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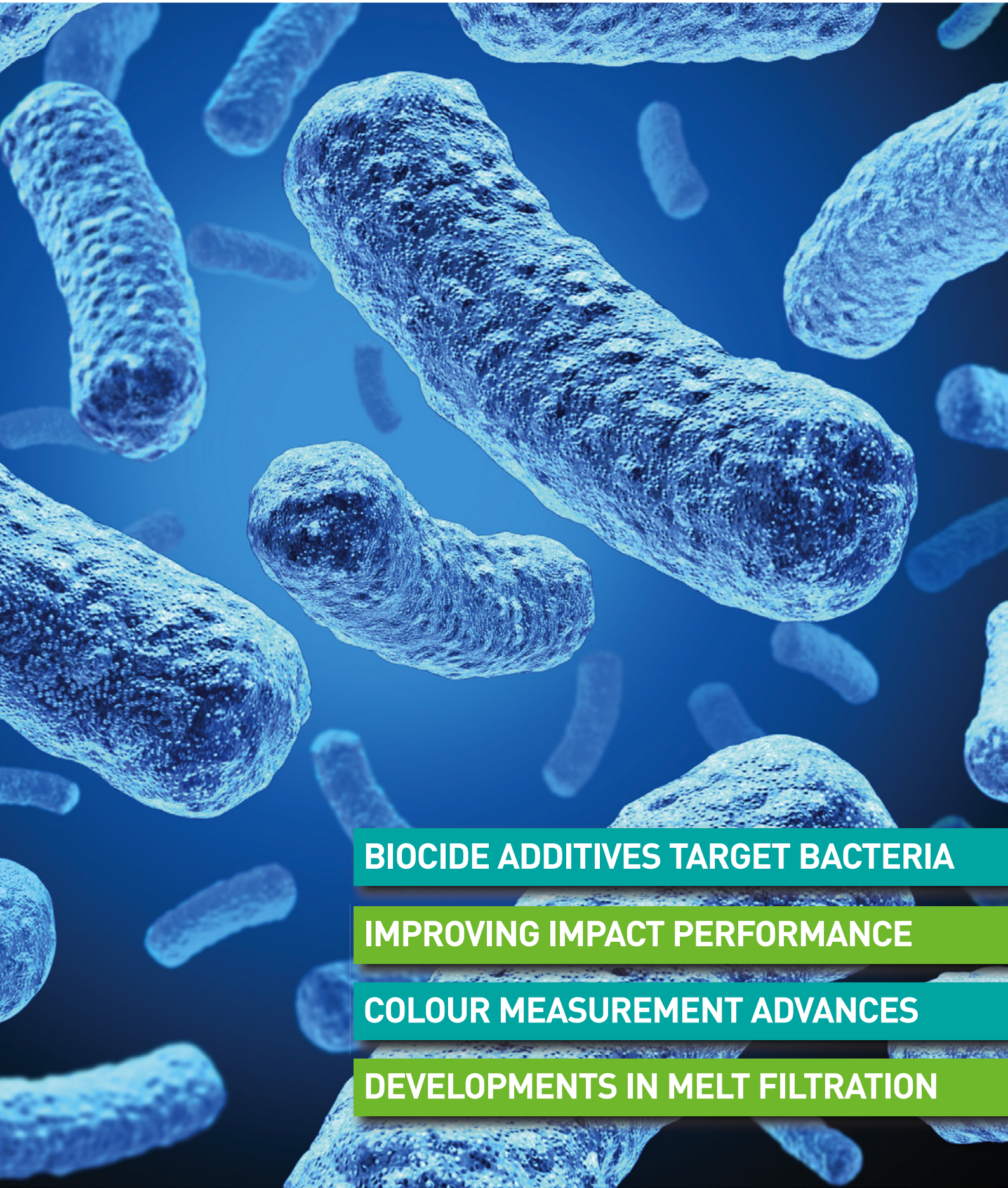

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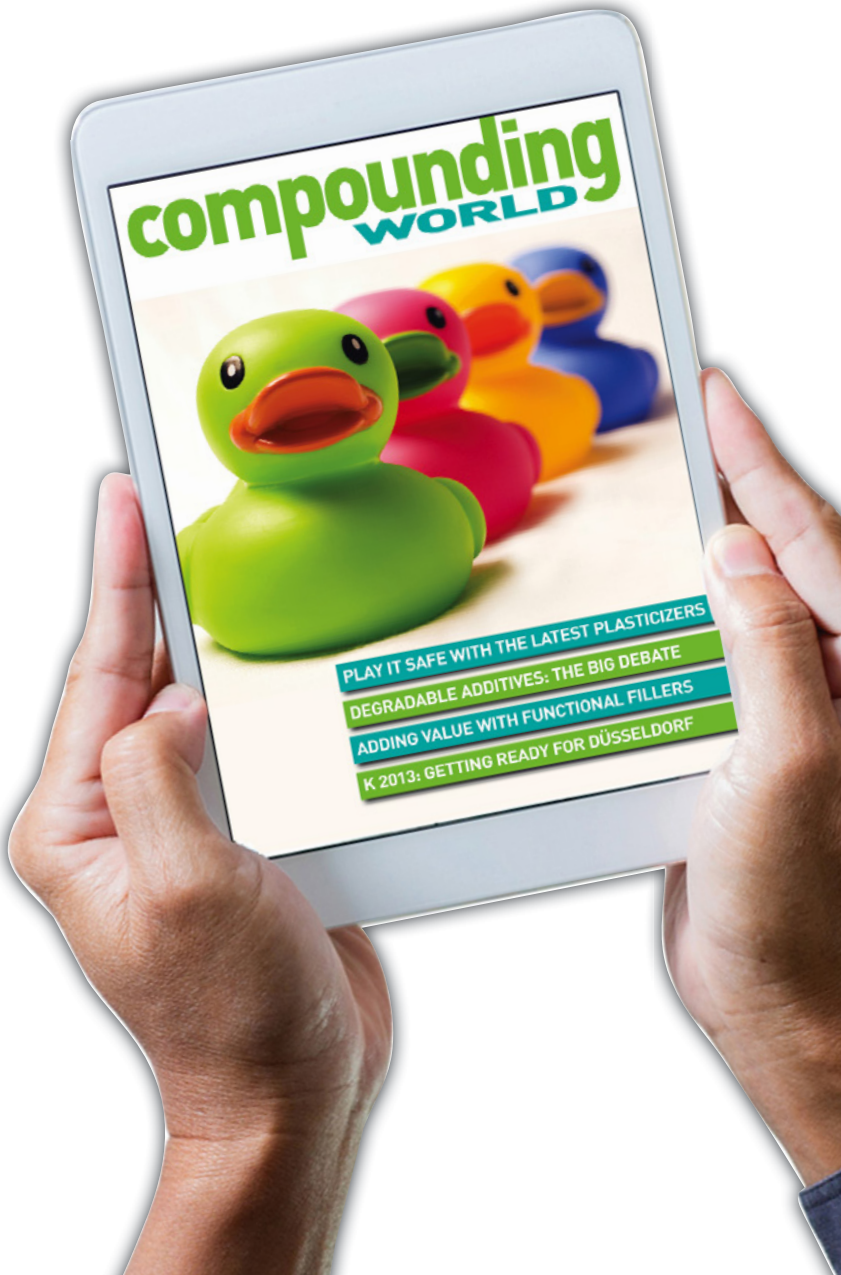

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* As compared to previous generation extruders of identical size

Engineering Value

KraussMaffei Berstorff

Industry worries over UK's Brexit

The UK vote to leave the EU on 23 June took both political pundits and business leaders by surprise and, as both UK and EU officials attempt to grasp what the reality will mean, several European trade associations have commented on the situation.

European chemicals association CEFIC said that, in agreement with member companies of the UK's Chemical Industries Association, it had jointly supported the UK remaining part of the EU "since it opens markets and reduces trade barriers for UK industry, benefitting society". However, it said it respected the outcome of the vote and now called for institutions to work with the chemicals and related industries "to ensure that existing trade and investment is not weakened and future opportunities are seized."

CEFIC noted that the UK is an important trading partner for EU chemical companies, contributing on average 9% of the total EU28 chemicals sales of €531bn. It is a small net importer of chemicals, taking an average of €22.3bn in value over the years from 2007 to 2014 and exporting €20.3bn.

Marijn Dekkers, president of Germany's 1,650 company-strong VCI, said he deplored the result. "Especially now, at a time of timid economy recovery in Europe, [the UK] leaving the EU is a negative signal for further economic development." Shortly before the vote, the VCI said that a UK vote to leave would have "noticeable negative effects" for the chemical industry in Germany. It anticipated a mid-term weakening of exports to the UK and a drop in direct investments in both countries, not least by the many subsidiaries of German chemical companies in Britain, which employ some 6,000 people and turn over €1.6bn annually.

The decision was also viewed with concern at Germany's VDMA machinery association. "Great Britain is an important market for us," said Ulrich Reifenhäuser, Chairman of the VDMA Plastics and Rubber Machinery sector. "In 2015, as in the previous year, the United Kingdom was ranked seventh among the most important countries buying German plant and machinery. At €152m, our exports were 6.6% higher compared with 2014. The first quarter of 2016 saw another sharp increase in deliveries to the island, up 25.9%, putting the UK fifth among the most important customer countries in that period."

The VDMA said that it expected Brexit unknowns to have a negative impact on investment decisions by UK firms but hoped "the period of uncertainty will be as short as possible."

- **www.cefic.org**
- **www.vci.de**
- **www.vdma.org**

Victrex celebrates ten years in Shanghai

Victrex celebrated the tenth anniversary of its Asia Innovation & Technology Centre (AITC) in Shanghai last month.

Opened in June 2006 at a cost of $2.5m and covering a floor space of 2,000 m^2, the AITC has since grown considerably, acquiring a film and coating lab and adding new technology capabilities, notably compression technology. It is one of three such centres, operating alongside similar units in the UK and Japan.

The Victrex technical centre in Shanghai

"Set in one of the world's most dynamic hubs for high-technology advancement, Victrex´s AITC has been driving design concepts to fruition by working with customers on analytical tests, design optimisation, prototyping and product testing," the company said. "Victrex's years of acquired expertise in PAEK polymer production and processing have been applied on complex design challenges in a way that marks Victrex as a competent partner for high-performance polymer solutions."

Among other things, the AITC, is said to have used its prototyping skills to help customers achieve a three to four times faster turnaround with speaker diaphragms for consumer electronics compared to the normal lead time.

The company said the AITC has also worked in the automotive and aerospace sectors.

