it in commercial volumes in Q2 of this year. "Feedback from the market has been very positive," says Becker.

Lanxess says the trend towards non-phthalate solutions is "unbowed, especially in regulated markets. One alternative to phthalates is the alkylsulphonic acid ester Mesamoll." This product has fast gelling properties in PVC and shows good plasticising efficiency, not only in PVC, but also in polyurethanes, acrylates and rubbers.

Lanxess has also developed a range of new polymeric adipic acid esters – Ultramoll V and Ultramoll VII – with optimised processing behaviour. This can be seen in a lower dissolution

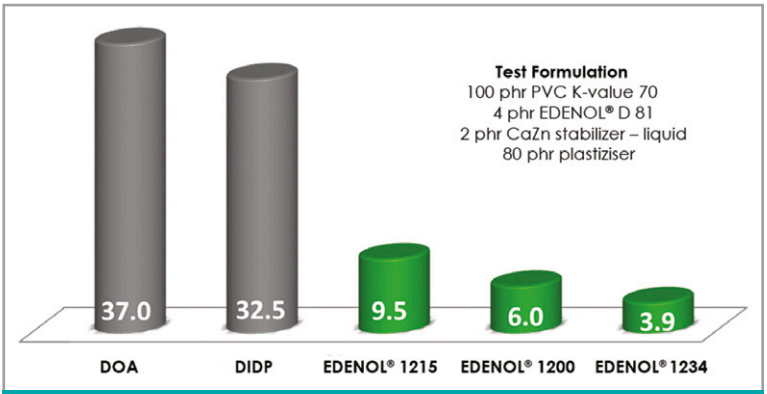

Figure 5: Migration resistance of monomeric and polymeric plasticisers. Comparison of weight loss (%) after immersion in iso-octane for 4h at 60 °C
Source: Emery Oleochemicals

PHOTO: EMERY OLEOCHEMICALS

temperature compared to Lanxess' standard grades. The company says the new grades also have an improved compatibility with PVC, which is demonstrated by reduced exudation especially in humid environments.

"Polymeric plasticisers from the Ultramoll range allow compliance with migration limits and the production of migration and extraction resistant goods," the supplier says. "In addition to technical applications, Ultramoll VII has also been developed for use in sensitive applications such as articles intended to come into contact with food." Ultramoll polymeric plasticisers differ in their average molecular chain lengths, which can be seen in their different viscosities, "to allow for diverse applications and the focus on processing conditions or migration behaviour."

Lanxess says its acquisition of Chemtura in 2017 significantly broadened its portfolio of organic phosphoric acid esters. Depending on type, Disflamoll and Reofos speciality plasticisers have a high gelling capacity and plasticising action or give plasticised PVC (and elastomers) good low-temperature flexibility, it says. The classification of Disflamoll DPO, diphenyl 2-ethylhexyl phosphate, was recently reviewed, with the result that since the end of 2017

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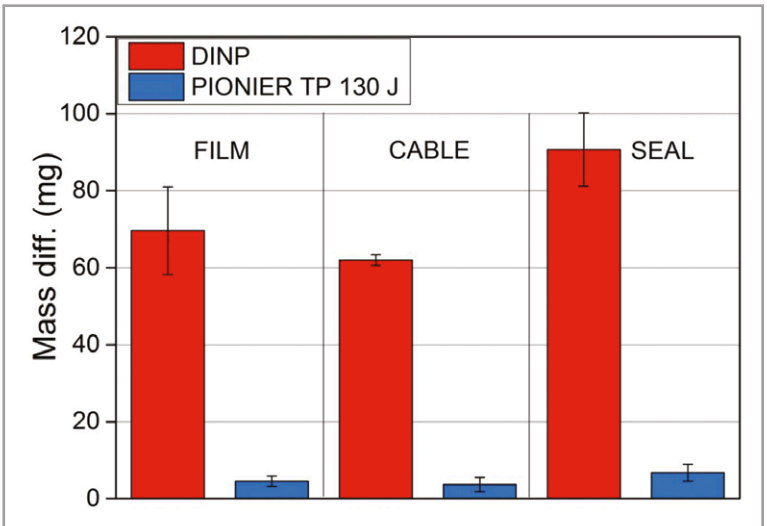

Figure 6: Comparison of plasticiser migration in different PVC products plasticised with DINP and Pionier TP 130 J
Source: SKZ

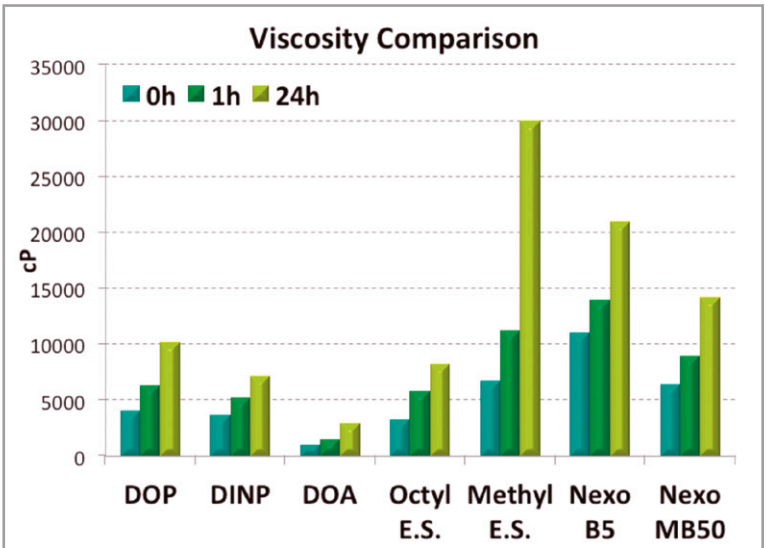

Figure 7: Viscosity comparison data for base coat PVC pastes plasticised with Nexoleum's Nexo B5 and MB50 bio-based plasticisers against conventional alternatives at same wt% (Brookfield viscometer, ASTM D 1824-95 (2010), 20rpm, 23°C
Source: Nexoleum

it no longer requires labelling under EU law.

Emerald says it continues to expand its portfolio of benzoate specialties. "Our goal is not to be closed in by the relatively narrow definition of a plasticiser as a flexibiliser; instead, we are utilising the versatile benzoate chemistry to solve a broad range of challenging formulation and performance hurdles," says a company spokesperson.

Recently introduced products are said to be useful as both plasticisers and modifiers. The company says their environmentally-friendly polymeric technology platform brings together an aliphatic polyester with some benzoate functionality to provide excellent compatibility with vinyl systems, together with permanence, flexibility, and stable surface energy characteristics. The latter is particularly important when creating multiple layer constructions or applying adhesives or printing.

Emerald says that its dibenzoates play an important part in plasticisation of VCT flooring materials as some general plasticisers have limited compatibility in vinyl. Incorporation of its K-FLEX 975P, 850P or PG products into a plasticiser blend can overcome this problem while also maintaining good rheology, enhancing stain resistance and lowering the fusion temperature. For newer LVT flooring products, which are more rigid, the company says new plasticisation technologies are being developed that help optimise characteristics such as resistance to indentation, impact and heat, and improve flexural modulus and melt rheology.

Bio-based developments

More bio-based alternatives to traditional plasticisers are emerging. **Emery Oleochemicals** for example, a global natural-based specialty chemical manufacturer, provides additives through its Green Polymer Additives business unit that are particularly suitable for the food packaging industry. The company has developed a portfolio of plasticisers with what it says are exceptionally low migration characteristics. They comply with EU Directive 10/2011, which sets migration limits of substances approved for indirect food contact.

To meet the demanding requirements of the food packaging industry, Emery Oleochemicals offers a full line of polymeric plasticisers over a viscosity range from 700 to 13,000 mPas (20°C); these plasticisers (in ascending order of viscosity) are Edenol 1208, Edenol 1215, Edenol 1200 and Edenol 1234.

Dr Nikola Kocić from the **SKZ** South German Plastics Centre introduced Pionier TP 130 J at the AMI conference on PVC Formulation. This is a 100% bio-based plasticiser obtained through modification of unsaturated triglyceride with hydrogen peroxide. Its properties can be adjusted through appropriate choice of alkyl rests. Kocić called the product a "green" alternative to DINP.

According to Kocić, Pionier TP 130 J scores over DINP in several ways. These include: faster incorporation into the PVC matrix; higher thermal stability; lower migration and chemical extraction; and better fogging properties. Efficiency is apparently comparable with DINP in achieving required mechanical properties.

Proviron is also working in the bio-based arena. Koen Engelen, Business Manager for Proviplast products says: "Over the last decade, Proviron

DEHP – a regulatory update

"Authorisation for use of DEHP in producing original PVC compounds and articles has been recommended by ECHA…and while official confirmation by the European Commission is still pending, the substances can currently be safely used in those applications for which an Authorisation request was submitted," according to **European Plasticisers**. Restrictions on DEHP and the three other LMW phthalates under the legislative microscope allow for continued use in outdoor applications where there is not prolonged contact with skin. There are also exemptions for industrial and agricultural applications, as well as spare parts for aircraft and motor vehicles.

The recycling of flexible vinyl containing DEHP has also been authorised for several companies and recently ECHA has recommended re-authorisation of such recycling, European Plasticisers says. The PVCMed Alliance, which is part of the European Council of Vinyl Manufacturers (**ECVM**), points out that, for example, 14 National Health Service Trust (NHS) hospitals in the UK participate in the RecoMed take-back scheme for disposable non-infectious PVC medical devices. Within this, hospitals collect PVC oxygen masks, oxygen tubing and IV bags, which is turned into tree ties for the horticultural industry.

Not everything in PVC recycling is working well, though. In June, VinyLoop Ferrara closed its plant in Italy that was recycling PVC cable sheathing and tarpaulins. The company, a joint venture between Inovyn and Texyloop, was established 15 years ago. The decision to close the plant was, according to the owners, was due to the collapse in the demand for regenerated material due to restrictive rules imposed on the use of products containing DEHP.

VinyLoop Ferrara used a selective dissolution process that eliminated foreign materials (metals, fibres), but not the plasticisers and additives present in the PVC. Authorisation for the plant was due to expire at the beginning of 2019.

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noted a wide range of demands to justify the development of two general-purpose and two niche plasticisers. It is now launching a valerate plasticiser and an improved epoxidised plasticiser."

The valerate plasticiser is for applications where weatherability and hydrolytic stability are critical – in outdoor decorative film, for example. The upgraded epoxidised plasticiser is dedicated to indoor applications. It can be used in calendering or flexible profiles. "Besides being renewable, this epoxidised plasticiser delivers outstanding long-term stability and eases recycling, a main trend to lower the environmental footprint," Engelen says.

Proviron is now also finalising the development of a medical citrate and a low-viscosity polymeric plasticiser, Engelen adds. "The medical citrate plasticiser aims to broaden the availability of this technology and to decrease the use of DOP in medical applications," he says. "The low viscosity polymeric plasticiser delivers an optimised solution combining fat/oil extraction resistance and "manageable" viscosity for plastisol-coating processes."

Argentinian chemical firm **Varteco** worked with Spain-based Shin-Etsu group company Compuestos y Granzas (**CYGSA**) in the Bioviplas project to develop a PVC shoe sole compound with a 64% renewable carbon content as certified in accordance to the USDA Biopreferred Program. The project, completed at the end of last year, used Varteco's V-Ziclus GP bio-based plasticiser, which is derived mainly from epoxidised soybean oil.

Epoxidised soybean oil also forms the base for a new generation of bio-based plasticisers from Brazil's **Nexoleum Bioderivados**. The Nexo B5, MB25 and MB50 products are said to offer visocisty and compatibility to allow them to replace DOP and DINP in emulsion and suspension PVC formulations (Figure 7). Nexoleum opened a subsidiary in the Netherlands in June and is in the process of REACH registering the new products. It hopes to complete that before the end of 2019.


PHOTO: VARTECA

Below: Shoes with a 64% bio-based PVC sole compound developed by CYGSA using Varteco plasticisers as part of the Bioviplas project

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Thursday 27th September 2018

09.00 Registration and welcome coffee
10.00 Opening announcements

SESSION 1- ASSESSING MARKET OPPORTUNITIES AND REGULATORY ISSUES

10.10 **Analysing global trends in plastics compounding and Asia's vital role in this market**
Mr. John Nash, Head of Strategic Research,
AMI CONSULTING, United Kingdom

10.40 **Exploring opportunities for filled and reinforced thermoplastics in the automotive and appliance industries in India**
Mr. Achal N. Thakkar, Managing Director,
AUTOTECH-SIRMAX INDIA PVT. Ltd., India

11.10 **Introduction to chemical legislation in Thailand**
Dr. Piyatida (Tung) Pukclai, Regional Business Development Director (Asia- Pacific)
DR. KNOELL CONSULT THAI Co. Ltd., Thailand

11.40 Morning coffee

SESSION 2 – GOING GREEN WITH BIO-BASED RESINS

12.20 **Raising the performance of bio-based polyamides – new developments and application case studies**
Mr. Wenda Chen, Head of Business Development,
ARKEMA Pte Ltd., Singapore

12.50 **Exploring the technical possibilities of fibre-reinforced stereocomplex PLA bioplastics**
Mr. YiKo Chen, Assistant General Manager,
POLYALLOY INC., Taiwan

13.20 Lunch

SESSION 3 – EXPLORING ADDITIVE OPTIONS

14.50 **Comparing inorganic and organic pigments for colouring plastics – making the right choice for your application**
Dr. Wolfgang Wald, Sales Director and Marketing Manager Asia Pacific,
HEUBACH GmbH, Germany

15.20 **Developing, testing and implementing non-phthalate plasticizers**
Dr. Chantana Saelim, Researcher,
SCG CHEMICALS Co. Ltd., Thailand

15.50 Afternoon tea

SESSION 4 - ADDING VALUE AND FUNCTIONALITY TO THERMOPLASTICS

16.30 **Investigating the use of graphite in flame retardant compounds**
Mr. Haibo Mo, Deputy General Manager,
QINGDAO HENSEN GRAPHITE Co. Ltd., China

17.00 **Making the most of functional fillers – understanding the impact of morphology, size distribution, hardness and surface properties**
Mr. Péter Sebö, Head of Marketing & Market Development,
QUARZWERKE GmbH, Germany

17.30 **Introducing the use of E-GMA copolymers as a reactive modifier or compatibilizer in polymer compounds, alloys and recyclates**
Mr. Xue Han, Deputy General Manager, High-Performance Engineering Plastics Dept., Advanced Polymers Div.,
SUMITOMO CHEMICAL Co. Ltd., Japan

18.00 Networking Cocktail Reception

Friday 28th September 2018

08.30 Registration and welcome coffee
09.00 Opening announcements

SESSION 5 - KEYNOTE SPEAKER - BUSINESS STRATEGIES FROM A GLOBAL PERSPECTIVE

09.10 **Developing strategies for growing a global compounding business: comparing experiences in Europe, Asia and the Americas**
Mr. Massimo Pavin, CEO,
SIRMAX S.p.A., Italy

SESSION 6 - COMPOUNDING SENSITIVE MATERIALS

09.40 **Exploring the inline compounding and extrusion of bio-based polymers**
Mr. Sebastian Fraas, Product & Applications Manager,
LEISTRITZ EXTRUSIONSTECHNIK GmbH, Germany

10.10 **Achieving gentle compounding without kneading blocks to optimise material properties**
Mr. Klaus Hojer, Business Development/Project Manager,
FEDDEM GmbH & Co. KG, Germany

10.40 Morning coffee

SESSION 7 - OPTIMISING THE PRODUCTION OF THERMOPLASTIC COMPOUNDS

11.20 **Overcoming challenges of feeding difficult handling and lightweight fillers in twin-screw compounding**
Mr. Alex Utracki, Business Development Manager, SE Asia,
COPERION, China

11.50 **Top tips for increasing the throughput of twin-screw compounding lines**
Dr.-Ing. Thomas Winkelmann, Head of Development Plastics Technology,
KRAUSSMAFFEI BERSTORFF, Germany

12.20 Lunch

13.50 **Optimising process and handling conditions to produce perfect pellets**
Mr. Harald Zang, Managing Director,
MAAG AUTOMATIK GmbH, Germany

14.20 **How to specify and operate compounding facilities for effective R&D projects**
Mr. Montree Pleekhunt, Compounding Specialist,
PTT GLOBAL CHEMICAL PUBLIC COMPANY LIMITED, Thailand

14.50 Afternoon tea and conference ends

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More than 4,000 expert visitors attended AMI's first Compounding World Expo and Plastics Recycling World Exhibition in Essen in Germany in June. We take a look back at the focused compounding industry event

Compounding industry votes with its feet for new expo

The Compounding World Expo (and co-located Plastics Recycling World Exhibition) made a very successful debut earlier this summer, attracting 184 exhibitors and 4,024 visitors to Messe Essen in Germany on 27-28 June. Organised by *Compounding World* publisher AMI, the focused plastics industry expos boasted an international audience – 42% of attendees came from Germany, 50% from the rest of Europe and 8% from outside of Europe. That final group included attendees from as far afield as South Africa, Brazil, China and South Korea.

"We are absolutely delighted with the response to our first exhibitions, which were very well supported by the international plastics recycling and compounding industries" said AMI's Head of Exhibitions, Rita Andrews. "We've had extremely positive feedback about the Essen shows from exhibitors and visitors alike".

Exhibitors reported large numbers of meetings with high-quality contacts on both days of the event. More than 60% of exhibitors have already reserved space for the next European versions of the shows, which will return to Messe Essen on 3-4 June 2020. Many have also booked stands at the first US versions of the Compounding World and Plastics Recycling World Expos, which will take place in Cleveland, Ohio, US, on 8-9 May 2019.

Many exhibitors highlighted the focused nature of the Compounding World Expo. "The Expo is very focused with everything key to the industry in one hall," said Dagmar Kirchof, Marketing Manager at Leistritz Extrusionstechnik.

The targeted compounding focus also helped deliver high quality visitors. "I have received more quality leads in one day of this event than a whole week at NPE," said Bernhard Gabauer, Segment Development Manager Plastics at Bühler. ›

Main image: Visitors doing business at the first Compounding World Expo and Plastics Recycling World Exhibition in Essen in Germany last month

PHOTO: BEKAERT

Above: Beki-Shield stainless steel fibres can provide ESD protection at low addition levels

The free-to attend conference programme also made a key contribution to the success of the events. The three conference theatres at the Essen shows hosted a series of presentations covering a wide range of technologies and market opportunities, plus informative training seminars and business debates featuring industry leaders, and attracted capacity crowds of up to 250 people each.

"The expo has been really valuable as I've been able to reconnect with a number of industry peers and share our expertise," said Dr Oliver Frey, Head of Compounding Department at Ensinger and a participant in one of the key Business Debates.

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

■ Over the following pages you can read about some of the technical and material innovations that were presented at the Compounding World Expo.

Steel fibre specialist **Bekaert** showed its Beki-Shield range of stainless steel fibres for providing anti-static and ESD protection and EMI shielding in plastics compounds. Available in bundle or grain formats, the materials are said to be easy to handle and disperse while a variety of surface coatings can be applied to suit specific matrix materials. According to the company, ESD protection can be achieved with additions of around 4 wt%; typical additions for EMI shielding applications start from around 8 wt%. Compounds containing the stainless steel fibres are said to be easily coloured.

The new Compeo co-kneader extruder from **Buss** was being shown for only the second time in Europe – its first outing was at the Italian Plast fair – and attracted considerable attention in Essen. The company's first major redesign in a decade combines the benefits of standardisation and modularisation to deliver a highly flexible production system that is intended to extend its appeal beyond the traditional PVC and heavily filled PO sector to high temperature engineering plastics.

The company says the new models offer a maximum processing temperature of 400°C and can match the throughputs of its equivalent-sized predecessors at 20% lower screw speeds. Torque density has been increased by 15%. The unit also allows conventional three and four flight kneading elements to be combined with new two and six flight elements to fully optimise performance.

Cabot Corporation used the event to highlight its recent, but not widely publicised, acquisition of Applied Nanostructured Solutions from the US

Dates for your diary

The Compounding World and Plastics Recycling World Expos will not take place in Germany next year because of the K 2019 show, but they return to Essen on 3-4 June 2020 when they will be joined by two additional focused related events, the Extrusion Expo and the Polymer Testing Expo.

Meanwhile, next year sees the US debut of the Compounding World, Plastics Recycling World and Extrusion Expos at the Huntington Convention Center in downtown Cleveland, Ohio, on 8-9 May 2019. For information on exhibiting at any of these events, contact Matt Wherlock.
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The conference programme at the Compounding World Expo proved a big attraction

PHOTOS: AMI

The focused nature of the show meant attendees could get the maximum from their visit

PHOTO: BUSS

Right: The Buss Compeo co-kneader was on display for only the second time in Europe

aerospace group Lockheed Martin. The company, acquired by Cabot in December last year, has developed a scalable continuous process for manufacturing novel three-dimensional carbon based nano materials that can be used to impart electrical conductivity in thermoplastic compounds.

Cabot's main focus for the new materials is in EMI shielding applications, said Cabot Performance Materials Business Development Manager Jean-Michel Poncelet. "This is an extension of our capability in conductive additives," he said. "We are known in the market as a carbon black-based compounder but we are moving beyond that. We already have graphene but CNS [carbon nanostructures] is a further step into advanced carbons."

Poncelet said the Applied Nanostructured Solutions' CNS additives are basically multi-wall carbon nanotubes (MWCNTs) arranged in a network. Like conventional MWCNTs, they can improve the electrical conductivity of polymer compounds either as a sole additive or by bridging the gap between carbon black particles. Both nano-additives can lower the percolation threshold (the addition level required to achieve conductivity). However, he said the 3D structure makes the CNS additives more effective in this respect.

The intention is to develop a range of materials within the Cabot Specialty Materials business that use combinations of carbon, CNS and perhaps graphene too, according to Poncelet. "It's finding the sweet spot between price and performance," he said.

Cabot is currently moving the Applied Nanostructured Solutions manufacturing equipment from Baltimore to its site near Boston in the US, where it also has its pilot-scale graphene production unit.

Below: CeNTI's Chromiumlike technology allows plastics to simulate the feel of metal

PHOTO: SHUTTERSTOCK

Portuguese nanomaterials technology institute **CeNTI** and mouldmaker Simoldes showed the results of the Chromiumlike project, which uses carbon-based nanoparticles to modify the thermal and electrical conductivity of plastic compounds to allow them to simulate the appearance and "feel" of chromed metal.

The new compounds simulate the cool touch of metal and are being targeted at automotive interior trim applications such as door handles, where many car makers are becoming concerned over the environmental profile of chrome plating, according to CeNTI Functional Polymers & Coatings R&D Manager Bruna Moura.

CeNTI also showed examples of some of its work in development of multi-layer piezoelectric fibres, which it sees having application in low cost strain monitoring systems for reinforced concrete. CeNTI claims to have one of only two lines in Europe capable of direct extrusion of such fibres.

Twin-screw extruder manufacturer **Changzhou Jwell Chemical Machinery** said it is setting up a dedicated export company targeting Europe and North America. Bond Shan, Vice-President and Sales Director at the company (part of one of China's Shanghai Jwell Machinery) said it has been working to grow its export sales in Russia, India, South Korea, Indonesia and countries in the Middle East. However, he said in Essen that executives at the company were surprised how many lines it was starting to sell in Europe and North America without specifically focusing on those markets.

Changzhou Jwell is now in the process of registering a new company, which will have a sales team led by Shan dedicated to export growth in the European and North American markets. It will start operating this year, he said. While the largest part of the group's sales are in extrusion lines for pipe, profile, film and sheet, the company also makes twin-screw compounding extruders in Changzhou at a 100,000 m² facility opened in 2015.

Coperion was highlighting its Involute screw and kneading elements in Essen, which use a new cross section claimed to provide a significant increase in throughput when processing highly filled com-

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pounds on its range-topping ZSK extruder range. Senior Process Engineer – Engineering Plastics Marina Matta said the new elements also enable higher filler loadings to be achieved, improve filler dispersion and homogenisation of the compound, and contribute to reduced energy consumption. Tests undertaken in Coperion's laboratory showed a throughput increase from 550 to 900 kg/h when processing PP with 70% $CaCO_3$ on a ZSK 58 Mc^{18} twin screw extruder.

The company also showed its virtual reality simulation of a compounding plant. This allows customers to "walk through" a planned installation and see exactly how it will operate before a single bolt is tightened. Aside from trialling project plans, the system – currently a development project – could also form the basis of troubleshoot or training tool. Available now, however, is the Coperion Production Contol Centre (CPCC). This incorporates the essential elements of a manufacturing execution system (MES) and interfaces that with a company's ERP system. It provides full documentation of the production process and allows finished product to be traced right down to the batches of raw material used.

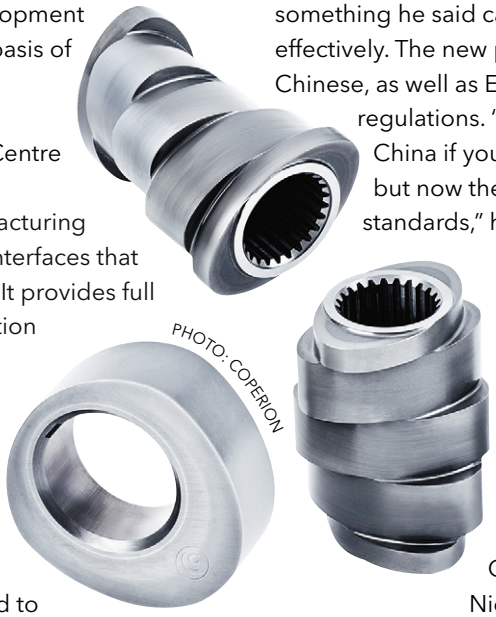

PHOTO: COPERION

Right: Coperion's Involute elements are designed to handle highly filled formulations

Based on the experience gained in the implemention of more than 150 compounding lines, the CPCC is intended to be customised to an individual customer's requirements. Coperion said the first system will be put into operation in the second half of 2018.

CPM Extrusion, which last year acquired Germany-based Extricom Extrusion, showed an RXT35 twin screw extruder on its stand. Part of the company's Apex machine range, the RXT series are cost-optimised machines assembled at the CPM Ruiya Extrusion plant in China using a combination of European and Chinese parts but localised to the European market. Director of Process Technology Adam Dreiblatt said the company is in the process of expanding its Chinese production facility. A 15,000m^2 extension to the plant at Nanjing in China will lift capacity to 500 lines annually when completed in March next year.

Dreiblatt, who gave a number of training presentations in the conference sessions, is also the driving force behind the company's training webinars and newly launched Extrusion Knowledge Centre, which makes an archive of some 35 available for on-demand viewing. "There is no shortage of twin screw compounding extruders available around the world but the training and knowledge to operate, maintain and troubleshoot is missing," he said. "The Extrusion Knowledge Centre is designed to provide 24/7 access to our learning portal to those customers who need it most."

Dow Performance Silicones said it will launch a new line of additives for PE films combining slip and anti-block performance at the Fakuma show later this year. Global Segment Leader Plastic Additives Christophe Paulo said the new additive masterbatches use a compatibilisation chemistry that allows silicone slip additives to be successfully compounded with a silica-based anti-block, not something he said can usually be achieved effectively. The new products will also comply with Chinese, as well as EU, FDA and Japanese, regulations. "In the past, you were OK in China if you had EU and FDA approval but now they are enforcing their own standards," he said.

Compounding systems producer **Feddem**, part of the Feddersen Group, was promoting the long fibre thermoplastics (LFT) production technology it has developed with fellow group company Akro-Plastic. That line will go into production in Q3 of this year at Akro-Plastic's Niederzissen plant in Germany but is already near sold out, according to Feddem sales manager Michael Hampf, and a second line is already under consideration.

Hampf said the LFT production technology is based on the company's ICX system, which is a combination of process and machine technology developed with a number of selected external partners to allow it to offer performance-optimised systems customised to individual applications on short lead times. He said a particular challenge in LFT production is ensuring the equipment is able to handle the wide variety of reinforcing fibres used. "LFT technology is completely different from compounding," he said.

With Industry 4.0 rising up the agenda for many, **Fraunhofer LBF** presented its ImProcess4.0 intelligent sensor node-based monitoring and optimisation systems for twin screw extruder production lines. Researchers at the institute identified suitable sensors and evaluation methods for determining undesirable machine conditions such as wear then established suitable process control

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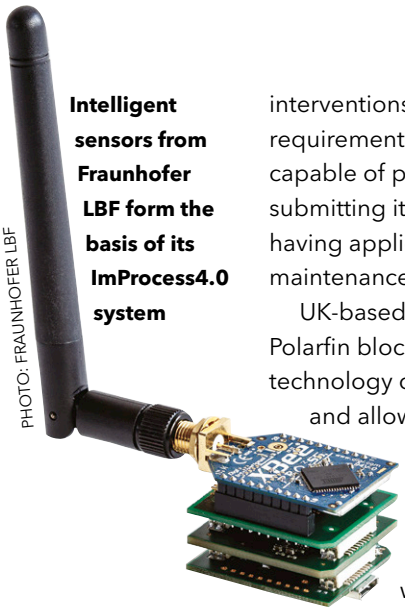

PHOTO: FRAUNHOFER LBF

Intelligent sensors from Fraunhofer LBF form the basis of its ImProcess4.0 system

interventions. From this they established the requirements for an intelligent sensor node capable of pre-processing collected data before submitting it to the controller. It sees the sensors having application in condition monitoring and maintenance planning.