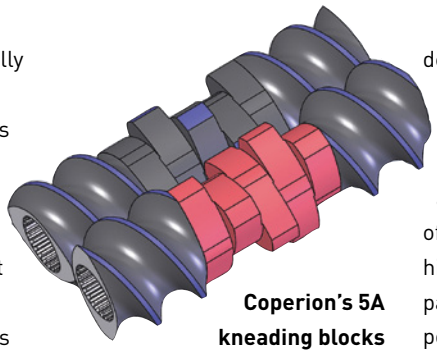
- **www.victrex.com**

EPO rules on Coperion kneading block patent

Coperion announced last month that it had successfully defended a challenge to its European patent covering its ZSK series twin screw extruder with 5A kneading blocks.

The EP1508424B2 patent was initially challenged by KraussMaffei on behalf of its Berstorff division back in 2011 and was revoked by the European Patent Office. That decision was subsequently appealed by Coperion and the patent maintained in an amended form in the EPO's recent final decison.

Coperion Director Global Marketing Bettina König told *Compounding World*: "The scope of protection has not been reduced but instead it has been defined more clearly."



Coperion's 5A kneading blocks are said to extend life of large machines

Coperion claims its 5A kneading blocks prevent torsional vibration resonance that may lead to cracked shafts and coupling malfunctions. Since the patent was registered in 2003 the company says it has primarily used the blocks in large compounding system installations.

Commenting on the appeal decision, KraussMaffei's European Patent Attorney Stephan Roider said:" The amended form is in our view a very restricted embodiment of a kneading block, we see no high potential impact of this patent decision for users and potential buyers of compounding equipment."

Coperion said it was not aware of KraussMaffei Berstorff equipement in the market that infringed the current patent, a point confirmed by Roider. "There exists no equipment of KraussMaffei Berstorff that has infringed, infringes or might infringe the patent in its current amended form," he said.

www.coperion.com

www.kraussmaffeiberstorff.com

Kingfa starts European operation

Chinese compounder Kingfa Sci & Tech opened the first compounding line at its facility at Bonn, Germany, on 8 June.

Kingfa Sci & Tech (Europe) will eventually run four highly automated production lines providing 15,000 tonnes/year of capacity. The company said that it will produce PP, PA, PBT and HIPS compounds.

The move follows the opening of a first production plant in the US in March.

www.kingfa.com.cn

Cappelle targets America

Cappelle Pigments has announced several new agent partners in the North American market "in order to improve its presence and continued growth".

The privately owned company makes organic and inorganic pigments, notably including bismuth vanadates and transparent iron oxides, at its headquarters site in Belgium and another production location in France.

The company said EM Sullivan Associates will represent Cappelle in the US East coast market, Dowd & Guild in the West coast, D&F Distributing in the southern US and Chem-Materials in the Mid-West.

Existing relationships of 30 and four years respectively will continue with Strauch Chemical Distributors in the upper Mid-West and with Azelis, formerly Unipex, in Canada, the company said.

www.cappelle.be

Ampacet launches ReptyleFX

Global masterbatch company Ampacet has revealed details of a patent-pending technology called ReptyleFX, which derives its name from the claim that it replicates the "tactile and visual appeal" of snakeskin.

ReptyleFX is said to combine colour, special effects and functional additives to render rough and smooth textures with multi-dimensional effects, all within a minimum two-layer film structure.

Applications are envisaged in stand-up pouches for snack food and juice beverages, merchandise bags and mailers and packaging for personal care products. Other potential uses include consumer tapes and labels, camouflage MRE packaging for the military, countertops, alternative cloth fabrics, and automotive interior trim.

www.ampacet.com

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Luxus and Roctool collaborate

UK-based compounder Luxus has announced a partnership with French moulding technology specialist RocTool that aims to market the former's scratch-resistant high-recycled content Hycolene PP compounds for Class A automotive interior parts.

RocTool's heat-cool injection moulding process is well suited to production of high gloss and finely structured surfaces. The French company said recent trials of the Luxus Hycolene 16818 compound at its technical centre had shown much better results than standard talc-filled prime PP grade in such applications.

RocTool, which recently set up a new branding of HD Plastics to promote its surface technologies, said it will include the Hycolene grade in its offering to Tier 1 automotive moulders. "We're really enthusiastic to obtain this kind of quality surface with PP," said RocTool Materials Engineer Calypso Belioli.

Roctool's processing technology delivers high quality surface effects

According to Luxus, the key appeal of the Hycolene compound is that its up to 60% recycled content allows car makers to achieve their environmental goals without sacrificing performance.

Luxus also announced an investment in two injection moulding machines from Boy – a 22A and a 90E model – as well as two test moulds that will allow auto designers to gain a realistic representation of how a component will look in a specific grain or colour.

www.luxus.co.uk
www.roctool.com

Lanxess invests at Leverkusen

Lanxess has added 900 m^3 of storage for liquids at its main site at Leverkusen in Germany.

The new investment comprises six 150 m^3 tanks and will replace a smaller tank farm, which had total capacity of 145 m^3.

The new tanks will be used to store phosphoric acid esters which are used in the company's Levagard and Disflamoll lines of halogen-free flame retardants, among other things.

In addition, Lanxess has built a new unloading station to transfer raw materials from tankers.

The company said it expects it to be in operation this month.

www.lanxess.com

Color Master expands in US

US-based Color Master has added capacity at its main site in Butler, Indiana, and plans further expansion at another site in Kendallville, 32 km away.

The investment at Butler will see 1,500m^2 of space added, of which 790m^2 will be for manufacturing and warehousing and the rest for offices. This will cost about $1.7m. It includes a twin screw extrusion line. Color Master has added five new employees at the Butler location. Future plans include another line and recruitment of up to 25 more personnel.

At Kendallville, where Color Master already has a separate manufacturing site that was formerly PVC Compounders, it has acquired a 4,200m^2 building that will be used as a warehouse to handle an increasing volume of colour concentrate products in particular. This investment amounts to a little less than $1m.

Color Master is mostly active in the construction, consumer products, medical and packaging markets, where it supplies PE, PS, PP and ABS materials. It has sales of about $30m/year.

www.color-master.com

Honeywell to spin off PA6 unit

Honeywell intends to spin off its $1.3bn Resins & Chemicals business into a stand-alone, publicly traded company named AdvanSix. The transaction is expected to be complete by early 2017.

"Following the spin-off, Honeywell and AdvanSix will each have a more focused business and be better positioned to invest more in growth opportunities and execute strategic plans best suited to its respective business," said Honeywell Chairman and CEO Dave Cote.

AdvanSix will be an independent and global manufacturer of PA6 (it also manufactures Sulf-N brand ammonium sulfate fertilisers and chemical intermediates, including phenol, acetone, and Nadone cyclohexanone). It will also be the world's largest single-site producer of caprolactam.

Erin Kane, currently VP and General Manager of the business, will become president and CEO of AdvanSix on completion of the transaction.

www.honeywell.com

“ ENTEK Extruders and Wear Parts Help Fiberon Produce the Highest Quality Wood-Plastic Composite Decking ”

Mike Huskey,
Vice President of Manufacturing, Fiberon

ENTEK’s Dr. Kirk Hanawalt (left) with Fiberon’s Plant Manager, Ken Ropski (center) and Mike Huskey at Fiberon’s plant in Meridian, Idaho

“Fiberon is one of the industry’s leading suppliers of wood-plastic composite (WPC) decking and railing products. We have worked with ENTEK since 1999 and have numerous high-output ENTEK 103mm twin-screw extruders running at our two plants in North Carolina and Idaho.

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China Jushi fires up its glass production in Egypt

China Jushi, a major glass fibre producer, has started up its second glass fibre furnace in Suez, Egypt, as part of an expansion of its global presence announced in 2013.

Production is scheduled to start in July and will double the site's capacity to 160,000 tonnes/year, with a third phase to follow in 2017. Meanwhile, ground-breaking at the firm's first US site at Richmond, Virginia, is expected to take place at the end of 2016.

Packaging glass at Jushi's facility in Egypt

Jushi, which is based in in the Tongxiang Economic Development Zone in Zhejiang province, has also announced that it will launch a new high performance E8-Glass this year. The new grade will be comparable to the traditional S-Glass but will have higher strength and stiffness for applications like rotor blades and automotive parts.

Hamburg-based Helm will continue to market the Jushi products exclusively in Germany, Austria and Switzerland, with the focus on chopped strands and rovings for long-fibre thermoplastics, as well as new capacity for bulk and sheer moulding compounds. According to Helm's senior adviser, Dr Michael Effing, the European glass fibre market is about 1.2 million tonnes/year and growing at 5%/year.

www.jushi.com

Emerald Kalama secures K-Flex plasticizer application patents

Emerald Kalama Chemical has secured two patents covering applications in use for K-Flex 975P, a low-VOC dibenzoate plasticiser and coalescent, in Europe, the US, Canada, Russia and various countries in Asia.

The patents, which are based on International Patent Applications PCT/US2011/067572 and 67584, relate to the use of K-Flex 975P alone or as a blend with general purpose and speciality plasticisers in end products containing a wide range of common polymers.

K-Flex 975P comprises a dibenzoate-based composition designed for improved processing and handling. It is also said to deliver performance enhancements, including stain resistance, durability and scrub resistance, in applications traditionally using plasticisers or coalescents, such as vinyl plastisols, adhesives, caulks, sealants, paints and coatings.

Emerald Kalama, a business group of Emerald Performance Materials, said its applications lab team, "has performed extensive testing with plastisol systems and blends in addition to the background in the patents, with the goal of balancing the performance benefits and fast fusion of K-Flex 975 with the processing rheology of general purpose plasticisers".

www.emeraldmaterials.com

ColorMatrix licenses Novapet technology

ColourMatrix, a PolyOne business, has obtained rights to manufacture, market and sell a high-performance light blocking technology for liquid dairy packaging from PET resin and concentrate manufacturer Novapet.

Bjoern Klaas, general manager of ColourMatrix, said that the new product "fits perfectly with our existing portfolio of speciality additives for protecting liquid dairy products". Under the deal, ColourMatrix will manufacture, market and sell Novapet's DCU (Dairy Concentrate Ultra) additive under the name ColourMatrix Lactra SX Light Blocking Additive in all markets other than France, Italy, Portugal and Spain, where Novapet has already established it and will retain control.

According to ColorMatrix, switching from laminate paper cartons or multilayer HDPE bottles to DCU additive-modified PET will enable dairy processors to differentiate their packaging with more innovative designs.

The company supplies ColourMatrix Lactra SX as a solid masterbatch, enabling users to tailor the level of light protection by adjusting dosage to match the needs of individual products.

www.polyone.com

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PPG sells European glass fibre units

PPG has agreed to sell its European fibre glass operations to Nippon Electric Glass, a Japanese glass manufacturer.