UK-based **Interface Polymers** presented its Polarfin block copolymer, which is based on technology developed at the University of Warwick and allows compatibilisation and surface modification of polyolefin resins. Polarfin materials have clear application potential in recycling of incompatible polymer blends, such as PE with PS, PA or PET. However, Business Development Manager Simon Waddington said the additives may hold even greater potential in surface modification.

Waddington cited the example of agricultural films for poly-tunnels where effectiveness is often limited by the durability of the anti-fog and anti-drip performance. Traditional additive based solutions suffer migration issues, which means they have a working lifetime of around 18 months. Polarfin additives are permanently fixed in the polymer so will last as long as the film itself, which can be as long as three years.

PHOTO: LEISTRITZ

Right: Leistriz will deliver its first "smart" online rheometry systems this year

Underlining the move towards smart compounding systems, **Leistritz** said it would deliver the first commercial systems using its new inline elongational rheometer later this year. Launched at Fakuma last year and developed in partnership with the Johannes Keppler University in Austria, the new device uses a patented slit die geometry that allows it to measure shear and elongational viscosity in-line over a wide range of melt viscosities. Its flexibility also means it can handle heavily filled and glass reinforced compounds.

Right: Polarfin block copolymers from Interface Polymers could double the life of poly-tunnel films

Leitritz has previously developed in-line systems for adjusting viscosity in polyolefin production and for colour control in pharmaceutical applications. However, it said in-line "smart" monitoring of more general compounding has not been possible due to the inflexibility of traditional rheometry technology.

The company also showed its ZSE 35iMaxx extruder. Product & Applications Manager Sebastian Fraas said this has been designed to meet the fast job changeover times required in the colour masterbatch sector, where batches down to 120kg or so are becoming increasingly common. Features include an enclosed motor, integrated water pump and cooling, insulated barrel and quickly removable die.

Although perhaps better known for its pellet materials handling systems, **Motan Colortronic** said the polymer compounding sector accounts for around 10% of its business. It recently introduced a new volumetric version of its Spectroflex flex-wall feeding system for powders, flakes and fibres. A gravimetric version will be available shortly, allowing better feeding of materials with varying bulk density. Key features of Spectroflex units include adjustable intensity of the feeding agitators (which do not contact the material to be fed), tool-free exchange of the hopper modules for fast changeover, and choice of discharge options.

Compounder **Poly-IQ** presented new engineering polymer compounds based on 100% recyclate at the Plastics Recycling World Exhibition in Essen. The company has started producing recycled PC, ABS and PC/ABS compounds at its facility in Overath, Germany.

Norbert Grünewald, Head of Business Sales and Technology, said that other compounders produce ETP materials with low recycled content, such as 10% or 20%, but Poly-IQ decided it would it would be better to make products with 100% content. The new products are a close match for equivalent ETPs based on virgin resin, he said, in terms of MFI and performance characteristics. On its stand, Poly-IQ showed parts such as a cell phone cover moulded in rPC, and an automotive lamp fitting moulded in rPC/ABS.

R&P Polyplastic Head of R&D Mikhail Katsevman said the company, which claims to be the leading player in the Russian compounding market

PHOTO: AMI/CHRIS SMITH

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PHOTO: SIKORA

Right: Sikora's Purity Scanner Advanced online pellet inspection system

and is a key supplier to Renault-Nissan-Avtovaz, Volkswagen, Magna, Whirlpool, LG and Candy, is now looking beyond its own borders and has delivered its first shipments to customers in Europe. He said the company is also seeking other forms of cooperation as part of its "Export Boost" strategy, including M&A, production in European manufacturing plants, as well as distributor agreements supplying material from its Russian production sites.

Sappi displayed its Symbio range of 50% cellulose fibre-based concentrated PP compounds, which allow processors and compounders to introduce its lightweight renewable reinforcements into their own formulations. The Symbio PP concentrates contain 50% cellulose fibre and are well suited to the production of compounds with a final concentration of between 20-30%. Sappi New Business Development Manager Jacob Hartstra said the materials are increasingly being used in hybrid formulations where they can replace either talc or glass.

Looking ahead, Sappi is working on development of a technology to compress the very low bulk density cellulose fibres into a pellet that can be accurately dosed without specialist feeding equipment. "Normal extrusion lines cannot handle cellulose fibres," said Hartstra.

Below: Schwing offers a variety of cleaning options for compounding system components

Schwing Technologies was promoting its cleaning services for safe removal of polymer and additive contamination from compounding machinery parts, including breaker plates and screw elements, without abrasion. "With our user-friendly and precisely controllable systems and our cleaning expertise, we guarantee perfect cleaning results," said Managing Director Thomas Schwing. "Our systems do an extremely gentle, energy-efficient and environmentally friendly job of cleaning without adding any chemicals."

PHOTO: SCHWING TECHNOLOGIES

Cleaning options include the Vacuclean vacuum pyrolysis for parts such as pelletising nozzles, screws and screw elements. Innovaclean fluidized bed cleaning for breaker plates and screw elements (which is capable of handling high-temperature plastics such as LCP, PEI, PPS, PI), and the Maxiclean pyrolysis process for large pelletizing nozzles and discs. Schwing offers the services on a 24/7 basis to compounders in Germany and surrounding countries.

Pellet inspection specialist **Sikora** had a busy time at the show with Sales Director Holger Lieder reporting growing interest in its online and offline equipment as compounders become increasingly aware of the cost of contamination to their business. "The [inline inspection] market is picking up," he said. "Initially we thought we would go to the high price compounders but at the moment we are talking to medium and low price producers."

The company's Purity Scanner Advanced combines optical and X-ray camera technology to inspect the outside and interior of every pellet produced. Any contaminated pellets are automatically rejected. Leider said he is also seeing growing interest in the offline Purity Concept system, which can automate the manual inspection systems used in many compounding plants, speeding up testing and eliminating errors.

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Taking a measured approach to dosing

*Suppliers of dosing and feeding equipment are finding new methods to achieve consistent performance. **Mark Holmes** takes a look at some of the latest developments*

Precision dosing and feeding of materials to the extruder is a key element of the compounding process. Manufacturers of dosing systems are not only focused on providing feeding accuracy, but are improving the flexibility of equipment to handle a wider range of materials and enhancing connectivity to provide full integration into the developing Industry 4.0 production environment. This article takes a look at some of the latest introductions.

PHOTO: SCHENCK PROCESS

Main image: Schenck's ProFlex C loss-in-weight flexible wall feeders have been designed for compounding industry applications (page 46)

Motan-Colortronic has added a gravimetric dosing option to its Spectroflex V dosing platform. The company describes the Spectroflex V as a modular, flexible wall dosing system capable of handling powder, granules, pellets, regrind, flakes and fibres. Introduced as a volumetric dosing model, the company says the new gravimetric dosing option uses the same base and exchange modules and offers an alternative for customers needing to accurately dose materials with varying bulk density.

Throughputs of between 0.7 and 3,000 litres/h are possible from the Spectroflex V design, depending on the material and model. Modules are easily exchanged, which is said to make material changes and set-up quick and easy. The gravimetric dosing unit is controlled via Motan-Colortronic's GRAVInet SF system, which is a network-compatible controller capable of supporting up to two dosing modules.

ProTec has developed a new range of high-precision gravimetric SOMOS Batchmix batch dosing systems. The company says the systems are capable of accurately preparing a formulation of up to six flowable components and holding it ready for further processing. In addition to ensuring high reproducibility and being easy to maintain, the company says the SOMOS Batchmix range is characterised by ease of operation and fast material and product changes.

The new Batchmix systems are available in three sizes offering throughputs from 240 to 1,900 kg/h. In addition to pellets and additives, regrind with a bulk density of as low as 400 g/l can also be processed. ProTec says it has completely updated the mechanical and aesthetic design of the new units. Two load cells, one fitted to the weighing bin and one to the downstream mixing bin, are said to ensure reproducible mixing results. The modular design also ensures flexibility in application - for example, the units can be set up for either four or six components with subsequent retrofitting possible.

Batchmix models are said to be simple and quick to install on an extruder or stand. A transport unit is integrated into the substructure while the lid of the batch dosing unit can be quickly removed

Right: Motan-Colortronic has introduced a gravimetric option for its Spectroflex V flexible wall feeding platform

for maintenance. Storage bins also feature generously sized cleaning openings and are easy to remove, even when full.

With a network-compatible PLC controller, Batchmix batch dosing units can be networked with processing machinery and other peripherals from the SOMOS range. Optional packages mean the units can also be adapted for use in an Industry 4.0 setting.

Schenck Process has introduced its ProFlex C loss-in-weight feeder family for the compounding and masterbatch industries. The company says that the optimised design, flexible hopper walls and support for a variety of installation options make the new unit well suited for continuous feeding of bulk materials such as powder, granulates, pellets or fibres.

PHOTO: COPERION

The ProFlex is available in three feeder sizes – C 500, 3000 and 6000 – supporting up to five extension hoppers. The units are easy to clean and feature an easily adaptable and space-saving design that makes it possible to install them in existing and new production plants. For example, the off-centre feeder arrangement allows up to eight feeders with close-fitting discharge helixes and nozzles to be used, while drive and feeder set-up can be customised during assembly.

The company says that the direction of the discharge side can be easily changed at any time, providing even greater versatility, and Schenck Process is now offering different discharge lengths as standard options. The company says that only two accessible sides are needed for service work.

Above: The T35 volumetric feeder from Coperion is designed for handling poor flowing materials

The company says various feed hoppers, gear reducers, helixes and nozzles are available for adaptation of the ProFlex C to the specific properties of different bulk materials and all models are available in volumetric and loss-in-weight feeder versions.

At the NPE show earlier this year, **Coperion** showed a twin screw T35 volumetric feeder configured for masterbatch production. The T35 can handle almost any type of material but is said to be particularly effective for materials that tend to clump or bridge, such as poor flowing powders (as well as flakes and fibres).

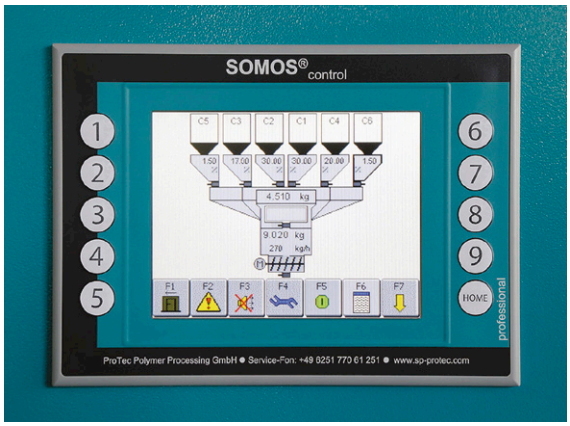
Right: ProTec's Batchmix dosing systems use a network-compatible controller suitable for integration into an Industry 4.0 system

The twin screw feeder features interchangeable feeding tools and all parts in contact with the material being fed are manufactured in stainless steel. A horizontal agitator gently moves material to the throat and into the screws. Feed rate ranges from 1.25 to 2,500 dm³/h, depending on the material.

The company also showed its Smart Flow Meter (SFM), which is designed for reliable metering in high rate applications. The SFM provides high accuracy feeding at feed rates of up to 200,000 dm³/h. According to Coperion, it is less costly to buy and maintain than typical large loss-in-weight feeders and it requires less head room in the plant. The SFM can handle a wide range of free-flowing materials, including granules, powders and fibres, with typical particle size in the range from 0.02 mm to 10 mm.

Movacolor has introduced the MCHybrid 30R gravimetric blender – a new variant of its current MCHybrid 30 the company says is specifically upgraded for the use of lower density regrind materials. The MCHybrid 30R can be customised with a wide choice of hopper models and support systems for loaders. Key features of the MCHybrid 30R include larger volume hoppers for lower density materials and steeper hopper angles to accommodate poorer flowing materials. Due to their increased weight, the new hoppers are non-removable but draining through the machine is possible.

Piovan Group supplies compounding line solutions through its Penta and FDM divisions for storage, feeding and dosing of granules or powder. The company identifies a number of trends in feeding and dosing technology. "Firstly, the management of production facilities is becoming more complex with a high number of materials



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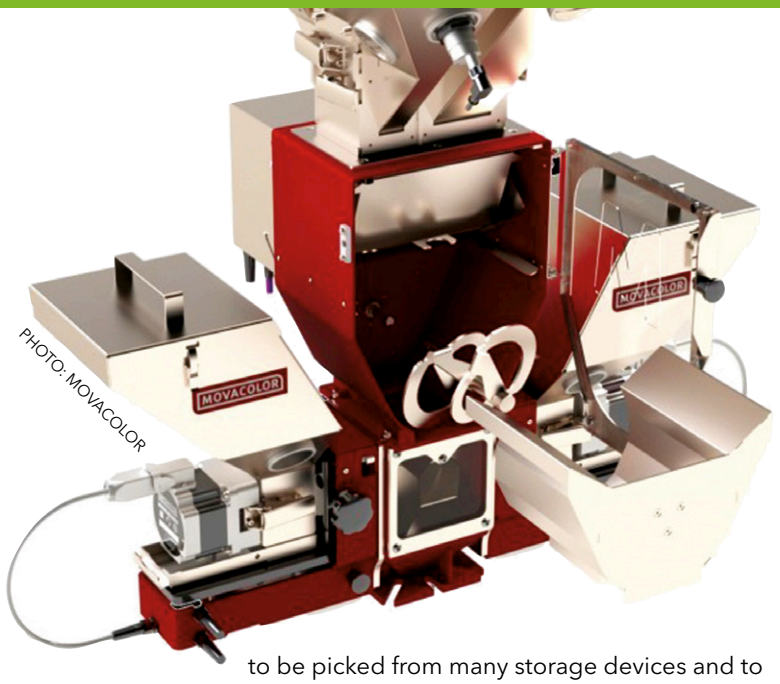

PHOTO: MOVACOLOR

Above: Movacolor's MCHybrid 30R blender combines gravimetric and volumetric technology

to be picked from many storage devices and to be addressed to many destinations," says Lorenzo Zamberlan, Product Marketing Manager at Piovan. "Other current issues include the control of humidity and crystallinity after pelletising and the increasing use of WPC materials – PP- or PE-wood compounds."