The businesses being sold comprise the R&D and manufacturing facilities at Hoogezand in the Netherlands and a manufacturing facility at Wigan in the UK that produces reinforcement materials for thermoset and thermoplastic composites. The two operations together had combined sales of about $150 million last year. PPG said it will continue to supply bushing fabrication and engineering support to the plants.

Terms were not disclosed in the deal, which is expected to close in the second half of 2016, subject to completion of employee consultations, regulatory clearances and other customary closing conditions. PPG said in a statement the proceeds "will be used for general corporate purposes".

www.ppg.com

BASF takes DesignFabrik concept to China

BASF has opened its first DesignFabrik centre in China at its Innovation Campus in Shanghai. Intended as a regional resource for its customers in the AsiaPacific region, the DesignFabrik will allow local designers to work with BASF's in-house design and engineering team in development of innovative new products.

www.basf.com

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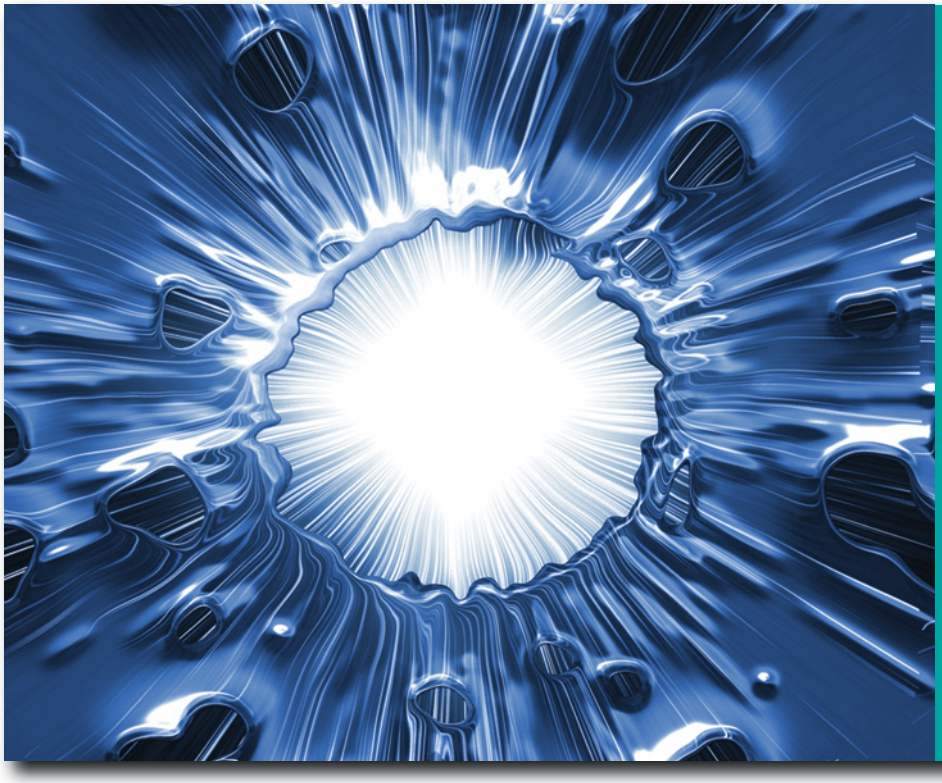


Improving the impact performance of plastics without adding significant cost is a key goal for resin and compound producers. **Peter Mapleston** looks at some of the latest impact modifier developments

Additives that make an impact

Whether considering high performance thermoplastics like PPS, mainstream engineering plastics, polyolefins, or even biopolymers, there are few polymer materials that cannot make use of impact modifiers in at least some of their target applications. And with cost saving high on the priority list for all manufacturers, end-user demands on resin producers and compounders to balance cost-in-use without sacrificing final product performance are only likely to increase. Impact modification, in particular, is a key area of development.

Durables, electronics and transportation applications for plastics are particularly challenging examples as broad variations in temperature demand premium performance targets that drive up cost. Polycarbonate (PC) resins are favored for these applications due to their good mechanical properties at ambient temperature, and good thermal resistance allowing use up to 120°C, says Yannick Saint-Gerard, European Sales Development Manager for **Dow Plastics Additives**. Blending PCs with ABS can improve mechanics and processing while blending with PBT can improve chemical resistance and flow. However, these blended resins do not offer the same level of impact strength in exceptionally low-temperature environments.

This downside can be ameliorated by incorporation of various types of impact modifiers. "MBS [methacrylate butadiene styrene terpolymer] impact modifiers are typically preferred for the toughening performance at sub-zero temperatures and good colour matching – as opposed to acrylic impact modifiers which give toughness at ambient temperature only," Saint-Gerard says. "Still, general purpose MBS impact modifiers do not generally offer good process and aging stability."

Dow Plastics Additives developed its Paraloid EXL-2690 MBS core-shell impact modifier to help address these various challenges (core-shell structures feature a rubbery core to provide resistance to impact enclosed inside a grafted glassy shell that provides rigidity and compatibility to the polymer matrix and maintains the desired shape and dispersibility of the particles).

According to Saint-Gerard, the modifier offers "exceptional" toughness performance while maintaining good flow. "The unique polymerisation process of Paraloid

Main image: Impact modification can allow lower cost resins to be used in more demanding application sectors

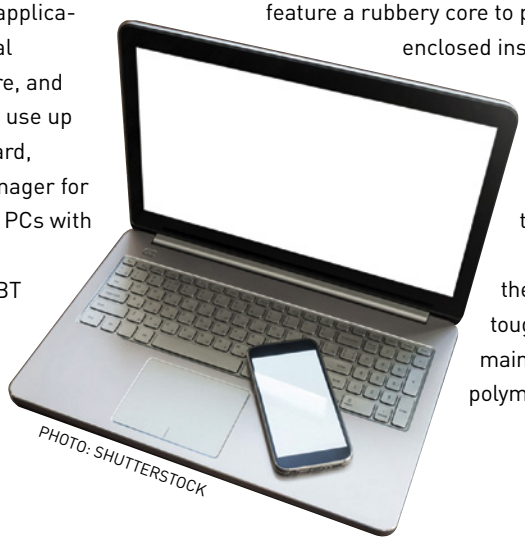


PHOTO: SHUTTERSTOCK

Left: Portable electronics is a key application sector for impacted modified PC resins and blends

Figure 1. Low temperature impact performance of modified polycarbonate with Paraloid EXL 2690 MBS impact modifier

Source: Dow Plastics Additives

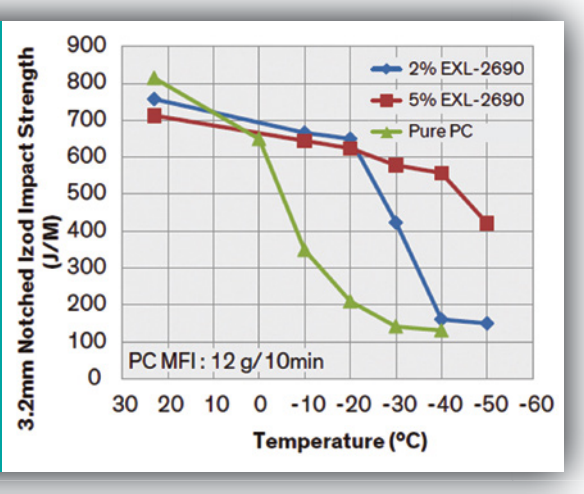
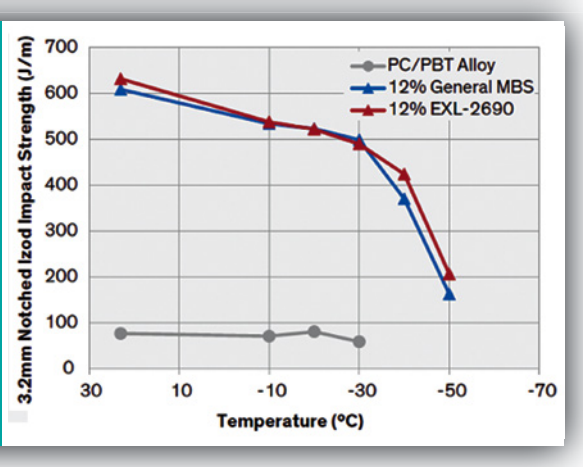


Figure 2. Impact performance of PC/PBT blend resin with addition of a general MBS impact modifier and Paraloid EXL 2690 MBS impact modifier

Source: Dow Plastics Additives



EXL-2690 facilitates high polybutadiene levels and an optimised particle design to offer excellent performance in combination with a shorter cycle time than conventional MBS, ultimately offering better cost-in-use for resin manufacturers and compounders," he says.

Paraloid EXL-2690 demonstrates high performance in PC applications, improving impact strength at low temperatures, as well as on thick substrates, minimising the effect on melt flow (Figure 1). Addition levels as low as 2wt% are satisfactory to obtain significant improvements in standard PC grades. State-of-the-art stabilisation features of this modifier are said to provide excellent processing stability, and good retention of performance even under the toughest moulding conditions. Retention of mechanical properties after long term heat ageing favorably compares with product benchmarks, while simultaneously minimising discoloration.

Paraloid EXL-2690 can offer dual benefits in PC blend applications, Saint-Gerard claims, including improved toughening and compatibility of polymer phases typically found in an MBS core-shell modifier. With addition levels typically between 10wt% and 15wt%, Paraloid EXL-2690 shows exceptional performance in PC/PBT blends, significantly improving impact strength at both ambient and low temperatures (Figure 2). In PC/ABS formulations, EXL-2690 displays good performance at addition levels between 3wt% and 5wt%, enhancing impact and also offering improved mechanical performance retention by stabilising the blend morphology during heat exposure.

ELIX Polymers, a producer of specialty ABS types, has taken a similar approach with its Elix 158 I, which also has a high rubber content (54-58%). This, it says, provides superior impact strength performance at ambient and low temperatures for blends containing polycarbonate, thermoplastic polyesters (PBT and PET) and SAN copolymers. It also improves impact strength, elongation at break and processability of PVC compounds used for various indoor applications.

Kaneka says its Kane Ace core-shell modifiers continue to expand into a wide range of engineering plastics, such as polyesters, polyamides and polycarbonate blends. They are said to provide an excellent balance between impact resistance, modulus and viscosity with an "extraordinary" good retention of heat distortion temperatures. Harald Braun, Technical Director at Kaneka Belgium, says the various variables are "carefully developed in order to create the perfect Kane Ace modifier with the desired functional performance. We are constantly fine tuning and developing modifiers with a high functionality."