Zamberlan says the company is addressing the first of those trends through development of its Easylink+ automatic coupling station. "We have also introduced a new Material Tracking System as part of the Winfactory 4.0 supervising system to keep materials flow under control in production and to optimise consumption and stock levels," he says.

Maguire Products has launched the WXB, a weigh extrusion blender that provides extrusion control based on batch precision and metering accuracy and can be interfaced with a supervisory system that controls the total production line. The company says the WXB incorporates a gain-in-weight (GIW) weigh bin and a loss-in-weight (LIW) mix chamber in one machine, together with a Maguire 4088 controller. While the GIW function precisely weighs batch ingredients as they are dosed sequentially into the weigh bin, the LIW mix chamber makes accurate metering of the blend into the processing machine possible.

The 4088 controller is designed for communication with other systems in an Industry 4.0 setting. It enables the WXB blender to interface with the Maguire + Syncro supervisory system, which provides control of all segments of a production line from a single touch-screen HMI control. The Maguire + Syncro brand is the product of a partnership between US-based Maguire and Italy's Syncro that began in 2016 with Maguire taking an investment position with Syncro.

"The partnership draws on Maguire's experience in materials handling and blending systems and Syncro's extensive range of control systems for extrusion applications," says Frank Kavanagh, Maguire Vice-President of sales and marketing. "It enables us to provide customers with turnkey control systems for virtually any type of extrusion operation."

Initially the WXB blender is available in three models: WXB 100 for throughputs of 50-100 kg/h (100-220 lb/h); WXB 200 for 100-200 kg/hr (220-440 lb/h); and WXB 400 for 200-400 kg/h (440-880 lb/h). The blenders can be configured for up to twelve ingredients, each with a separate dispenser. The WXB mix chamber is easily removed for quick cleanout and all loading system options available from Maguire are integrated into the controller.

Well known for its Flexwall line of volumetric and gravimetric feeding systems, one of the more recent additions to the **Brabender Technologie** product line is its fibre feeder. Designed for feeding natural fibres, wood fibres, shredded films and long carbon fibres, the unit uses a special screw, steep walled hopper and fibre optimised hopper agitator that ensures good feeding of the material into the screw. The company says the units' CM controller allows accurate setting of the feed screw to agitator speed ratio, which it explains is the secret to effective fibre feeding.

Koch-Technik has developed the Kem-Touch direct colouring device as a cost-effective solution for dosing masterbatch or additives directly in the material input of a processing machine. The company says the device offers a simple design that provides precise volumetric dosing via a new stepper motor with an epicyclic gear that provides improved precision, starting and stopping behaviour, as well as 60% lower energy consumption. The control system is integrated into the Kem-Touch casing and includes several programs to provide precise dosing, including support to dose in accordance with an extruder rotation pulse.

Control is carried out from the unit's touchscreen via a clearly structured menu. Dosed quantities can be set continuously in percent-

PHOTO: MAGUIRE

Right: Maguire's WXB blender incorporates extrusion control technology from Syncro

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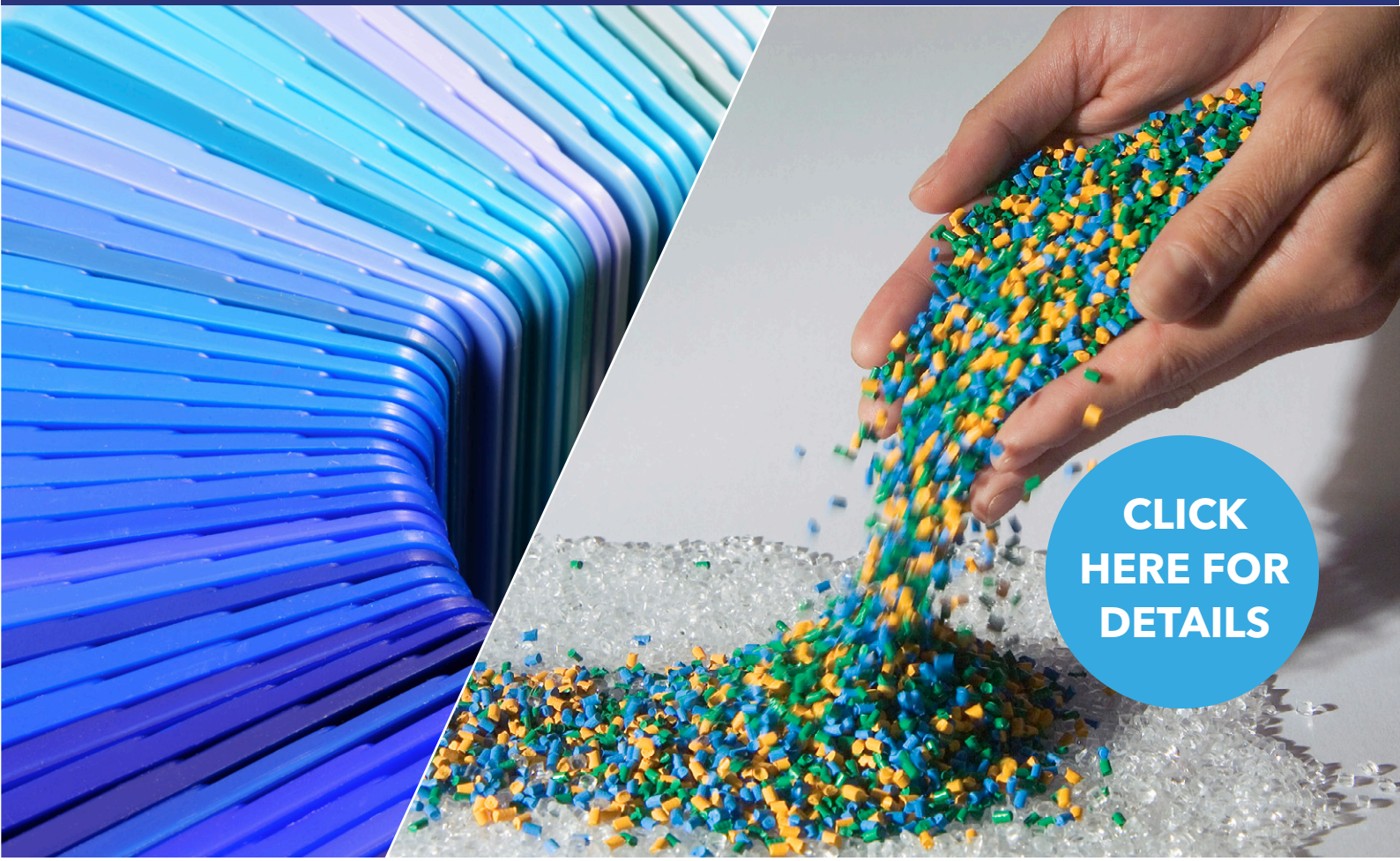

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PHOTO: KOCH-TECHNIK

Above: Kem-Touch is Koch-Technik's latest unit for direct colour or additive masterbatch dosing

ages or seconds while optional filling level and rotation monitoring can provide greater safety in the dosing cycle. A network interface is also available as an option to allow integration of each Kem-Touch unit into an external ERP-system. OPC-UA communication also ensures the devices will be capable of integration into Industry 4.0 systems. Kem-Touch also has a new dosing motor. This stepper motor with an epicyclic gear case provides retention torque, precise starting and stopping behaviour, as well as 60% lower energy consumption.

Moretto has introduced the DPK, a compact loss-in-weight blender, suitable for intermittent or continuous dosing of small quantities of colour or additives. The company says the new dosing unit prevents overdosing through extremely precise control. It says the combination of a vibration protection system and machine control algorithm means the DPK can achieve a dosing accuracy to 0.3%. The unit features a removable hopper made of transparent acrylic that allows the operator easily to check fill level while an integrated feeding system handles materials loading, depending on the needs of the processing machine.

Wittmann Group has extended its range of Feedmax basic material loaders with appliances with 15 and 25 litre capacities. The company says that these new models now make it possible to connect material loaders from this series with larger drying hoppers or gravimetric blender systems with higher material throughputs as well.

All parts of the Feedmax range which come into contact with the material to be processed are made of stainless steel, and the central part is connected to the pedestal by a clamping ring. The flow of granulate into the material loader can be optimised by twisting the top part of the appliance. The standard version features a cast stainless steel inlet with a generous wall thickness to withstand abrasive granulates while a sealing surface on the vacuum stopper ensures reliable functionality on the vacuum side of the appliance. The lids of the larger models are also easy to open as there are no hoses in the way.

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PHOTO: MORETTO

Right: Moretto's DPK is a compact gravimetric blending system for intermittent or continuous dosing applications

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Footwear brands kick off innovation dialogue

We preview AMI's second edition of Polymers in Footwear, taking place in Cologne, Germany, in October

Main image: Crocs LiteRide collection

AMI will stage the second Polymers in Footwear conference in October, providing a comprehensive market overview, discussing future trends, key challenges and exciting opportunities for the footwear industry and its supply chain. This high-level international event will bring together polymer and additive suppliers, processing machinery experts, shoe designers, manufacturers, brand owners and retailers. Polymers in Footwear 2018 will cover the latest, ground-breaking innovations in polymer solutions and technologies, and explore future ambitions of this market.

The two-day conference takes place on 10-11 October at the Maritim Hotel in Cologne, Germany. It will be an essential meeting place for footwear industry professionals to get an up-to-date view on market trends, keep up with new material and technology developments for footwear applications, discuss the most demanding challenges with innovators in the industry, and to network with experts from forward-thinking companies from around the world that are shaping the future of the footwear market.

Green solutions and sustainable options, technological breakthroughs, impressive research projects, Industry 4.0 and future opportunities that will help you gain a competitive advantage in this extremely fast-moving industry – all these issues and trends will be covered. Here we take a closer look at the line-up of expert speakers.

Current and future trends

The opening session of Polymers in Footwear 2018 kicks off with a presentation by **Joana Vaz Teixeira**, International Business Intelligence Manager, at **APICCAPS & World Footwear** in Portugal, on global footwear market perspectives. This is followed by a panel discussion on industry challenges and opportunities that new innovations present to the footwear market. The discussion is joined by **Sabrina Zinner**, Manager Material Engineering Innovation Footwear, **Puma** in Germany, **Alec Jessiman**, Performance Engineer at **Saucony Human Performance and Innovation Lab** in the United States, **Chris Bellamy**, Product and Manufacturing Engineering, at **Wiivv Wearables** in the United States and **Stefano Ferniani**, Senior Director, Global Innovation at **Crocs** in Italy.

The conference's second session offers an opportunity for delegates to find out more about the idea behind a pair of Veja shoes: standing with one foot in design and the other in social responsibility by using fair trade, organic, and recycled materials, in a presentation by **François-Ghislain Morillion**, Co-founder, at **Veja** in France. This is followed by a talk by **Galahad Clark**, Shoe Maker, Owner and Founder of **Vivobarefoot** in the United Kingdom, and **United Nude** in the Netherlands, focussing on environmentally sustainable approaches for footwear with plants and circularity. Then **Anna Bullus**, the Founder of **Gumdrop** in the United Kingdom, is addressing how the second biggest litter problem can provide manufacturers with a sustainable alternative, by turning waste chewing gum into innovative footwear.

Polymers and innovation

The third session of the day features **Stefano Ferniani**, Senior Director, Global Innovation at **Crocs** in Italy, who is talking about a project that has a customer-centric approach to further develop materias. The next presentation by **Marco Meneghetti**, R&D Leader TPE Solutions at **Applicazioni Plastiche Industriali (API)** in Italy, explores innovative, value-adding TPE solutions in footwear. A paper on 3D printing materials for footwear combining bio-based materials, increased productivity and enhanced performance is then presented by **François Tanguy**, Business Development Manager at **Arkema** in France. **Marco Ortalda**, PU Footwear Development Manager at **BASF Italia**, investigates light and high performing PU foam in injection moulded footwear. To close the day **David Pascual**, the Global 3DP Marketing Manager and EMEAI Footwear & Performance Apparel Marketing Manager at **Lubrizol Engineered Polymers** in the US, discusses innovation through advanced footwear materials enabling design freedom, high performance and lean manufacturing.

Expert speakers include, from left to right: Stefano Ferniani from Crocs, Sabrina Zinner from Puma, Joana Vaz Teixeira from APICCAPS & World Footwear and Marco Meneghetti from API

Applying science

Day two of Polymers in Footwear 2018 is opened by **Filippo Goi**, who works in product development at **Vibram** in Italy, presenting the findings of his study of the effect of vibration and foam materials on foot segments. **Alec Jessiman**, Performance Engineer, at **Saucony Human Performance and Innovation Lab** in the US, then speaks about footwear function and future trends in polymer technology. This is followed by a paper by **Chris Bellamy**, Product and Manufacturing Engineering at **Wiivv Wearables** in the US, who will present the findings of a research project on custom fit 3D printed footwear components.

The last session of the conference starts with a presentation by **Adrian Strauß**, Manager Innovation Centre at **DESMA Schuhmaschinen** in Germany, on implementing innovative direct injection technologies for customised footwear production with personalised midsole characteristics. **Karim Oumnia**, CEO at **Digitsole / Zhor-Tech** in France will talk about the transformation of shoes into smart shoes. Closing the conference will be **Christine Niklas**, Product Manager at **Sanitized** in Switzerland, who will explain how to implement a footwear odour control strategy.

About Polymers in Footwear 2018

Polymers in Footwear 2018 will provide a unique international forum in which to explore the current developments in the footwear market and future trends. Listen to industry experts presenting issues and innovations, performance and productivity. Then discuss your needs in networking breaks, including a table top exhibition area and complementary cocktail reception at the end of the first day.

To find out more about attending the conference, taking a table-top exhibition space, or becoming a conference sponsor, visit the **conference website** or contact Conference Organiser Sophie Harrisson at **sophie.harrisson@ami.international**, Tel +44 117 314 8111.

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PHOTO: CHRIS DEARMITT

Functional fillers set to flourish

Functional fillers can lift the performance of polymers, enabling compounders to open up new application areas. Peter Mapleston looks at some of the latest developments

A huge variety of functional fillers – ranging from minerals through to engineered glass structures – can be added to plastics to extend performance and applications into areas not attainable with unmodified materials. It is a multi-billion dollar market and one that continues to grow. And while some functional fillers have been around in one or another form for decades, new developments in application and modification, as well as the emergence of new filler products, still occur at a remarkable pace.