This February, the **Emerald Specialty Polymers** business group of Emerald Performance Materials introduced Nychem Poly4000, a specialised waterborne polybutadiene homopolymer for plastics impact modification. "Nychem Poly4000 provides a soft, uniform core to enhance the impact resistance of more brittle engineered thermoplastics," says R&D Manager Jeffrey Mathys. " The use of these types of materials provides manufacturers with a wider range of options for their impact modification needs." When used as a matrix for more brittle polymers, Nychem Poly4000 diffuses stresses that can lead to cracking and failure.

"Emerald already has a long history of product expertise in impact modification for thermosets with its legacy Hypro line of reactive liquid polymers, originally known under the Hycar brand," says Mathys. "The new Nychem product leverages that expertise to expand into a greater area of impact modification for plastics."

The latex may also be used to produce a core-shell polymer, Mathys explains. "For these applications, Nychem Poly4000 was optimised with a consistent particle size for greater control and latitude in engineering the polymer." Nychem Poly4000 is also said to be suitable for use in transparent materials. Mathys says Emerald will work with customers to tailor products to meet specific features to enhance performance in the end product.

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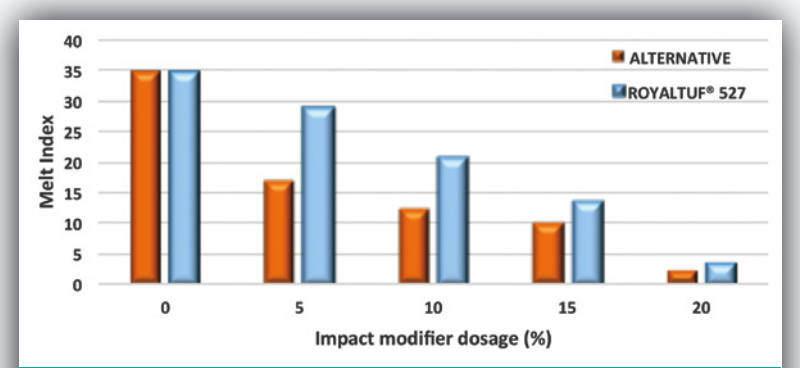

Figure 3: Royaltuf 527 provides improved melt index over an alternative impact modifier in polyamide 66 *Source: Addivant*

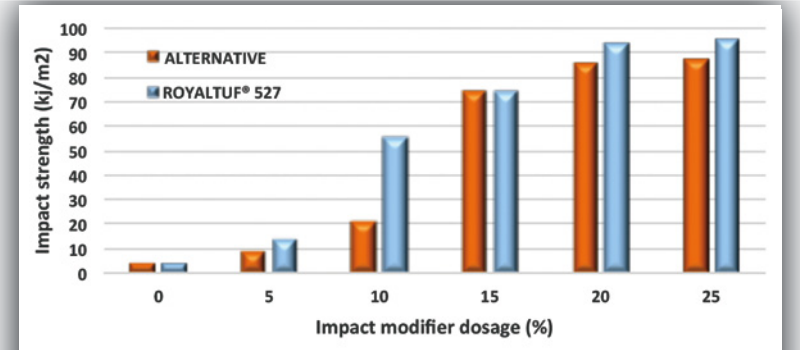

Figure 4: Royaltuf 527 is more efficient at lower dosage levels than the alternative impact modifier in polyamide 6 *Source: Addivant*

For polyamides

At additives supplier **Addivant**, Global Business Development Manager Irfaan Foster highlights a new impact modifier for polyamides, Royaltuf 527. With polyamides continuing to grow in use across applications from automotive to electronics to consumer applications, and with part complexity increasing and weight falling, polyamides with higher flow are required, he says. "Furthermore, as OEM's seek greater customisation to meet the needs of demanding consumers, polyamides with better colour consistency and aesthetics are required," he says. These trends are equally applicable for both general grades and impact modified grades.

Royaltuf 527 complements Addivant's existing product range, Foster says. It provides "super toughness" over a wide temperature range, especially at very low temperatures down to -40 °C. It also imparts a higher melt index in glass filled PA 66 than an alternative impact modifier over a wide dosage range (shown in Figure 3). This enables faster mould filling for more complex parts or for thinner wall parts providing designers with more freedom and flexibility.

Another advantage claimed for the new impact modifier is that it offers higher efficiency than previous impact modifiers. In PA 6, Royaltuf 527 provides a greater improvement in impact strength at lower dosage levels than an alternative impact modifier (Figure 4), enabling compounders to optimise their cost/performance balance without sacrificing the mechanical performance of the end article.

Royaltuf 527 has been designed to provide better colour consistency than previous impact modifiers. Improved colour consistency is a necessity to meet consumer demand for natural coloured or colour sensitive applications, even in the automotive world of black finishes. "The new product is also beneficial for black applications as it provides enhanced colour consistency of end articles increasing productivity by lowering off-spec part rejection rates," Foster says.

At **DuPont Performance Materials** R&D Fellow Karlheinz Hausmann says impact modifiers that are currently requested by the market should provide high impact performance combined with high flow. In other specific cases, high flexibility and chemical resistance are also needed.

Hausmann says DuPont Performance Materials has been developing a very broad range of impact modifiers for engineering polymer blends. They are all based on reactive or non-reactive ethylene copolymer technology, ranging from ionomer chemistry, through epoxy chemistry, to MAH grafted polymers. "We are mainly focusing on modification of polyamides, polyesters, and biopolymers" he says.

For polyamide modification, in addition to the conventional metallocene and EPDM-based MAH grafted Fusabond products N416, N493 and N525, DuPont has developed a new offering around Fusabond A560; it is an MAH modified acrylate polymer which provides up to 20% higher flow for PA-GF compounds versus conventional MAH grafted modifiers while maintaining good impact resistance down to -20°C. It also provides good gloss on the resulting parts.

"We have also developed – and are currently further developing - ionomer-based modifiers for polyamide which provide good impact properties and improved flow versus MAH modification," Hausmann says.

Right: Addivant's Royaltuf 527 impact modifier provides improved colour consistency in polyamides as well as enhancing impact resistance

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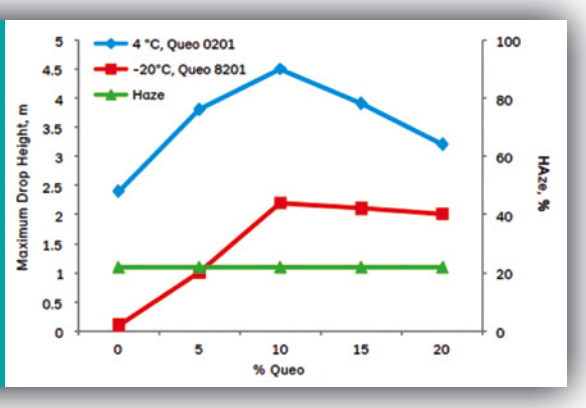
Effect of Queo POP on impact strength of PP



Source: Borealis

Examples of these are Surlyn 9020 and Surlyn 9320.

Another DuPont technology enables PA 6 to be enhanced with a new ionomer-based modifier, Surlyn AD1032, allowing injection moulding grades to be modified in a way to make them suitable for extrusion or blow moulding applications. The additive provides transparency at high modification rates and reduces water sensitivity and chemical resistance of the resulting compound. "This is possible by achieving a very fine modifier particle distribution ranging in the 50nm range," Hausmann explains. "This technology can be combined with conventional impact modifiers in order to provide low temperature impact toughness."

For polyester (PET and PBT) modification, DuPont is supplying Surlyn Ionomers as nucleating agents that enhance impact performance, as well as ElvaloyPTW for low temperature impact performance. This can be combined with ElvaloyAC acrylate copolymers in order to enhance the flow of the resulting compounds while maintaining the desired impact resistance at low temperatures. These technologies can also be applied to PC (although transparency is lost) and PPS.

For biopolymers such as PLA, DuPont developed its Biomax Strong 120 high purity ethylene copolymer-based reactive impact modifier that reduces brittleness in foils when used at low addition levels between 1-3wt%. "In addition, Biomax Strong 120 can be used to impact modify PLA at low temperatures when applied at higher addition rates," Hausmann notes.

For polyolefins

Markets for polyolefin plastomers and elastomers (POP, POE), including impact modification, are exhibiting robust growth, says one major supplier, **Borealis**. The range of applications continues to expand, particularly in the areas of automotive modified polypropylenes (TPOs), wire and cable, and consumer packaging, the company says, noting that POPs and POEs are replacing more conventional polymers such as ethylene propylene diene (EPDM), traditionally widely used in TPOs.

Borealis made its move into POPs when it acquired the ExxonMobil/DSM joint venture DEX Polymers in 2013. Earlier this year, it extended its range, now branded Queo, to include POEs. The products encompass a range of metallocene-catalysed low density ethylene-octene copolymers. Borealis says they combine the performance characteristics of elastomers with the processing advantages of a thermoplastic.

"Queo has a highly amorphous structure, resulting in outstanding flexibility, good optical properties and very low temperature impact resistance," Borealis says, while a narrow molecular weight distribution and uniform comonomer incorporation are said to make Queo "exceptionally" tough.

"Driven by the improved mechanical properties of metallocene-based products, Queo plastomers exhibit top performance when it comes to overall toughness," Borealis says. "For this reason, Queo plastomers are the material of choice for high- strength freezer films, meat packaging and pouches. Even in minority blends, the improvements are of such significance that cost-effective downgauging can still be achieved," it claims.

In rigid packaging, meanwhile, Queo plastomers improve low temperature impact resistance. When Queo is used as a blend partner with random PP copolymer, clarity and haze level can also be maintained. "What is more, low flex fatigue, excellent chemical resistance and organoleptics make Queo the material of choice when the aim is to improve performance of caps, closures and seals," Borealis says.

Borealis launched three new Queo POE grades in

Right: Storage facilities for Queo PO elastomers at the Borealis plastomers and elastomers production facility at Geleen in the Netherlands

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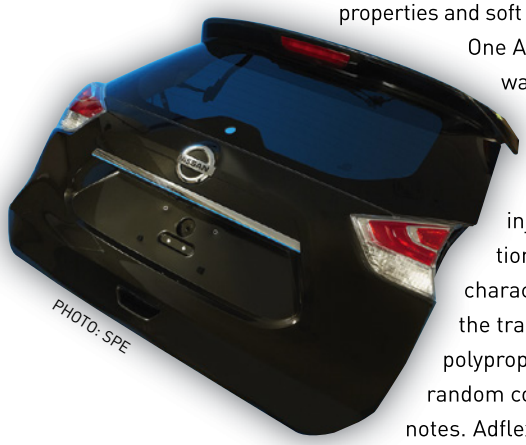
Right: TPOs for car bumpers are a typical target for new Queo elastomers from Borealis.

June: Queo 6800LA (density 0.868 g/cm3, melt flow rate 0.5 g/10 min); Queo 7001LA (density 0.87 g/cm3, melt flow rate 1.0 g/10 min); and Queo 7007LA (density 0.870 g/cm3, melt flow rate 6.6 g/10 min 0.870, 6.6). It says key applications where they are expected to offer an especially appealing value-added proposition include TPOs for automotive parts, appliances, housewares, furniture, crates and containers.

"Whilst Queo POPs are primarily aimed at applications requiring good to moderate flexibility combined with higher thermal properties and high mechanical strengths, Queo POEs are the material of choice when it comes to enhanced flexibility (below 20 MPa) and outstanding low temperature impact (Tg is -55°C)," the company claims. Queo elastomers can be melt-blended with PP in twin screw compounding equipment.

LyondellBasell, meanwhile, points out that its Catalloy reactor grades of TPOs can themselves be used as impact modifiers and to improve processability of other polyolefins. Adflex, for example, as a family are very soft and flexible TPOs used as a blending partner to improve impact performance, as well as in in applications such as speciality films, extrusion coating, bitumen modification and consumer applications. "In addition to enhanced flexibility, the Adflex resins exhibit excellent impact performance at low temperatures, outstanding haptic properties and soft touch," the company says.

Below: Impact modified Hiflex TPO from LyondellBasell is used for the all-olefinic tailgate on the Nissan Rogue



One Adflex grade, Adflex X 100 G, was developed specifically as an impact modifier for polypropylene to be used both in extrusion and in injection moulding applications. "Thanks to its particular characteristics, it does not alter the transparency of the modified polypropylene (homopolymer or random copolymer)," the company notes. Adflex X 100 G exhibits a high softness and a low modulus (80 Mpa), with a relatively high melt flow rate (8 g/10 min).

With its Hiflex TPOs, LyondellBasell has developed a "phase inversed" structure where the elastomer acts as the matrix and the polypropylene (PP) as the modifier. "Hiflex TPO resins combine the properties of existing Hifax and Adflex TPO resins offering easy processing, recyclability, flexibility, weatherability, weight reduction, high thermal resistance and low gloss together with improved impact, stiffness and shrinkage performance balance when used in a compound," LyondellBasell says, adding that they offer an alternative for high-priced flexible polymers, engineering resins or POEs. They can be used directly in the manufacturing process or as a building block in compounds for a wide variety of applications.

Click on the links for more information:

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Developing technologies and applications for electrically and thermally conductive plastics

September 27-28

Hilton Philadelphia City Avenue, Philadelphia, Pennsylvania, USA

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CONDUCTIVE PLASTICS 2016

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Tuesday, September 27, 2016

8:00 Registration and welcome coffee
9:00 Opening announcements

9:10 **Market overview**
Mr. Chris Smith, Editor, AMI Magazines,
APPLIED MARKET INFORMATION Ltd., United Kingdom

SESSION 1 - PROCESSING AND COMPOUNDING

9:30 **Effective techniques for successful processing of electrically conductive plastic compounds**
Mr. Kari Alha, R&D Director,
PREMIX OY, Finland

10:00 **Challenges to produce electrically conductive plastics: The perspective of a conductive carbon black supplier**
Ing. Christine Van Bellingen, Global Polymer Technical Leader,
IMERYS GRAPHITE & CARBON, Belgium

10:30-11:00 Coffee break

11:00 **Continuous processing techniques for highly filled conductive plastic compounds**
Mr. Mario Gillmann, Research Associate,
ZENTRUM FÜR BRENNSTOFFZELLENTECHNIK ZBT GmbH, Germany

SESSION 2 - ENHANCING ELECTRICAL/THERMAL CONDUCTIVITY

11:30 **High performance boron nitride fillers for thermal management in polymers for E&E: Key properties, application examples and design considerations**
Mr. Stephen Amos, Sr. Specialist,
3M COMPANY, United States

12:00 **Advanced thermo management with mineral fillers in plastic materials**
Mr. Péter Sebö, Market Development Manager,
HPF THE MINERAL ENGINEERS, A DIVISION OF QUARZWERKE GROUP, Germany

12:30-2:00 Lunch

2:00 **Modifying thermal and electrical conductivity using novel infused hybrid nanostructures**
Dr. Tushar Shah, Chief Technology Officer,
APPLIED NANOSTRUCTURED SOLUTIONS, United States

2:30 **Highly electro-conductive carbon black in polyolefins, engineering plastics and polymer blends**
Dr. Josef Křivánek, Senior Researcher,
UNIPETROL RPA s.r.o. - POLYMER INSTITUTE BRNO, Czech Republic

3:00 **Electrically and/or thermally conductive polymers incorporating transitional metal nanoparticles**
Mr. Nate Slating, Director of Business Development,
THE MACKINAC GROUP, INC., United States

3:30-4:00 Coffee break

SESSION 3 - THERMALLY CONDUCTIVE APPLICATIONS

4:00 **Simplified manufacturing of 3D-mids with thermally conductive polymers**
Mr. Jason Eckel, Global Marketing Director,
Specialty Engineered Materials,
POLYONE CORP., United States

4:30 **Thermal management of Li-ion systems & mobile devices with latent heat sink (LHS) plastics**
Mr. Mark Hartmann, CTO,
OUTLAST TECHNOLOGIES LLC, United States

5:00 **Thermal management solution for LED application with customized polymers**
Mr. Ted Sidoriak, Product Manager - North America,
LEHVOSS NORTH AMERICA, United States

5:30 Afternoon wrap-up and questions

5:40 - 7:10 Cocktail reception

Wednesday, September 28, 2016

8:30 Welcome coffee
9:00 Opening announcements

SESSION 4 - NOVEL CONDUCTIVE ADDITIVES

9:10 **Developing and enhancing conductive properties using novel porous isotropic 3D carbon structures**
Dr. Daniela Sordi, Chief Technology Officer,
CARBONX BV, The Netherlands

9:40 **Single-walled carbon nanotubes as a novel conductive filler for thermoplastic materials**
Dr. Evgeniy Ilyin, Senior Researcher,
OCSIAL GROUP, United States

SESSION 5 - ELECTRICAL CONDUCTIVE APPLICATIONS

10:10 **Application of highly conductive aliphatic polyketone to reduce weight and cost in LEV III compliant auto fuel systems**
Mr. James Arbuckle, Managing Partner,
MEGA POLYMERS, United States

10:40-11:10 Coffee break

11:10 **Development of a highly conductive polymer bipolar plate for high performance lead-acid battery applications**
Mr. Doug Bathauer, CEO,
INTEGRAL TECHNOLOGIES, INC., United States

SESSION 6 - MANAGING ESD AND EMI

11:40 **Comparative wear characteristics of stainless steel fiber EMI shielding compounds**
Mr. Ned Bryant, Senior Product Development Engineer,
RTP, United States

1:40 **Utilizing light colored electro-conductive pigments to comply with evolving electrostatic (ESD) standards**
Mr. Jim Stavrakas, Global Product Manager,
MILLIKEN & COMPANY, United States, and
Dr. Philippe Scheerlinck, Senior New Business Development Manager - EMEA,
MILLIKEN & COMPANY, Belgium

12:40-1:40 Lunch

1:10 **Innovative options for controlling static and ESD of plastics: Permanently anti-static block copolymers and multi-wall carbon nanotube masterbatches**
Mr. Patrick Delprat, Graphistrength Business Manager,
ARKEMA SA, France, and
Mr. Nick Deluca, Business Development Engineer - Antistatics,
ARKEMA, United States

SESSION 7 - MEASURING THERMAL CONDUCTIVITY

2:10 **Measurement of thermal conductivity and thermal conductivity anisotropy of wood-plastic composite materials**
Ms. Sarah Ackermann, Applications Specialist,
C-THERM TECHNOLOGIES, Canada

2:40 **Thermal conductivity measurement by steady-state and flash diffusivity methods and instruments**
Dr. Heng Wang, Product Marketing Specialist,
TA INSTRUMENTS-WATERS LLC, United States

3:10 Afternoon wrap up and questions

3:30 Conference ends

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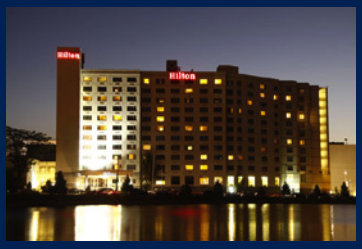

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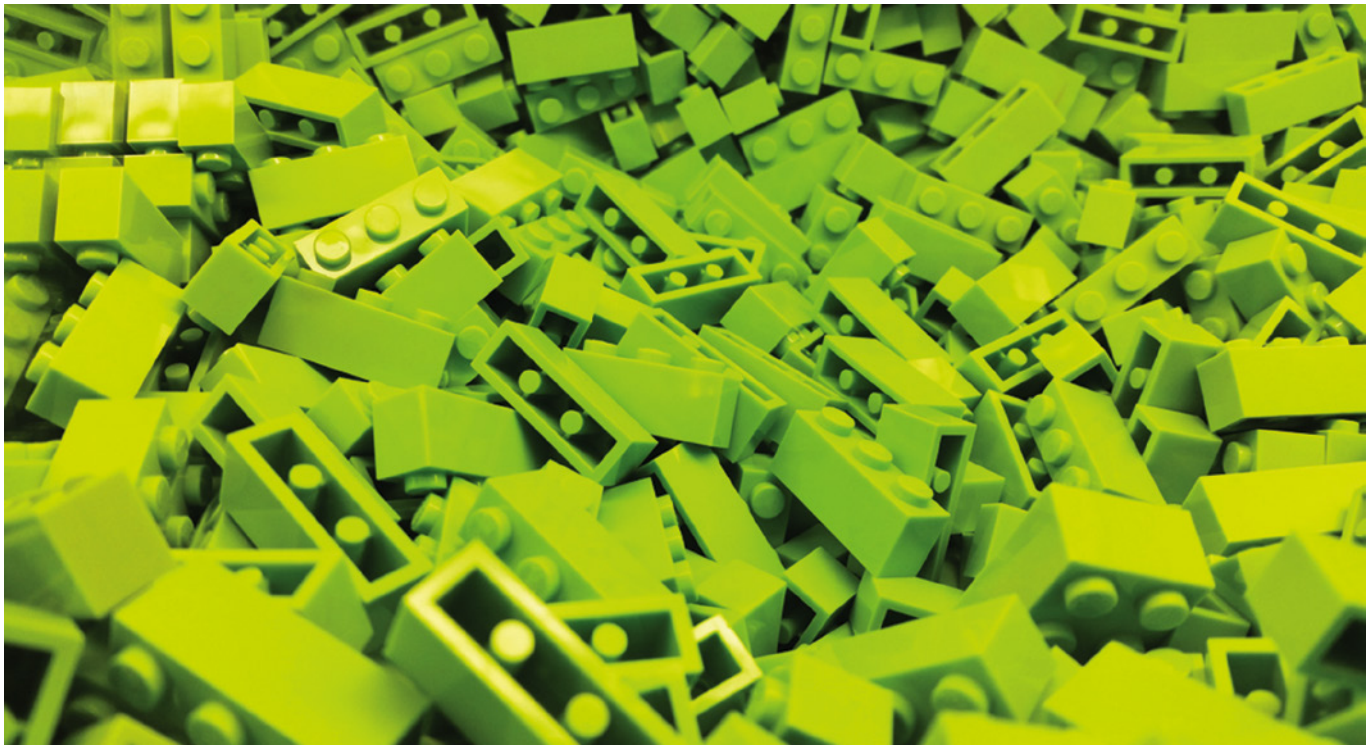

Getting the colour right

The world of colour is both an art and a science and plastics compounders need to be at the very centre of it. Fortunately, there is technology available to assist from the design stage through to production, writes **Mark Holmes**

The plastics compounding industry has to pay particular attention to trends and developments in colour. Fundamental to this is colour measurement and how colour information is communicated throughout the production cycle. "Colour is a critical part of brand identity and is often a deciding factor in a customer's purchasing decision," says Felix Schmollgruber, Application Engineering Manager EMEA at **X-Rite Pantone**. "Brand owners, as well as their supply chain partners, are constantly looking at consumer trends to ensure that future products will meet consumer colour demands."