One technical expert who keeps a keen eye on developments (and is involved in quite a number of them) is Chris DeArmitt, an independent consultant who at various times in his career has worked at prominent functional filler companies such as LKAB Minerals, Applied Minerals, and Hybrid Plastics. One of the numerous interesting areas that he highlights is low-quartz fillers.

Common mineral fillers such as calcium carbonate, talc and mica have something of a reputation for causing wear during processing, but it is not the minerals themselves that are the problem because they are relatively soft. It is hard impurities, particularly quartz, that cause machine wear, DeArmitt explains. For this reason, low quartz levels have always been desirable. However, with concerns now being paid to possible detrimental health effects of quartz in mineral fillers, increasing attention has been focused on low quartz mineral fillers in recent years, he says.

"There has been an upsurge in requests for functional fillers without quartz and new grades are appearing to meet that demand," DeArmitt says. He cites the example of Kish Company's **Artic Minerals** (for which he provides consultancy services), which has developed numerous fillers with levels of crystalline silica below 0.1%. These include DenzFlex iron oxide and FiberFlex, a developmental mineral fibre with properties similar to wollastonite.

Barium sulphate is the standard high-density filler for plastic parts used to dampen vibrations. When even higher density is needed, then iron oxides are selected (the density of barium sulphate is 4-4.5 g/cm^3 while the density of pure iron oxide is 5.2 g/cm^3). Iron oxide has been used for many years by major automotive companies but its cost has precluded wider adoption in applications such as washing machines, for example. Kish Company subsidiary Arctic Minerals hopes this will change

Main image: Artic Mineral's DenzFlex iron oxide – in this case in a PEEK resin – provides an alternative to barium sulphate as a high density filler

with its introduction of DenzFlex, a high purity Fe_2O_3 red iron oxide launched earlier this year.

DenzFlex is described as a high purity Hematite-based product and is said to be substantially less expensive than traditional iron oxide offerings, allowing it to compete with barium sulphate. With a thermal conductivity of 1,250 W/(m.K), it may also find application in the production of thermally conductive compounds. It can also provide x-ray and radar blocking and enable microwave heating.

Wollastonite fibres

Wollastonite is the dominant mineral filler in the marketplace at present, says DeArmitt, but users are looking for alternatives. Here, Arctic Minerals expects to soon be able to sample a new experimental amorphous mineral fibre product called FibraFlex. This is said to have a higher aspect ratio than wollastonite – which means it delivers superior mechanical properties – but contains no detectable crystalline silica. The main target applications are foreseen as a reinforcement or to provide scratch resistance in PP automotive parts.

PHOTO: CHRIS DEARMITT

Above: Washing machine counterweights are a potential application for DenzFlex red iron oxide from Artic Minerals

DeArmitt also highlights the custom milling and surface treatment services offered by Arctic. Mineral fillers are often surface treated with dispersants or spoiling agents to confer additional performance. Dispersants can, for example, help provide higher gloss, impact resistance and elongation at break while allowing for higher filler loadings for a given polymer melt viscosity. Coupling agents help retain high temperature and wet mechanical and electrical properties of a composite material. Standard options are available but, until now, he says few affordable custom surface treatment options have been on offer.

DeArmitt says Arctic has developed a new in-line process that offers a new level of flexibility and affordability. The company is now able to mill additives and minerals to tight specifications and surface treat them where needed. It can also offer a low-moisture milling option to produce talc and other minerals with very low levels of water. "This is important for sensitive plastics like polyesters and for cases where venting of moisture during compounding is not possible," DeArmitt says.

PHOTO: SHUTTERSTOCK

Right: Wollastonite fibres could improve scratch resistance of PP automotive interior parts

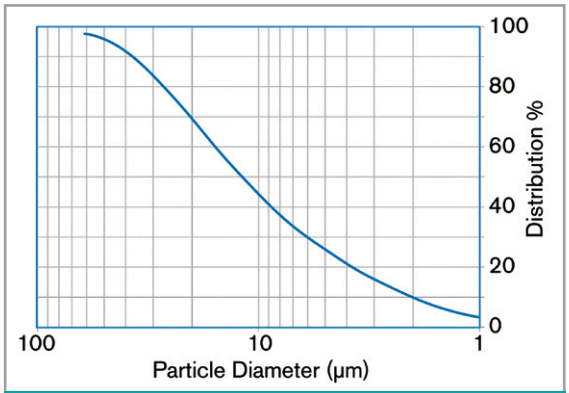

Figure 1: Particle size distribution of Hubercarb W325 low-silica calcium carbonate
Source: Huber

Talc developments

Huber Carbonates is another functional filler supplier responding to increasing demand for additives with low levels of crystalline silica. It mines and manufactures an array of ground industrial calcium carbonate grades at three strategic locations in the US: Marble Hill in Georgia; Quincy in Illinois; and Marble Falls in Texas. The company has introduced Hubercarb W325, a ground grade of $CaCO_3$ it says is manufactured from the brightest limestone ore available and offers a silica level of 0.05%. "Consequently, Hubercarb W325 does not require a health warning on its SDS. Other benefits include a consistent particle size at 13 microns along with its white and high brightness appearance," says a company spokesperson (Figure 1).

Imerys Performance Additives Development Manager, Polymers & Rubber, Anaïs Berjeaud says developments in its talc products are further improving the performance of polymer compounds. She says engineering thermoplastics such as PC and PC alloys require a good balance of mechanical properties combined with good surface appearance. "Glass fibre can cause abrasion and poor appearance and mineral solutions used in polycarbonate and PC alloys must have very limited interaction with the PC matrix to prevent deterioration of the polymer and surface appearance issues."

Talc – hydrated magnesium silicate – is the softest of all minerals and provides improved stiffness and

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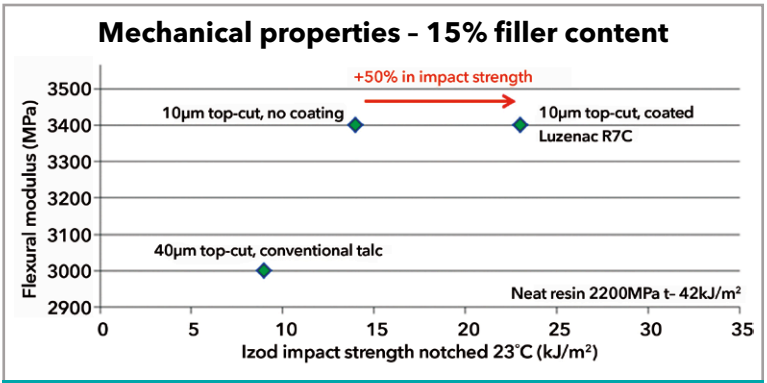

Figure 2: Effect of coating on impact strength of a 15% filled PC/ABS compound (ratio 65/35)
Source: Imerys

dimensional stability in plastics. However, enhanced reinforcement can result in reduced impact resistance of the finished product. Berjeaud says that, thanks to a surface coating developed specifically for this application, Luzenac R7C from Imerys provides good stiffness/impact balance and limits interaction with the PC matrix (Figure 2). The 10-micron top-cut talc grade is available in white and grey versions, so is suited to all types of finished applications where it provides the mechanical performance and good cost effectiveness.

"In addition to mechanical performance, talc also improves char cohesion and limits heat transfer by barrier effect. In many cases, engineering thermoplastics contain a flame-retardant package; Luzenac R7C physically contributes to improving the fire performance of the compound," says Berjeaud.

IMI Fabi has developed a new talc product portfolio specifically for plastic automotive applications. Designed for modification of thermoplastic olefins (TPOs), the new products include highly engineered grades for lightweighting and surface coated grades designed to improve final appearance of plastic compounds.

HVTextra, for example, has been developed to achieve extremely high stiffness in PP/TPO at a lower filler loading in order to minimise the specific gravity of the compound. It is recommended for TPO compounds containing up to 20% by weight of talc (more typically in the range of 5-15%). The material also helps in reducing the thermal expansion and mould shrinkage of the compound while its plate-like structure helps reduce warpage. It is also available in a compacted format, which makes it easier to feed than other traditional highly micronised talc grades.

Product and Application Development Manager Piergiovanni Ercoli Malacari says the company has also been targeting foamed polymer parts. In automotive, both physical and chemical foaming are being more widely used to achieve lightweighting targets, but he says final properties are strongly determined by the dimension of the gas bubbles and their distribution in the thermoplastic resin. IMI Fabi says its NSultraC talc exhibits a stronger nucleating effect than standard fine talcs in foaming applications and provides opportunities for high quality unpainted surfaces.

PEEK performance

Moving up the pyramid of ETPs, polymers such as PEEK and PEKK are known for their outstanding thermal and mechanical properties. Aside from the high processing temperatures – typically in excess of 375°C – when these polymers are combined with fillers and fibre reinforcements their viscosity can increase to a point where torque, temperature, and pressure demands can approach the limits of some processing equipment.

"A common approach to reducing viscosity is to decrease the molecular weight of the polymer, or to use bimodal molecular weight distributions which, while allowable for some uses, can decrease mechanical performance," says Joe Lichtenhan, President of **Hybrid Plastics**, which produces POSS (Polyhedral Oligomeric Silsesquioxane) additives. "The high processing temperatures of PEEK and PEKK also limit the use of traditional plasticisers due to their propensity to degrade and volatilise during compounding."

Lichtenhan says POSS is becoming a "go-to additive solution" for precisely such complex compounding scenarios. "Favourably, POSS cages bearing all-phenyl groups – such as dodecaphenyl – melt and are thermally stable in the 400°C temperature range. When phenyl POSS cages contain silanols (such as the heptaphenyl trisilanol) they also behave as high temperature dispersants which both reduce viscosity and aid in dispersion," he says.

All-phenyl containing POSS are white-solid


PHOTO: SHUTTERSTOCK

Right: IMI Fabi has developed new performance talcs for automotive applications such as TPO compounds

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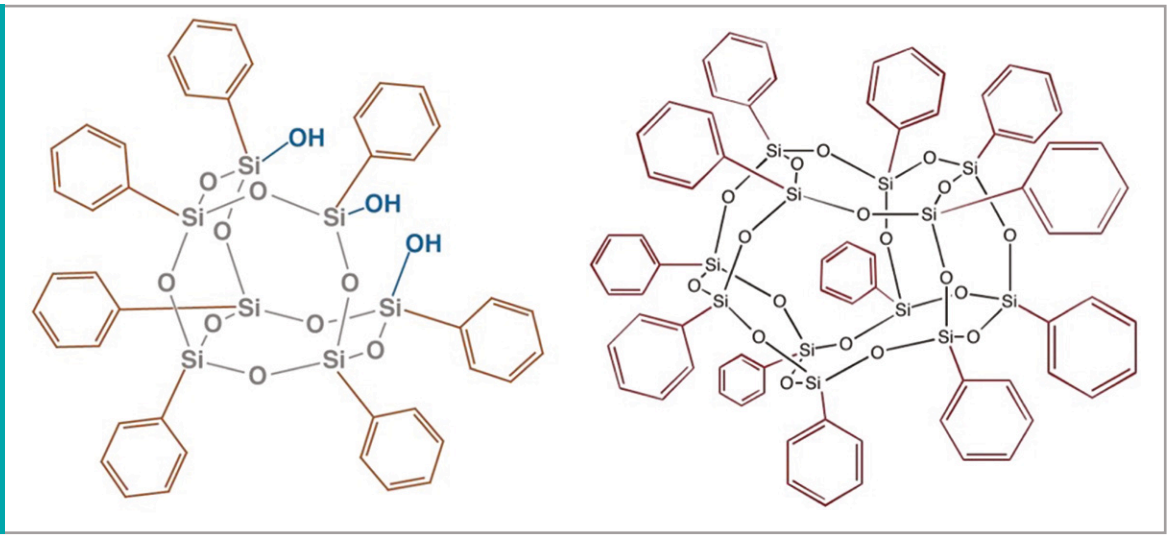

Schematic showing different POSS structures. The example on the left has POSS cages bearing all phenyl groups. In the right-hand structure, the phenyl POSS cages also contain silanols

Image: Hybrid Plastics

powders and are typically added directly at the extruder throat using a standard powder feeder at effective loading levels of 0.5 - 3 wt%. In PEEK, the addition of heptaphenyl trisilanol POSS results in viscosity reductions ranging from 7% in high sheer regions, to 60% in low sheer regions, he says.

Lichtenhan points out that many technical aspects of phenyl and phenyl trisilanol POSS in PEEK and related aromatic polymers have been investigated by Professor Sarah Morgan at the University of Southern Mississippi as well as the United States Air Force Laboratory. Morgan says: "High temperature flow and dispersion are common problems that POSS seems to solve. POSS is becoming known in the thermoplastics marketplace for these types of niche but critical processing challenges."

POSS in practice

One company using POSS in its compounds is **The Resin Enterprise**. Its Temppeclear grades are based on polyphenylene ether (PPE). CEO Linda Marlin says the additive can improve the resin's processing parameters, physical properties, and colour. Temppeclear grades, which are available with and without reinforcement, impact modifier, and flame retardant, are being offered as an alternative to polysulphone (PSU) and polyetherimide (PEI).

"PPE by itself has notable physical properties, such as high heat distortion temperatures and stiffness," Marlin says. "However, unalloyed PPE has in the past processed with extreme difficulty and the base polymer has provided only opaque colour opportunities." She says PPE is, as a consequence, frequently blended with polymers such as polystyrene and polyamide in commercial products from other leading suppliers.

"With the addition of the proprietary additive we are now able to provide a translucent or clear, amber tint PPE product that processes well. The new colour is similar to a polysulphone or PEI. Not only is the colour alike but the physical properties of the new compound are also comparable to these two high heat materials," Marlin says. Temppeclear is also said to be much less dense than PSU or PEI – and less costly.

The only problem the company faces at present is getting hold of PPE. "Unfortunately, PPE went on short supply about the same time we came out with this product," says Marlin. "I think it can be a very successful project, but PPE obviously has to be readily available."