Schmollgruber says the company's Pantone Color Institute works with a number of brand owners to help identify emerging colour palettes and says this year's key colours – Pantone 15-3919 Serenity and 13-1520 Rose Quartz – will be represented in everything from appliances, and home furnishings, through to textiles and cosmetics. "Many consumer products made from plastics will show up with special editions in the colours of the year, such as coffee makers, furniture or smart phone covers. By following consumer colour trends, compounders are able to provide customers with materials in a range of colour palettes that meet consumer trends," he says.

While colour selection may be a localised issue, globalisation of supply chains can create numerous colour management challenges. "First, there is a greater need for accurate communication of colour across the entire supply chain, from brand owner to specifiers and compounders to manufacturing facilities," Schmollgruber explains. "This places a greater importance on communicating colour digitally rather than relying solely on physical references or samples. Using a specified digital standard, which includes information on how to measure samples, operating procedures and the spectral data, in a connected colour management solution ensures that everyone in the supply chain is speaking the same colour language and measuring using the same criteria."

Main image: In a globalised manufacturing environment, maintaining colour consistency is a prime consideration

Above: Pantone's Rose Quartz and Serenity are key colours for 2016 and will feature in many plastic products this year

Schmollgruber says it is also important to incorporate an audit trail into the supply chain/colour workflow process. This allows data to be analysed to identify where any colour error may have occured. Audit trails also help strengthen standard operating procedures and reduce the risk of future colour errors in the supply chain.

"Matching colour in plastics can be challenging as preparing calibration samples for software-based colour formulation requires tremendous effort. Access to such calibration files is usually exclusively provided by the larger pigment or masterbatch manufacturers and creates a dependency on using their colourants or material," he says. "Using physical samples for simple visual evaluation comes with a lot of risks and variations for different ambient light conditions, sample variation from ageing, temperature, exposure to light or surface defects. This can create a lot of colour errors in the process. Accurate colour measurement and digital colour communication eliminate these risks and accelerate the colour specification and control process remarkably."

Schmollgruber adds that over the past 5-10 years the industry trend has been toward expanded colour palettes and special effects pigments. The emergence of new resins, manufacturing technologies, pigments and changes in the regulatory environment for plastic materials has also led to a greater need for precise colour measurement technology.

Colour tolerances are also tighter now than they were 10 years ago. And with a smaller margin for error, suppliers need to get colour right the first and every time. "For example, special effect pigments, such as metallic flakes, pearlescent and thermochromatic pigments, affect the way colour appears and must be measured and managed differently than traditional colourants. The increased use of optical brighteners in plastics has also impacted colour management processes. If optical brighteners are used, manufacturers need measurement tools that account for UV," Schmollgruber says.

"Equally important, the plastics industry has become more fragmented while dealing with increasing restrictions, environmental regulations and other requirements. Many products are specified globally but produced and/or sold locally and are subject to local and regional regulations. This means that manufacturing processes and materials may differ, making it harder to get to accurate and consistent colour," he says.

Lighting variation

Many manufacturers still rely solely on the human eye for visual evaluation of colour. Schmollgruber says it is not unusual to hear from plastics manufacturers how they take products outside to evaluate colour under natural daylight. "However, each person views colour differently and a colour can look different under different lighting conditions. If it is a cloudy day, or you are evaluating during the morning or in the afternoon, the colour will appear different. This can lead to colour errors and product rejects. For companies that rely on visual evaluation, we recommend using a light booth that provides a variety of reliable and consistent lighting sources, from daylight to fluorescent and home lighting."

He cites the company's X-Rite Judge QC as a typical example. It is a compact, industrial-grade light booth offering five light sources allowing QC professionals to evaluate accurately incoming materials, samples and final products for colour consistency and physical defects.

Many companies combine visual assessment with colour measurement instruments such as spectrophotometers. "As part of a colour management programme, designers and specifiers can use spectrophotometers to help specify and communicate colour," Schmollgruber says. "Manufacturers use spectrophotometers to monitor colour accuracy in pre-production and production as part of colour formulation and quality control processes. There are many different types of spectrophotometers, from handheld devices, to benchtop and inline. They can measure anything from unusual shapes to liquids and powders. For example, benchtop spectrophotometers provide the ability to measure plastics in various forms. This allows manufacturers to pick up colour problems before they are processed."

Right: Portable devices such as X-Rite's Ci6x series spectophotometers play a part in accurate colour measurement and communication

X-Rite says that spectrophotometers such as its Ci7800 benchtop offer both reflection and transmission measurements. This is particularly important for plastics, which are often translucent or transparent. The Ci7800 benchtop sphere spectrophotometer is claimed to deliver accurate and repeatable sample-to-sample colour measurement, from raw materials through to the delivery of an on-spec colour product. It is

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X-Rite's Ci7x00 benchtop range of spectrophotometers offer both reflection and transmission measurement modes, essential for most plastics

designed to support a connected colour management strategy with instrument agreement while delivering reliable, repeatable, and accurate measurements.

"Companies with more advanced colour management processes add software solutions to help manage formulation and quality control," adds Schmollgruber. "For example, formulation software, like X-Rite Color iMatch, incorporates multi-flux match capabilities that can fully characterise the complex light paths in all kinds of layers and materials, considering transmission, absorption, and both surface and inner reflection. The same database can be used for samples at all levels of opacity; transparent, translucent, and opaque, and the quality of the predicted recipes will be the same for all degrees of opacity."

Connected colour

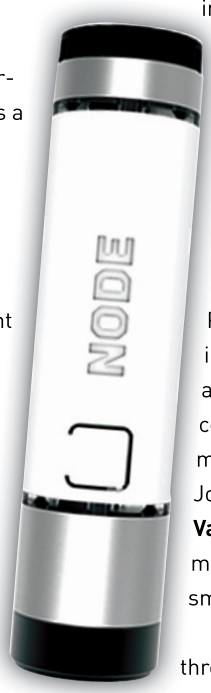
Schmollgruber says that globalised manufacturing has meant more companies moving towards a connected colour management strategy, where customers share a specified digital colour specification across the supply chain and everyone measures and reports based on that shared digital specification. "This creates a detailed audit trail for each colour measurement taken in the process from the laboratory to production and assembly. It makes identifying potential colour errors in the process easier," he says.

When a colour is selected, a tolerance is identified that the end product must be within. There are many individual steps between product conceptualisation and manufacturing and colour measurement errors can occur at any one of them. These errors might be caused by the wrong device configuration, procedural errors, environmental changes, or even using the wrong sample data. The sum of these errors can quickly mean a component moving out of colour tolerance.

X-Rite says that using a connected colour management solution, each measurement uses the same specified template and is recorded. When specifiers and/or their supply chain implement such solutions as part of their colour workflow, all stakeholders can be confident that the design/colour intent is carried through to the final product. The resulting audit trail allows companies to identify where colour is going wrong. This creates a more efficient process, reduces project rejects and helps improve manufacturing times.

However, colour is only part of the aesthetic of a component. X-Rite is working on a future technology solution that will enable the measurement and communication of all visual characteristics of a material's appearance. Its Total Appearance Capture (TAC) ecosystem is intended to provide a complete digital material appearance management system that will ensure appearance accuracy, consistency and repeatability. The company says TAC will help designers and manufacturers visualise a product's final appearance, including colour, plastic type, surface textures and graining, before committing to materials or specifications. This will allow customers to consider expensive advanced material effects during the design phase, but also minimise waste and speed time to market.

"We believe this technology will have a significant impact on the plastics industry," says Felix Schmollgruber. "For example, the texture or grain added to plastics impacts the appearance of colour. If colour is specified using a glossy black but the plastic mould includes a level of grain, then the resulting colour will look different. It will be less saturated and have a lighter, matt appearance. As a result, the finished product will not meet expectations."



Right: The NODE+ sensor platform from Variable is a hand-held device that gathers, processes and uses sensory data

Mobile measurement

Portable and mobile technology solutions are increasingly important in the colour selection and management process. "We are seeing compounders embrace technology and become more creative to streamline operations," says John Kowalski, vice-president of Marketing at **Variable Inc**, which has developed colour measurement and inspection tools based on smartphone technology.

"With multiple facilities, customers and throughout the supply chain, communication of colour data and standards is critical not only to ensure colour consistency but also to reduce scrap. This means the need for portability and mobile

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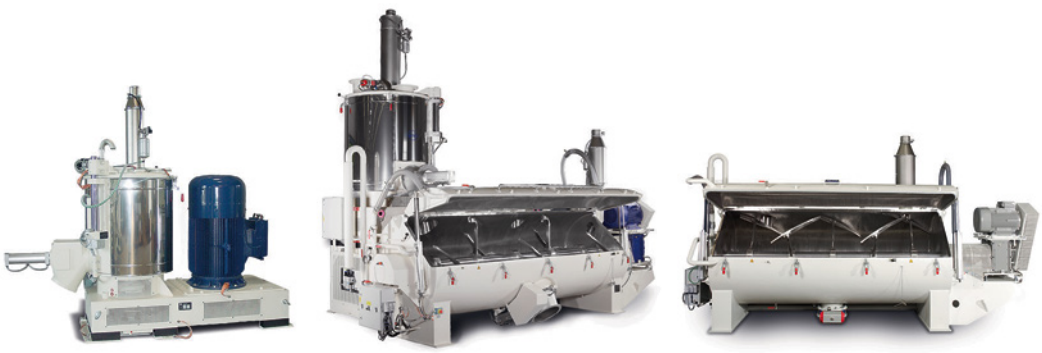

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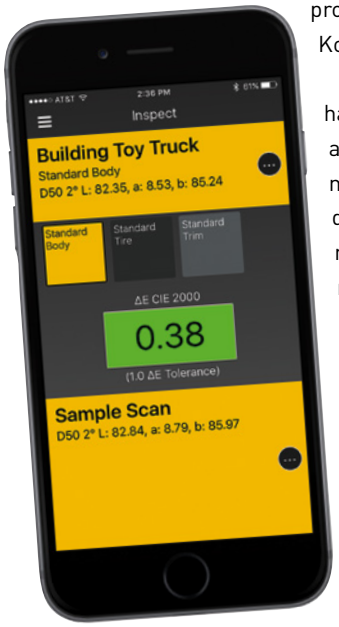
solutions. We have developed a Bluetooth-enabled colour sensor and mobile app system that measures a colour and then references to the closest match or provides light quality control functionality," Kowalski says.