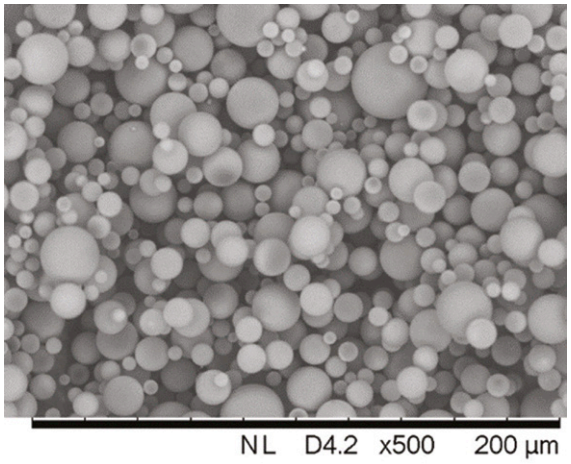

PHOTO: POTTERS

Right: Microscale image of glass microspheres from Potters Engineered Glass Materials

Glass microspheres

Solid and hollow engineered glass microspheres can produce advantageous processing and product characteristics in a wide range of thermoplastic applications, says Douglas Rudnick who works in Technical Service at **Potters Engineered Glass Materials**. "Injection moulded parts with very tight tolerances in shape can see compounding benefits with solid microspheres achieving high levels of warpage control," he says. "Due to glass microspheres' unique property of having an aspect

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Comparison of properties of Temppeclear PPE containing POSS with PSU and Ultem PEI

Properties	ASTM Method	Units	Temppeclear	Polysulfone P1700	Ultem 1000-1000
Specific Gravity	ASTM D792	g/cm^3	1.07	1.24	1.27
Flexural Modulus	ASTM D790	psi	471,500	390,000	510,000
Tensile Strength	ASTM D638	psi	12,500	10,200	16,000
Elongation at Break	ASTM D638	%	19	50-100	60
Modulus of Elasticity	ASTM D638	psi	345,000	360,00	520,000
Notched Izod Impact Strength	ASTM D256	ft-lb/in	0.89	1.3	1.0
HDT@264 psi	ASTM D648	°F	361	345	394

Source: The Resin Enterprise

ratio equal to one, they provide dimensional stability during processing."

This property minimises stress concentrations in the filled thermoplastic, causing reduced shrinkage and improved part flatness in the finished product. Unlike traditional mineral fillers, engineered glass microspheres can also lower the viscosity of most compounds, acting as miniature internal ball bearings to improve flow. "Spherical particles require less energy to compound into resins than angular, irregular, or platelet particles," Rudnick says.

When used in combination with fibres or particles with other shapes, flow improvements can reduce product defects and potentially improve production rates, he says (Figure 3). Additionally, high loadings can increase flexural modulus, increase surface hardness and improve stress distribution. Surface-modified glass microspheres offer improved bonding with polymer systems in harsh processing or environmental conditions.

"Hollow glass microspheres can provide many of the performance attributes of solid glass beads but also have the additional benefits of providing density reduction in thermoplastic composites to make lightweight parts," Rudnick says. So, not surprisingly, one area that is drawing a lot of interest is the automotive industry, where he says hollow microspheres are being considered as alternatives to denser mineral fillers.

The company is currently developing additional engineered glass microspheres with adhesion promoters to enhance the bond within the polymer matrix. "Potters continues to develop engineered glass materials with lower density, higher strength, smaller particle size, and whiter in appearance," says Rudnick.

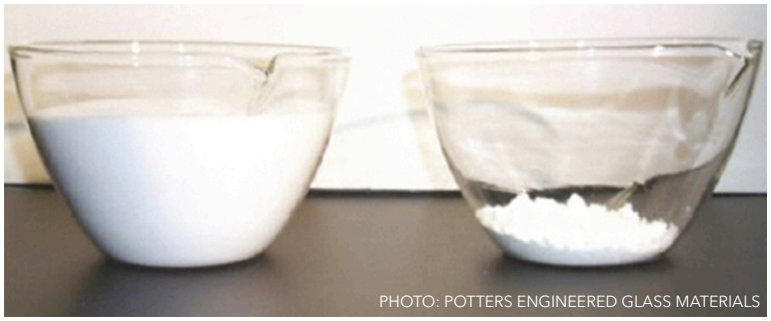
PHOTO: POTTERS ENGINEERED GLASS MATERIALS

Above: Equal weights of hollow glass microspheres (left) and mineral filler (right) showing the potential density reduction

Compound partnership

Also offering glass spheres is **3M**. Earlier this year it announced a partnership with compounder **A Schulman** "to develop innovative insulation and weight-reduced compounds that incorporate 3M Glass Bubbles, engineered hollow glass microspheres." The partnership is focusing on western Europe.

"First innovations, which are now in production, such as scuff plates in vehicles, show great potential for further lightweight applications," said Heinrich Lingnau, Vice President and General Manager EMEA at Schulman, when the partnership was announced earlier this year. "Due to the combination of 3M's hollow glass beads and our innovative filler systems, a weight reduction of 15% can be achieved without compromising on product properties."

Schulman recently launched RD (Reduced Density) grades of Schulamid PA and Polyfort PP compounds for use in automotive applications, saying they offer a weight-saving potential of up to 26%. Some of these material solutions can be used directly, without any changes in tool design or in equipment. In addition to the lightweight aspect, a carbon footprint reduction of up to 59% can be achieved, the compounder says.

In addition to automotive lightweighting, Schulman says it is also focusing on developing compounds with improved insulation properties for the construction industry. "By using 3M Glass Bubbles in an existing compound, thermal conductivity can be reduced by 23%," the company says.

3M Glass Bubbles are made of a high-quality borosilicate glass, says 3M Application and Product

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Development specialist Dr Friedrich Wolff. "For thermoplastic applications the Glass Bubbles grade iM16k is typically the material of choice. Its main key features are a low density of 0.46 g/cm³, an isostatic crush strength of 1,100 bar and a median diameter of 20 microns," he says.

US compounder **RTP Company** is using glass sphere technology in its LT (Light and Tough) series of PP, PA and PBT compounds, which it introduced earlier this year to provide "drop-in" part weight savings of 5-10% with minimal loss of mechanicals compared to traditional glass reinforced grades (Figure 4).

Senior Product Development Engineer Structural Products Karl Hoppe says the new grades have resulted from developments in the strength of the glass spheres and optimisation of the compounding process, which has minimised breakage. "Previously with spheres we focused on maximising the weight saving but you lost the properties," Hoppe says. "The LT compounds are targeting the same properties that customers want with 30% glass filled PP or PA."

PHOTO: AKZONOBEL

Above: Wine bottle stoppers are a relatively new application for AkzoNobel's Expancel microspheres

Polymer microspheres

Akzo Nobel also makes microspheres, but of thermoplastic rather than glass. Its Expancel microspheres consist of a polymer shell – a copolymer based on acrylonitrile and methlymethacrylate – encapsulating a gas. When the microspheres heat up during processing, the internal pressure from the gas increases and the shell softens, resulting in a dramatic increase of the volume of the microspheres. The gas remains inside the spheres.

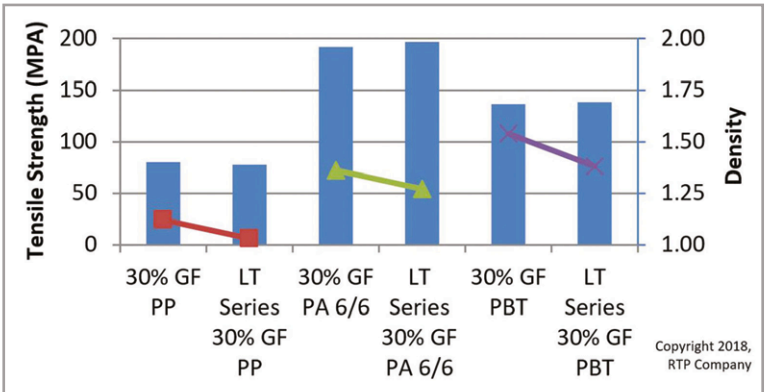

Figure 4: Tensile strength and density of 30% glass reinforced PP, PA66 and PBT compounds against LT equivalents with glass microsphere reinforcement
Source: RTP Company

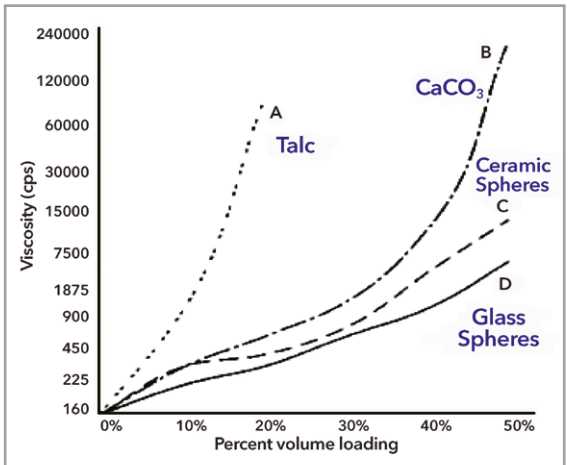

Figure 3: Effect of different fillers on melt viscosity showing that glass microspheres allow higher loading levels when compared to other fillers, providing greater flexibility in formulation and greater resin extension
Source: Potters Engineered Glass Materials

"The main reason why our customers are using Expancel microspheres in thermoplastic applications is – beside the fact to reduce density and in many cases the costs of the end product – that it is possible to achieve a non-visible closed cell-structure," says Klaus Rosskothen, Key Account Manager for Expancel. "A quite new application is the use of microspheres in food applications, for example thermoplastic wine stoppers." Akzo Nobel offers grades that fulfil the requirements of regulations for food packaging, he says.

"The main reason for using Expancel in wine stoppers is the improved sealing properties. When the stoppers are squeezed into the bottle, the spheres are squeezed as well. But the gas inside provides a counter-pressure that improves the sealing properties. The stoppers are mostly produced in PE and EVA," he says. "Expancel microspheres can be used in all kinds of thermoplastic applications, as long as the process parameters – process temperature and time for example – allow for their use."

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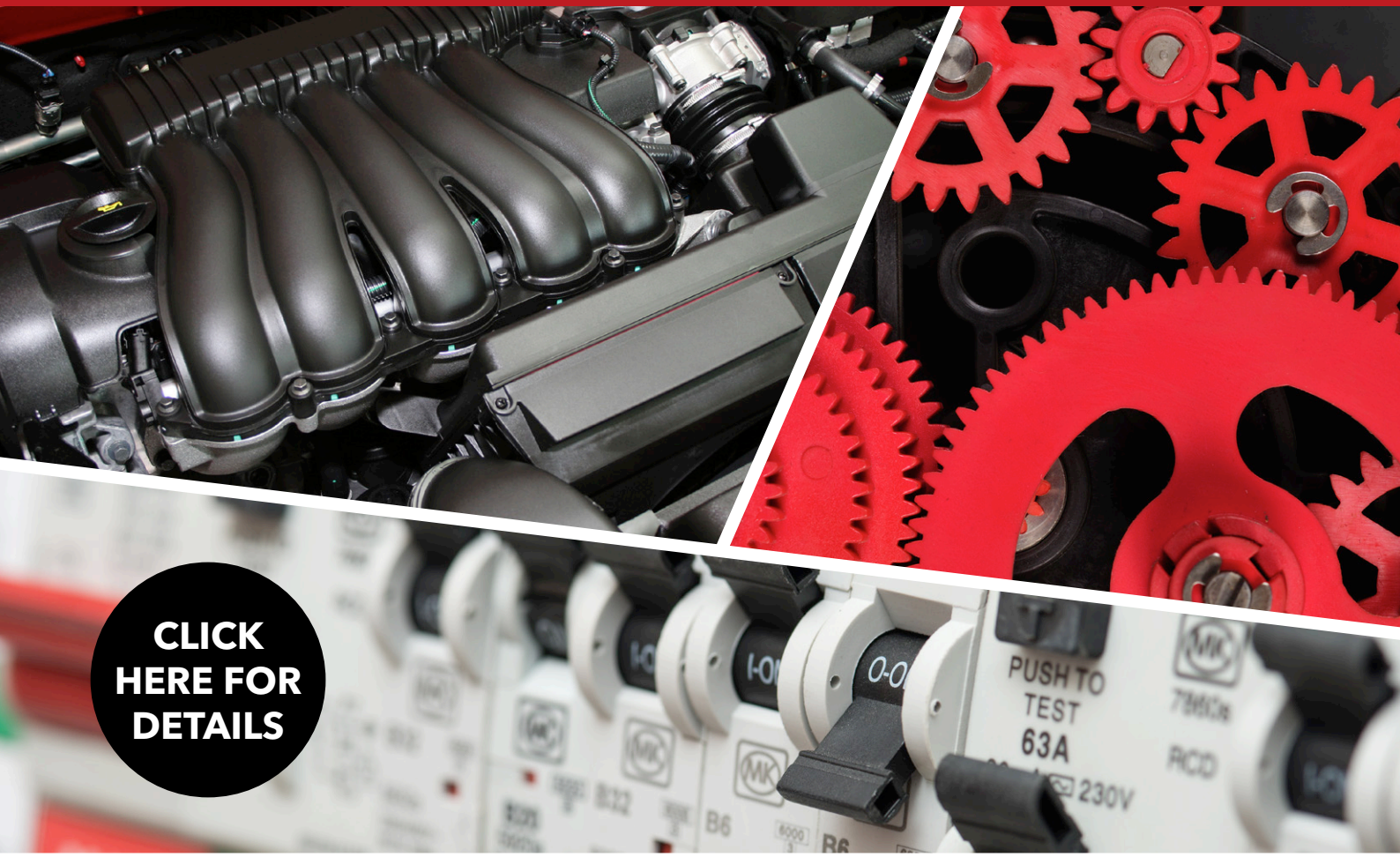

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*Compounders need screw and barrel designs that meet product quality goals while offering extended durability. **Mark Holmes** looks at the latest options available from some leading suppliers*

Mixing quality with durability

Few would argue that the screw and barrel combination forms the heart of any compounding system, playing a critical role in product quality but facing high levels of both mechanical and chemical wear. No surprise, then, that extruder manufacturers and suppliers of replacement screw and barrel components are looking to prolong service life, offering compounding solutions optimised to specific customer requirements, and aiming to shorten lead times for replacement parts.

According to US extruder manufacturer **Entek**, wear of screw elements and barrel sections remains one of the most common problems in the compounding industry. "Customers are always looking to extend the life of these wear components," says Dean Elliott, Technical Processing Manager. "We have found that wear problems are often a result of the processing and mixing work being done in only a small portion of the extruder's overall length."