Above: Comparing production results with standards on the Variable system

The Variable NODE+ sensor platform is a hand-held device that gathers, processes and uses sensory data. The system takes measurements on the go and transmits data wirelessly to a mobile device, where modules customise the data to match the requirement. A range of apps have been developed that can both aid designers streamline the colour selection process, as well as validating and inspecting colour standards in manufacturing. "Our current hardware offers less than 0.05 ΔE short-term repeatability and less than 0.25 ΔE inter-instrument agreement," says John Kowalski. "Combined with our mobile apps we can either reference the closest match in a colour library (Color Elements) or create colour standards and then measure against them with production pieces (Color Inspect)."

US-based **Plastics Color Corporation** has been using the Variable colour measurement system for some time. "We place great emphasis on staying ahead of the trends. In fact, as an active Color Marketing Group member [an international association for colour designers], we are forecasting colour trends two years out,"says Sarah Skidmore, additives product line and marketing manager at the compound and concentrates producer.

"When it comes to product design and development, we have seen interest with a portion of our customer base to use digital tools and technology for colour communication," She says. "Through the use of the Node, and specifically, the Colors Now app, our customers can leverage design 'ideation' from the palm of their hand – not having to rely solely on traditional colour chips."

According to Skidmore, product designers often have a particular colour in mind that they would like to see used for their final product. "Traditionally, if you were not in the same room as a sample part or a customer did not have a precise Pantone colour in mind, then it was timely to find the correct match the customer was looking for," she continues. "However, with the help of the Node device and Colors Now app, customers can get that exact colour code by way of a quick scan. This digital tool allows us and the customer another way to communicate colour to help speed up the matching process and achieve an exact colour match.

"The Colors Now and Node technology plays to the societal mindset that everyone wants everything immediately. Take out your phone and you have access to an endless amount of information at your fingertips. Using the Colors Now app and Node gives customers the immediate response they are now accustomed to receiving. Having colour-focused apps is very much a necessity in the world we now live in."

As an example, she highlights a consumer market project that Plastics Color recently worked on that required six new colours in the product line. "We achieved this entirely through the use of visual technology. Through the use of the Colors Now app, we were able to communicate and help them select the perfect colour for their products remotely. The results were immediate and we were able to deliver the exact colour match."

Another player in the smartphone-based colour measurement arena is Germany's **RAL Colours**, which recently launched the Colorcatch Nano colour measuring tool. The company claims the portable colorimeter, which was developed in partnership with **Colorix** of Switzerland, records up to five colours simultaneously, regardless of the size and condition of the surface or material. The system enlarges the image to six times its size and eliminates shadows and dirt to provide a precise colour measurement which, using the connection to the RAL App iColours, is used to identify the closest RAL colour (or a colour from another preselected colour collection). The selected colour shade can be shared via email or directly transferred to a photographed object.

In-line measurement

Equitech International has developed spectrophotometer technology suitable for compounders and masterbatchers for inline colour measurement with closed loop control. The company says that the goal of process analytical technology has been to move the measurement of key physical parameters, such as temperature,

The Colorcatch Nano portable spectrophotomer by Colorix and RAL Colours

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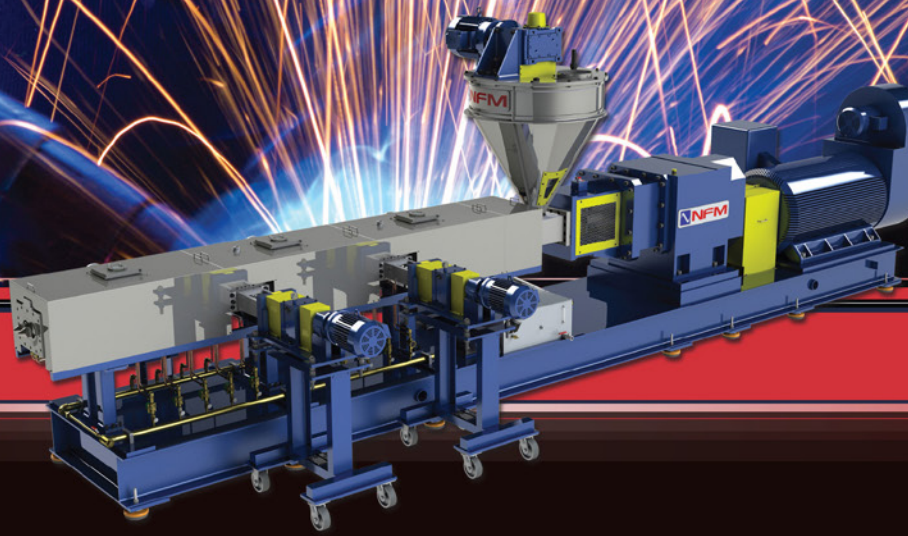

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concentration, pressure and colour, out of the laboratory and as close as possible to the production line. Colour measurement of molten plastics prior to extrusion offers a number of advantages and benefits for colour quality, as well as for extruder diagnostics. Making the measurement further 'upstream' allows for more rapid and effective response or correction to colour drift or out-of-tolerance conditions. Real-time colour data can also be used to diagnose extruder conditions such as colour feeder performance and screw speed/wear. Furthermore, this real-time data is required for closing the loop and allowing automated colour corrections.

Right: The 500 Series of benchtop spectrophotometers are among the latest introductions from Datacolor

Work undertaken by Equitech involves collecting data using a fibre-optic spectrophotometer with a CCD detector and xenon flash lamp. The instrument functions as a double-beam spectrophotometer, with a probe or sample channel and a reference channel. Two different fibre-optic melt probes are used: one for reflectance spectroscopy and one for transmission spectroscopy. The probes are designed to fit into a standard ½-20 UNF extruder port that is typically used for temperature or pressure transducers. The materials in contact with the process are the sapphire window and Hastelloy probe tip. All colour data are computed from spectral data using illuminant D65 and a 10° observer function. The optical geometry of the reflectance probe is 28°/0°. The instrument can achieve a stability of 0.2 units L*, a* or b* per day.

The company cites advantages of the system as being increased archiving of the process and data sharing with the end user. It says the technology is particularly beneficial for use with recycled polymers and a recent development project involved recycled polypropylene with closed loop control of the colour feeder for the L*.

The company says that advantages of inline colour monitoring over offline solutions include: continuous process monitoring with 100% product inspection; immediate measurement allowing rapid correction and process stability; minimisation of off-spec production; no waiting time for results to come back from the laboratory; early detection of dosage problems; optimisation of material usage; off-spec production can be isolated meaning no more contamination; compliance with customer demands; and elimination of returns. While Equitech says the use of online colour measurement to provide real-time control of colour is just beginning in the plastics industry, it argues many benefits can already be seen. Future development work will involve the measurement of pigment particle size to understand its homogeneity and colour strength, the company says.

Lab developments

Meanwhile, for offline measurement, **Datacolor** has introduced the 800 and 500 series of spectrophotometers. This range of fully backward-compatible benchtops has embedded processor and data storage and is claimed to provide a platform for increased efficiency and colour measurement confidence. The series includes Datacolor 850, 800, 550 and 500 instruments.

The Datacolor 800 is a close-tolerance spectrophotometer for communicating colour digitally. Featuring a digital camera, the spectrophotometer allows good sample placement and is fully backward compatible with existing Datacolor 600 spectrophotometers. The 850 version includes a transmission measurement capability in addition to reflectance. The 500 range is claimed to offer an economical option for a high performance spectrophotometer with enhanced speed and advanced technology, while being compatible with existing 400 instruments. The 550 is a transmission and reflectance instrument.

Both the 800 and 500 ranges feature a new colour LCD screen that displays calibration status and instrument settings. With an embedded processor, the health of the instruments can now easily be validated through remote diagnostics, allowing for faster issue resolution. Instrument accessibility has also been expanded with the introduction of an Ethernet port, allowing for simultaneous connection of multiple computers. Performance enhancements have been implemented as well to enable real-time sample measurement within a global Citrix or Terminal Server environment.

Click on the links for more information:

- **www.xrite.com**
- **www.variableinc.com**
- **www.plasticscolor.com**
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The European ban on OBPA has not been replicated in the US but the move has sparked a new round of biocide development. **Jennifer Markarian** explores the latest product and market moves

Biocides aim to beat the bugs

Companies that use biocides to protect plastics from bacterial and fungal growth have likely become pretty familiar with change in recent times, as both names and owners of their key suppliers have changed. At the same time, regulatory developments, most notably in the European Union, have driven an evolution in the types of biocides that are available to them. This article takes a look at some of the latest biocide products, product registrations, and dosing forms and reports on a new test method for microbial activity.

Since the conventional workhorse biocide for protecting PVC and other plastics, oxybisphenoxarsine (OBPA), was withdrawn from sale in the European Union in January 2013, producers and users of biocides have been moving to alternatives. While many expected the US to quickly follow suit, three years later on the US Environmental Protection Agency (EPA) has yet to give a decision on re-registration of OBPA. **Troy Corporation**, the only supplier to support OBPA's EPA re-registration, is working with the EPA's data call-in for the additive. The company says it is "committed to providing OBPA in all regions outside of Europe, and is supporting its re-registration in the US." Troy says, with the exception of Europe, OBPA remains the dominant biocide for flexible PVC globally.

In addition to OBPA, Troy offers iodopropynylbutyl-carbamate (IPBC) and other alternatives within its Micropel portfolio. The company's acquisition of Ashland Corporation's industrial biocides business in 2015 included the Plastiguard portfolio of preservatives, which includes Folpet and IPBC. This portfolio "offers European manufacturers a wider product selection as a solution to Europe's tightening BPR regulations," says the company.