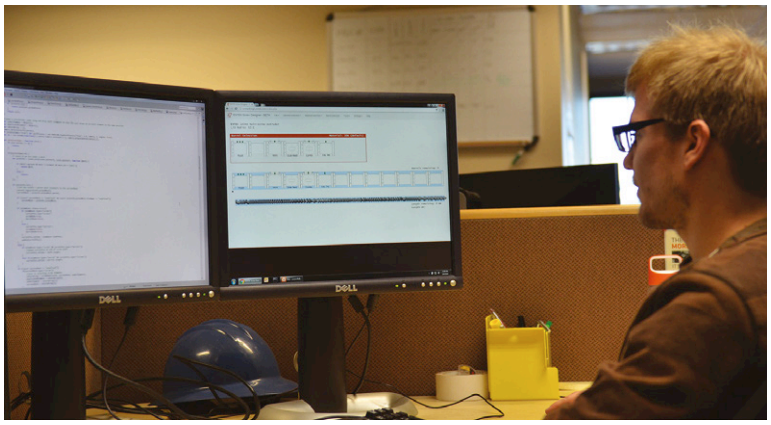
Elliott says that Entek's screw layout program and visual layout comparison of the screw in relation to the barrel allows customers to identify high wear locations to better manage wear. "Our screw layout program enables customers to quickly and accurately re-design their screw layout and spread out the processing work within the extruder," he says. "Our customers are finding that by re-configuring their machines they are able to reduce or in some cases eliminate high wear locations. As a result, they are seeing reduced overall screw and barrel wear. Often spreading out the work along the machines length can result in higher processing throughput rates as well."

Entek's screw design program allows compounders to design screw and barrel layouts for their particular application at speed. Built-in features of the software include drag-and-drop functionality on all components that customers need to specify, such as barrel sections, screws and metallurgy. It also provides automatic calculation of the remaining space on the screw shafts, as well as safeguards to prevent putting certain elements where they do not belong. Complete part numbers are furnished within the program and, once the design is complete, it is easy to save within the program or export to an Excel file option.

"This new program is something that provides

Main image: Key drivers for development of new screw configurations include improving quality and operational efficiency, according to Coperion

PHOTO: ENTEK



Above: Entek says its screw design software means better optimisation to the specific application

great value to our customers," says Linda Campbell, Director of Sales at the company. "We want them to see first-hand how it can make their lives easier by giving them the ability to specify, and provide a drawing of, exactly what they need for their applications."

Meanwhile, Markus Schmudde, Head of Research & Development at **Coperion**, identifies two main trends he sees driving developments in compounding extruder screws and barrels. Firstly, new construction materials are providing customers with more efficient solutions, not only for standard processes but also for special applications. Secondly, new screw geometries are being introduced that can provide better product quality and/or more efficient operating conditions.

"Every year, plastics producers are creating new materials or new formulations to improve their products," Schmudde says. "As a machine vendor Coperion needs to meet the requirements for these new products in terms of quality and cost effectiveness in production. This means that we either have to develop new screw configurations for better mixing capabilities or we need to use new materials of constructions to provide a reasonable lifetime for Coperion parts."

Right: KraussMaffei Berstorff's 72HA lining is claimed to cut wear rates

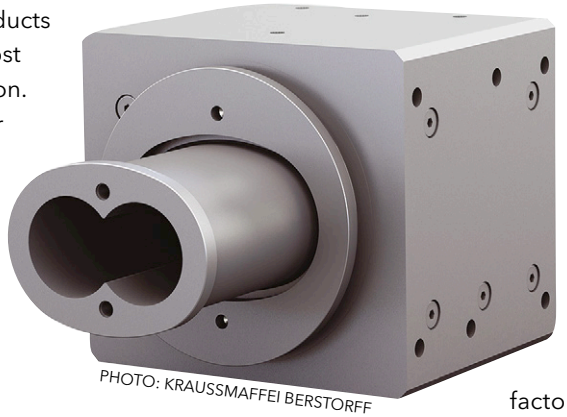


PHOTO: KRAUSSMAFFEI BERSTORFF

Schmudde says that requirements can be very different depending on the customer and their compounding project. "Customers producing masterbatch or specialities focus on downtime of the machine during product changes. Other customers try to utilise the machine as much as possible by increasing the throughput to its limits. This positively affects, for example, the energy consumption of the process. For high throughputs, new or modified screw elements can be critical for success. For example, they can solve issues with feed limitation or quality problems due to the shorter residence time by increasing the mixing capability," he says.

Material trends

The material of construction of screw and barrel parts is also of interest when machines are utilised at or near their production limits. "The mechanical stress to barrels and screw elements increases significantly with higher throughput and motor power of the machine. The specific torque of twin screw extruders was significantly increased a couple of years ago by all machine vendors in the world market, following Coperion's introduction of ZSK Mc^{18} technology. Providing materials of construction with high lifetime and high robustness for a variety of processes is a task which is still ongoing," says Schmudde.

Coperion's latest development in the screw and barrel area is its Involute screw elements, introduced in 2017. "With these elements we are able to increase the throughput for filled compounds significantly and utilise the machine more efficiently. However, new screw or barrel geometries are not always the perfect solution. Standard elements that have been on the market for a long time still have a lot of potential if used in a meaningful combination with other elements," says Schmudde.

"Coperion is aware that other vendors, selling mainly single elements, are very active in developing new geometries," he says. "Our philosophy is that we use our experience in designing complete screw configurations to meet customers' requirements. We use and develop new screw elements only if we see a significant improvement with these parts. Otherwise, we use existing technologies which are well known by our customers. Another important key factor is that we also focus on providing or developing one universal screw design for our customers' product portfolio to reduce downtime and increase the profitability of their production."

Targeting wear

Last year, **KraussMaffei Berstorff** introduced a new highly wear resistant liner option for its ZE BluePower extruder models. The company said the move was a response to the higher demands

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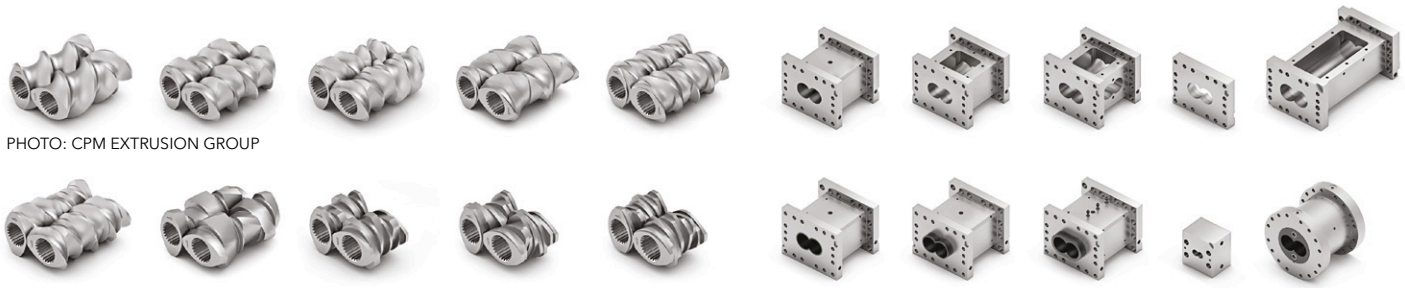

PHOTO: CPM EXTRUSION GROUP

Above: OEM suppliers need to hold more stock components to meet demands for shorter leadtimes, says CPM

placed on plastic compounds, which is seeing more fibre-reinforced and heavily filled formulations. This means that wear protection is an issue of ever increasing importance for compound producers. The new 72HA lining material is an iron-based powder-metallurgical alloy with high carbon and chrome content and is manufactured using HIP technology, with each liner through-hardened. The chemical composition is said to provide very good wear, abrasion and corrosion protection.

The company says the wear resistant 72HA material does not compromise its ability to produce precision liner geometries. It says it is able to optimise the position of the cooling and cartridge heater bores to achieve efficient temperature control while a special contact collar ensures correct axial positioning of the liner inside the housing to avoid the leaks that could occur due to different thermal expansion of the liner and housing.

Addressing leadtimes

According to Jürgen Stoll, Product Manager Components and Inside Sales Manager Spare Parts at Extricom Extrusion (now part of **CPM Extrusion Group**), the market is really struggling with lead times for screws and barrels at present. "Having delivery times of less than ten weeks is rare," he says. "With customers focused on getting their spare parts for screws and barrels as soon as possible to optimise their production, we are trying to tackle the problem by offering some in-demand products to the market off the shelf. We currently have spare parts in stock for our CXE lines, which are identical to ZSK and MC machines. For these machines, we also have material available to reduce delivery times to around eight weeks. In addition, we have drilled blanks available to further reduce delivery times. We also have many barrels and inliners available, including vautid lined barrels in closed and open versions, plus through-hardened tool-steel combi block barrels."

On the technical front, colleague Tom Urban, Sales Manager Spare Parts at CPM Century Extrusion says that customers are continuing to ask what new materials are available to make wear components last longer, as well as getting higher throughputs on existing machines. "Customers want improved mixing and kneading along with increased output from their extruders," he says. "CPM Extrusion Group has developed a high performance screw and kneading elements line to solve this issue. These new extruder screw geometries create better products in less time. We also manufacture many different barrel and barrel liner designs and configurations. One design is a barrel with added ventilation, letting unwanted air out of the extruder while letting raw materials in. This also provides better cooling of the material in the extruder."

Below: Steer offers it latest Fractional Lobe Processor technology on its Omega extruder line

PHOTO: STEER

Urban also believes that suppliers of screws, barrels and shafts will need to consider their lead times and have more products in stock and to meet the shorter lead times needed to support customer up-time. "Industry demands are increasing and as an OEM supplier we need to be flexible and respond to this," he says. "The CPM Extrusion Group recognises the industry needs and we continue to make investments and initiatives to respond to those needs."

Compounding equipment manufacturer **Steer** has introduced the next generation of its Omega Fractional Lobe Processor (FLP). The company says that the Omega co-rotating twin-screw extruder provides great control over the amount of work

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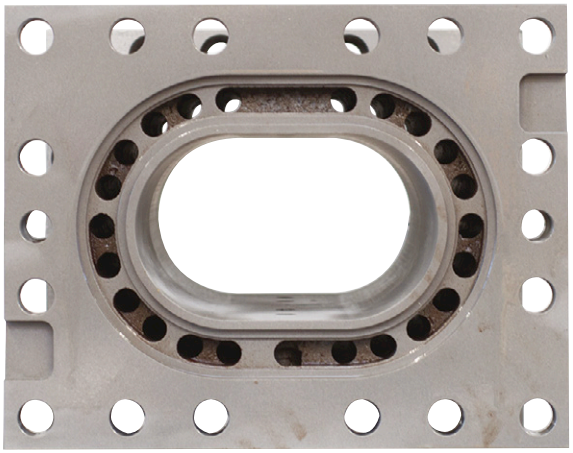

PHOTO: EXTRUDER EXPERTS

Right: The Cool and Clean sealing system from Extruder Experts simplifies maintenance of cooling channels

done inside the extruder and over residence time, adding that the new Fractional Lobe Processor is able to significantly enhance mixing and melting capabilities. "The Fractional Lobe Processor has the ability to work on materials in solid state to achieve intimate interaction between the constituents while imparting physico-chemical changes through reaction, devolatilisation, shear, compression, elongation, surface renewal, distribution, dispersion – either alone with minimal interfering effects from other actions or in any desirable combination of actions," says Atanu Maity, Chief Executive Officer of Steer.

According to the company, the Fractional Lobe Processor eliminates meta-radial shear, which allows it to achieve stable and improved process control in compounding. Omega extruders with the Fractional Lobe Processor feature improve efficiency in handling difficult-to-process materials and perform well in applications that need lower residence time and/or tighter residence time distribution.

Custom combinations

KraussMaffei Group company **Burgsmüller** has developed ScrewCon, a new software tool allowing the development of custom combinations of screw and barrel housing elements for twin-screw extruders. The software is extruder-independent, allowing configuration of processing sections for a wide range of different twin-screw extruder brands.

According to Burgsmüller, the ScrewCon software ensures rapid, cost-effective and premium-quality compounding is achieved. The company's engineers can design tailored screw and barrel housing element configurations for any application with a true-to-scale visualisation. In addition to the specific rating of conveying, kneading, mixing or retaining elements, the company says it can provide advice on the optimum material selection for the screw elements and housings in order to increase service life and output rates.

ScrewCon currently includes a library of some 3,000 screw and barrel housing elements, which allows bespoke configurations to be designed for specific machine types and applications. Where elements are not available, the company says it can easily add them using the machine owner's data. Burgsmüller says it is not limited to the standard portfolios from the extruder producer but can provide compounding companies with the most cost-effective screw configuration by integrating special elements such as multi-process elements, shoulder kneading disks or other mixing elements.

Easing maintenance

Extruder components specialist **Extruder Experts** has introduced a new cooling system seal – Cool and Clean – for its barrel sections. The company says the Cool and Clean design allows full access to the cooling channels and easy maintenance and cleaning of cooling systems. In cases of calcination of the cooling system, for example, it is no longer necessary to call in external specialists as in-house cleaning of the channels is easily carried out.

Advantages for compounding customers include self-determined maintenance intervals, allowing flexibility in channel maintenance programmes. Production is maintained through fast and uncomplicated cleaning, and machine downtime can be reduced, the company claims. In addition, it says operating costs are reduced by prolonging the life cycle of the barrels while aggressive cleaning chemicals can be avoided.

Meanwhile, **CA Picard** has completed the relocation of its Extruder Technology business division's barrel production from Monschau-Imgenbroich to Remscheid in Germany. The company says capacity at Monschau-Imgenbroich was no longer sufficient and could not be expanded due to space constraints. The company has also relocated its barrel refurbishment activities to the new site and two new milling machines – DMU100 units from DMG – have been acquired to supplement the existing machines that have been upgraded and transferred from Monschau.

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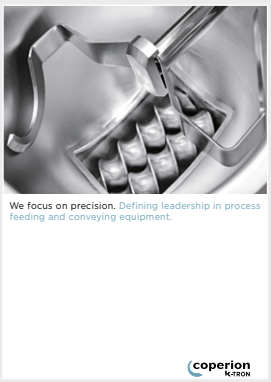

Coperion K-Tron provides a full portfolio of feeding and conveying equipment for compounders. This 16-page brochure details the full range, from volumetric and gravimetric feeders to blenders and metering units.

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CPM EXTRUSION: SYSTEMS AND PARTS

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Sustainability and design

AMI's new Design for Sustainability conference brings together leading experts to discuss design and its role in the circular economy. We preview the event

Main image: Design is expected to play a key role in the development of products that support the creation of a more sustainable circular economy

AMI's Design for Sustainability conference provides an opportunity for professionals from across the entire plastics supply chain to come together to discuss and debate the latest trends and developments within product design and exchange ideas on how business can rethink design processes and product attributes to enable the move to a greener economy.

The two-day international conference will take place on the 11- 12 December in London in the UK. It will bring thought leaders in product and industrial design, technical specialists, R&D professionals and engineers, together with high-profile sustainability experts and brand owners.

Design for Sustainability will open with a presentation by **Dr Chris Sherwin**, Director of the UK-based sustainable and innovation design consultancy **Reboot Innovation**. He will look at the front end of the design process and explain why sustainability means having the full lifecycle in mind from day one. Sherwin will be followed by **Dr Fiona Charnley**, Senior Lecturer in Circular Innovation at **Cranfield University** in the UK, who will focus on how to create value from the circular economy.

Then **Simon Gandy**, Principal Consultant for UK-based consultancy **Ricardo Energy & Environment**, will explore how Life Cycle Assessment can be used to investigate the environmental pros and cons of packaging alternatives.

The conference then turns its attention to the automotive sector. **Dr Irene Colicchio**, Sustainability Engineer at **DSM Engineering Plastics** in the Netherlands, will bring the audience up to date with the latest lightweighting developments. She will be followed by **Jamie Shaw**, Technical Specialist Whole Vehicle Sustainability at **Jaguar Land Rover** in the UK, who will explore the latest developments from an end user perspective.

Packaging sustainability

The conference will then move to address packaging. **Peter Skelton**, Senior Partnerships Manager at waste action group **WRAP** in the UK, will open the session with an explanation of the organisation's plastics pact, detailing its goals and what it has achieved with some of the biggest global names in plastics packaging to date. He will be followed by **Dr Karlheinz Hausmann**, R&D Fellow at **Dow** in Switzerland, who will

Expert speakers sharing their insight at Design for Sustainability 2018 include (from left) Pearlfisher CEO Jonathan Ford, Plastics Recyclers Europe Board Member Paolo Glerean, Interface Innovation Partner Jon Khoo, HP Director of Global Sustainability Operations Dr Kirstie McIntyre, Corbion Market Development Manager Stephan Roest, and WRAP Senior Partnerships Manager Peter Skelton

detail the company's new toolbox for structure simplification. The design agency perspective of packaging will be laid out by **Jonathan Ford**, CEO of UK-based design agency **Pearlfisher**, who will examine the concept of lightweighting and how it is applied in packaging design. Then **Stephan Roest**, Market Development Manager at bio-materials maker **Corbion** in the Netherlands, will discuss how the latest generation of bio-based polymers could improve product sustainability.

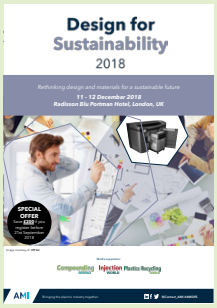
The first day of the conference will close with a discussion on packaging design from a recycler's perspective. **Richard McKinlay**, Head of Circular Economy at UK recycler **Axion,** will detail what he thinks designers need to know about the recycling process. And the day will be brought to a close by **Paolo Glerean**, Board Member of the Belgium-based **Plastic Recyclers Europe** association, who will detail its new product design tool – Recyclass – and explain how it can help designers to keep recycling issues in mind.

Sustainable electronics

Consumer electronics is the topic for the first session of the second day of Design for Sustainability. It will open with a presentation from **Eelco Smit**, Senior Director of Sustainability at consumer electronics giant **Philips** in the Netherlands, who will explore possibilities open to designers to use more recycled plastics. He will be followed by **Karsten Schischke** Group Manager at German technical institute **Fraunhofer IZM**, who will look at current circular design trends within the electronics sector. The session will conclude with an explanation by **Dr Kirstie Mcintyre**, Director Global Sustainabililty Operations at computing giant **HP Inc** in the UK, of how the circular economy model fits into its business model.

The focus of the conference then moves to interiors and furniture. **Jon Khoo**, Innovation Partner at **Interface** in the UK (one of the world's leading carpet tile manufacturers), will talk through the long-standing work the company has been undertaking to minimise climate impact. Then **Arnold Struik**, Marketing & Innovation Director at office furniture firm **Royal Ahrend** in the Netherlands, will present a business case study on the positive benefits that can result from integrating the circular economy approach. He will be followed by **Joe Hale**, CEO of UK-based design agency **Dragon Rouge**, who will discuss how brands can work towards building sustainable homes for the future. **Risto Vapola**, Technical Production Manager at **Neste Corporation** in Finland, will explore the development the company is making in renewable and circular plastics.

The conference will close with two presentations looking at how brands can influence consumer perception of sustainability. **Gillian Garside-Wright**, Packaging Technology Director at **Sun Branding Solutions** in the UK**,** will explore shifting public perception and how that impacts on designing for a sustainable future. Then **Nick Liddell**, Director of Consulting at UK-based branding agency **The Clearing**, will look at how brands can develop within the circular economy framework.



Design for Sustainability 2018 takes place at the Radisson Blu Portman Hotel in London's West End on 11-12 December 2018. This brand-new conference from AMI presents an unmatched opportunity to discuss and debate the latest trends and developments that designers, suppliers and brand owners are advancing to develop a future green economy. The event will cover automotive, packaging, consumer electronics and interior design and features discussions from world-leading experts from across the supply chain. In addition to the formal conference sessions, attendees will benefit from the opportunity to discuss and network during informal refreshment breaks and the complimentary day-one cocktail reception. To find out more, visit the **conference website** or contact Conference Organiser Heidi Lesiw. Tel: +44 (0)117 314 8111; Email: **heidi.lesiw@ami.international**

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AMI's 3rd Polymer Testing & Analysis conference will take place on 11-12 September 2018 in Berlin, Germany, acting as the key meeting place for scientists, laboratory staff and R&D professionals.

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POLYMER TESTING & ANALYSIS US

Polymer Testing & Analysis US 2018 takes place on 11-12 September 2018 in Pittsburgh. The event is a great meeting place for laboratory professionals to network and discover the latest advances in polymer testing and characterisation.

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AMI's well-established Agricultural Film conference series continues on 17-19 September 2018, in Madrid, Spain, bringing together agricultural and horticultural cover specifiers, raw material and film manufacturers and agricultural stakeholders.

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WEAR-RESISTANT PLASTICS

This brand new conference will focus on the critical area of polymer tribology and explore how it can open up new applications, particularly in metal replacement. The event takes place in Dusseldorf in Germany on 19-20 September 2018.

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The second North American edition of AMI's Polymers in Flooring conference takes place in Atlanta, GA, USA, on 20-21 September 2018. It provides a unique forum in which to explore the latest flooring market, materials and technology trends.

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AMI's Compounding World Asia conference returns to Bangkok in Thailand for 2018. Taking place on 27-28 September, the fourth edition of the conference provides a learning and networking opportunity for compounders across the Asia region.

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POLYOLEFIN ADDITIVES EUROPE 2018

Now in its 11th year, AMI's European Polyolefin Additives conference takes place on 9-11 October in Cologne in Germany. It examines commercial developments and technical innovations impacting on the PE and PP additives market.

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SMART PACKAGING 2018

Taking place in Hamburg in Germany, the third edition of AMI's Smart Packaging conference brings together brand owners, retailers, packaging producers, plastics suppliers and technology providers to explore active and intelligent packaging.

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CONDUCTIVE PLASTICS EUROPE 2018

The third European edition of AMI's Conductive Plastics conference takes place on 6-7 November 2018 in Vienna in Austria. It presents a unique opportunity to learn about the latest technologies for achieving electrical and thermal conductivity.

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Delta Kunststoffe AG

Head office location:	Weeze, Germany
Managing director:	Andreas Baessler
Ownership:	Public limited company
No. of employees:	80
Sales (2016):	€19m
Production (2017):	10,000 tonnes
Plant locations:	Weeze, Germany
Profile:	Delta Kunststoffe was founded in 1994 by the Riegler family, which still owns a majority stake in the company. Active in Germany and internationally, Delta specialises in colour masterbatches and coloured and high performance compounds for the logistics, construction and artificial turf markets. It also has a strong presence in the sports and leisure, household, toys, automotive and electrical sectors.
Product line:	Delta Kunststoffe produces colour masterbatches in off-the-shelf standard colours and custom formulations to specific requirements. It offers solid colours as well as fluorescent, metallic, thermochromic and marbling special effects. Carrier resins include PP, PE, PA, PS, ABS, POM, TPE and EVA. Delta augments its colour masterbatch range with dry pigments and additive masterbatch products, plus electrically conductive and permanent antistatic compounds for injection and blow moulding, profile and film extrusion.
Product strengths:	Aside from its standard product lines, Delta also offers specialist solutions for niche markets such as artificial grass, where it can supply custom specially-formulated compounds in colours to UEFA and FIFA certified standards.

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

Compounding WORLD FORTHCOMING FEATURES

The next issues of Compounding World magazine will have special reports on the following subjects:

September
Colour pigments
Recycling additives
Antioxidants and UV stabilisers
Reactive compounding

October
Reinforcing additives
TiO_2/white pigments
Compounds for 3D printers
Fakuma 2018 preview

Editorial submissions should be sent to Chris Smith: chris.smith@ami.international

For information on advertising in these issues, please contact:
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Claire Bishop: claire.bishop@ami.international Tel: +44 (0)1732 682948

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Compounding World July 2018
The July issue of Compounding World explores the latest colour management systems to control visual factors and effects. The edition also reports on innovations in antimicrobial additives, melt filters and impact modifiers.

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Compounding World June 2018
The June edition of Compounding World explores long fibre thermoplastic technologies as viable replacements for metals. The issue also contains a preview of the Compounding World Expo, a review of NPE2018 and features on TPEs and PVC additives.

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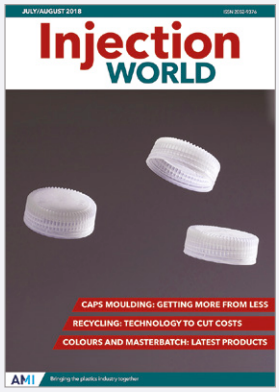

Injection World July/August 2018
The July-August issue of Injection World contains features on caps and closures, masterbatch and recycling technology, plus review features on the Plast 2018 show and Arburg's Technology Days event.

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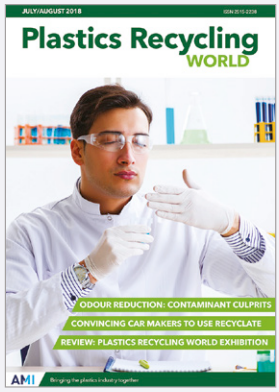

Plastics Recycling World July/August 2018
The July/August edition of Plastics Recycling World looks at technologies to tackle odours. It also explores recycling developments for the car industry and and the latest washing systems innovations. PLUS, reviews of the Plast 2018 and the Plastics Recycling World Exhibition.

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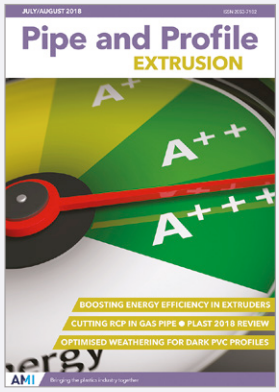

Pipe and Profile July/August 2018
The July-August issue of Pipe and Profile Extrusion explores ways of boosting energy efficiency in pipe extrusion. The edition also looks at optimising weathering for dark PVC, designing RCP out of PE pipe, and the economies of scale in large diameter pipe.

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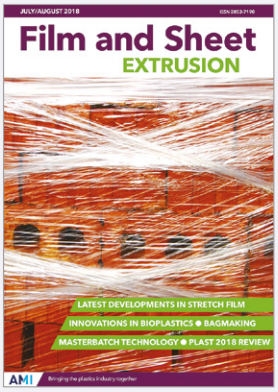

Film and Sheet July/August 2018
The July/August issue of Film and Sheet Extrusion examines the latest innovations in stretch and shrink films as well as exploring developments in bioplastics, bag-making and masterbatch technologies. It also reviews the Plast 2018 show in Italy.

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Film and Sheet EXTRUSION
Pipe and Profile EXTRUSION
Injection WORLD
Plastics Recycling WORLD

GLOBAL EXHIBITION GUIDE

2018	**15-19 August**	Taipei Plas, Tapei, Taiwan	www.taipeiplas.com.tw
	19-22 September	Indoplast, Jakarta, Indonesia	www.indoprintpackplas.com
	24-28 September	ColombiaPlast, Bogota, Colombia	www.colombiaplast.com
	28 Sept – 1 October	Koplas, Seoul, South Korea	www.koplas.com
	14-17 October	Pack Expo, Chicago, USA	www.packexpointernational.com
	16-20 October	Fakuma, Friedrichshafen, Germany	www.fakuma-messe.de
	7-9 November	Expo Plasticos, Guadalajara, Mexico	www.expoplasticos.com.mx
	14-16 November	JEC Asia, Seoul, South Korea	www.jeccomposites.com
	26-29 November	All4Pack, Paris, France	www.all4pack.com
	5-7 December	Plastic Japan, Chiba, Japan	www.plas.jp/en
	5-8 December	Plast Eurasia, Istanbul, Turkey	www.plasteurasia.com/en
2019	**5-8 January**	ArabPlast, Dubai	www.arabplast.info
	12-15 March	Pro-Pack Africa, Johannesburg, South Africa	www.propakafrica.co.za
	19-21 March	EU Coatings Show, Nuremberg, Germany	www.european-coatings-show.com
	25-29 March	Plástico Brasil, São Paulo, Brazil	www.plasticobrasil.com.br
	8-12 April	Feiplastic, Sao Paulo, Brazil	www.feiplastic.com.br
	8-9 May	Compounding World Expo, Cleveland, USA	www.compoundingworldexpo.com/na
	21-24 May	Chinaplas 2019, Guangzhou, China	www.chinaplasonline.com
	21-24 May	Moulding Expo, Stuttgart, Germany	www.moulding-expo.com
	18-21 September	T-Plas / Tiprex, Bangkok, Thailand	www.tplas.com

AMI CONFERENCES

3-5 September	Masterbatch 2018, Madrid, Spain
5-6 September	Performance Polyamides, Cologne, Germany
11-12 September	Polymer Testing & Analysis Europe, Berlin, Germany
11-12 September	Polymer Testing & Analysis USA, Pittsburgh, PA, USA
19-20 September	Wear-Resistant Plastics, Dusseldorf, Germany
20-21 September	Polymers in Flooring USA, Atlanta, GA, USA

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

www.ami.international

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