Also in 2016, the Material Protection Products (MPP) business unit of **Lanxess**, headquartered in Cologne, Germany, announced it had received Environment Protection Agency (EPA) FIFRA registration for several new biocide formulations based on the active ingredients thiabendazole (TBZ) and IPBC for compounding into PVC and other polymers. "These registrations open up a new market for us in plasticized PVC," says Patricia Souza, Head of the MPP Business Unit in the NAFTA region. She adds that Lanxess MPP supplies

Main image: The global biocides market has seen both regulatory and structural change in recent years, sparking a round of new product development

Above: The biocidal active ingredient is encapsulated in the carrier resin in Valtris's Intercide DBF-10-SVC pellets

biocides for wood protection, construction, and disinfectants. Its IPBC product has been used in wood-plastic composites, but the EPA registrations mark the company's entrance into plasticized PVC in North America.

The new product portfolio centres around TBZ, which Lanxess describes as having "a good toxicity profile featuring excellent biocidal performance as well as regulatory sustainability." The new products, in liquid form for plastisol or dry-blending, include Biochek 8064 (in DINP), Biochek 8064 (in DOTP), and Biochek 8065 (in Mesamoll). All are based on the same TBZ/IPBC active combination, but differ in concentration. In addition to EPA registration, the active ingredients are supported under the EU's Biocidal Products Regulation (BPR) and Biochek is available in the EU.

In April this year, **Valtris Specialty Chemicals**, a portfolio company of private equity investing firm HIG Capital, announced its acquisition of a major player in biocides for plastics, Akcros. Valtris, which was carved out of Ferro Corporation in December 2014, has its own line of biocides but these are generally complementary to the existing Akcros line, according to a company spokesperson. Both the Microchek brand and the Intercide brand will continue to be sold by Valtris.

Alternative formats

Valtris has been expanding production of its OBPA alternatives, particularly its Intercide isothiazalone-based biocides. The company invested in capacity for solid, pellet-form biocides at its New Brunswick, New Jersey facility in the US, following its deal with Dow Microbial Control to produce and market what were Dow's Vinyzene biocides for plastics.

"A pellet, in which the active is encapsulated within a carrier, is safer than powder for operators to handle," says Humberto Goldoni, Managing Director, Stabilisers & Latin America at Valtris. The company currently offers pelletized OIT and DCOIT in a PVC or processing aid carrier. "Some like the additional ease of processing that the processing aid carrier provides. The encapsulation and pelletizing process is flexible and can be used with other carriers as well," he adds. In Europe, EVA is a popular carrier.

In 2015 the company introduced another new dosing form: Intercide ZnP 5 DIDP, an easy-to-handle form of 5% zinc pyrithione (ZnP) in DIDP paste. The paste form eliminates any dust hazard and improves housekeeping compared to powder. The higher dosing amount of the paste can lead to easier and more accurate weighing and dispersion. "Instead of a 97% active powder which can be irritating, the paste is 5-10% active and is dosed along with the plasticiser and other additives," explains Goldoni.

The ZnP product is recommended for use in flexible and plastisol PVC applications at 1% to 4% by weight of the total PVC formulation to provide protection against attack from a wide spectrum of fungi and bacteria, says the company.

Liquid options

Riverdale Global, which supplies liquid additives and colourants, introduced +Clean Antimicrobials in May of this year, a series of inorganic silver-based liquid antimicrobial agents for use with polyolefins and engineering thermoplastics. The new additive products are available in pails or drums, in custom blends with liquid colours, or as one of the company's GlobalPlus range of liquid additives (in the GlobalPlus system each additive is supplied in a drum with a built-in pump that stays sealed throughout shipping, handling, and processing).

The liquid antimicrobials can be dosed at lower letdowns (0.2 to 0.5%) than masterbatches and disperse more readily in the polymer than pellet concentrates, according to the company. The additives have been

Right: Intercide ZnP5 DIDP is an easy-to-handle paste of 5% zinc pyrithione in DIDP from Valtris

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Recycling without odours

Microban, building on its Scentry odor-capture products for textiles, introduced Scentry for Polymers in April this year, designed to eliminate unpleasant odours in recycled plastics. The technology can be used for odour capture alone or for a combination of odour capture and an antimicrobial to help fight against stain and odour-causing bacteria and product degradation. The company claims that Scentry technology has been shown to provide a 10-times reduction in odours produced from recycled materials used in consumer products such as trash bags, trash cans, flooring, plastic storage containers and footwear.

www.microban.com

optimised for colour retention in both indoor and outdoor environments. The +Clean AM-139 liquid additive is for use with polyethylene or polypropylene at 0.2 to 0.4% letdowns, while the +Clean AM-150 liquid additive is for use with engineering resins at letdowns of 0.3 to 0.5%.

"The liquid form of Riverdale Global's +Clean antimicrobials ensures low and precise metering rates and improved mixing and dispersion," says Charles B Irish, Vice President of Product Development. "Enhanced dispersion is particularly important for product protection because it promotes an even distribution of the agent at the surface."

There are no "drop in" alternatives to OBPA but suppliers have a good understanding of what alternatives work well in different applications. Isothiazolones, such as OIT [n-octyl-isothiazolinone] and DCOIT [dichloro n-octyl-isothiazolinone] are commonly used. Other alternatives include butylbenzisothiazolinone (BBIT), zinc pyrithione (ZnP), and iodo-propynlbutyl carbamate (IPBC). "Key properties to consider are dependent upon the application," explains Thomas Robitaille, Global Technical Marketing Lead for Antimicrobials in Plastics at **Lonza**. "For example, soil burial performance is important for wire and cable. For outdoor applications, both the effectiveness of microbial control after UV exposure and the effect of UV on yellowing should be examined."

Solubility of the antimicrobial in the formulation controls where the antimicrobial resides in the finished part, says Robitaille. For example, if the antimicrobial is highly soluble in the plasticiser, it will reside in and migrate with it. Water solubility of the antimicrobial is also important in certain applications.

Solubility issues

Lonza's Vanquish SL10 Antimicrobial, a 1:1 blend of Zinc Omadine Antimicrobial (the company's trade name for ZnP) and Vanquish 100 Antimicrobial (BBIT), provides a "dual solubility profile," Robitaille says. ZnP has low solubility in the plasticiser, so while some migrates with the plasticiser, most remains in the polymer, contributing to a longer lasting effect. BBIT, however, has higher water solubility than ZnP, which acts to control the higher bio-burden typically found in the early phase of a final product's useful life.

When making any change, Lonza's specialists recommend that the entire formula should be consid-

King Plastic is aiming for a clean sheet

King Plastic Corporation, a US-based producer of polymer sheet and shapes, announced an exclusive license with Gelest in 2015 to use the Biosafe antimicrobial in polyolefin sheet stock.

King Plastic plans to make a growing number of its brands available with the King 'Microshield protected with Biosafe' technology and is targeting use in sheet for walls, shelving, doors and other applications in healthcare facilities, commercial laboratories, veterinary facilities and food processing companies.

The Biosafe antimicrobial's active ingredient is a condensed silane quaternary ammonium salt that is compounded into the plastic and does not leach out. "The antimicrobial additive is bonded at the molecular level at the very beginning of our proprietary K-Stran production process, keeping it from ever leaching out of the product," says Michael Fabbri, National Sales Manager for King Plastic.

"This permanently protects the polymer sheet, which means the antimicrobial agent retains its effectiveness throughout the life of the product. When customers fabricate and install our products, the fresh surfaces they create are fully antimicrobial. If heavy abrasion occurs during end use, the antimicrobial additive will never lose its efficacy, unlike antimicrobial surface coatings," he says.

www.biosafe.com
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King Plastics is targeting clinical work areas and other sensitive applications with its Microshield sheet products

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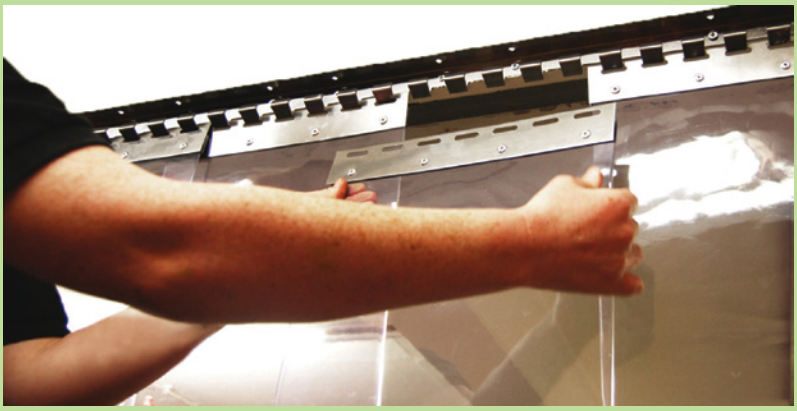
Stripping out cross contamination

UK-based Strip Curtains Direct is using a PVC compound from Vinyl Compounds containing an ionic silver-based antimicrobial masterbatch by antimicrobial brand SteriTouch for applications in the food processing and cleanroom sectors.

Strip curtains are widely used in cold stores and chillers for temperature regulation in high traffic areas, but can also provide a vector for cross contamination. Huw Durban, Director of SteriTouch says: "The development of the masterbatch for the strip curtains had to take into account that the curtains are manufactured from a transparent PVC compound, which needs to remain transparent if the curtains are exposed to UV light. Antimicrobials can occasionally cause discolouration in PVC, so a stabiliser system is used which doesn't affect clarity or, importantly, the antimicrobial performance."



Strip curtains are a potential source of contamination, says UK-firm Strip Curtains Direct, which is using an antimicrobial PVC from Vinyl Compounds

Independent testing of the antimicrobial demonstrated efficacy of 99.9% against E.Coli and MRSA. SteriTouch also recently received excellent test results against Campylobacter, which is important with the recent focus in the food industry on the prevalence of bacterial infection in poultry processing.

www.steritouch.com

ered. The company's researchers have been studying the impact of changing carriers and solvents on biocide behavior, says Jim Loricchio, global marketing director at the company. Plasticisers can impact microbial growth, which needs to be considered in formulations. There is also a trend towards switching to non-phthalate plasticisers such as DOTP or DINCH.

When switching from OBPA to DCOIT, for example, the chlorine molecule can affect stability and colour, making stabilisation critical. "We have identified the stabilisers that work best; they are not reactive in the formula and they prevent colour formation," says Goldoni at Valtris.

In addition to checking colour and stability, formulations should be checked for microbial activity in the laboratory. Key tests include the ASTM pink stain test (G-21) and the longer-term soil burial test, in which the formulation is buried for at least 60 days, notes Goldoni. Valtris also performs weathering tests, which typically involve six weeks in an accelerated tester, although outdoor real-time weathering can also be tested.

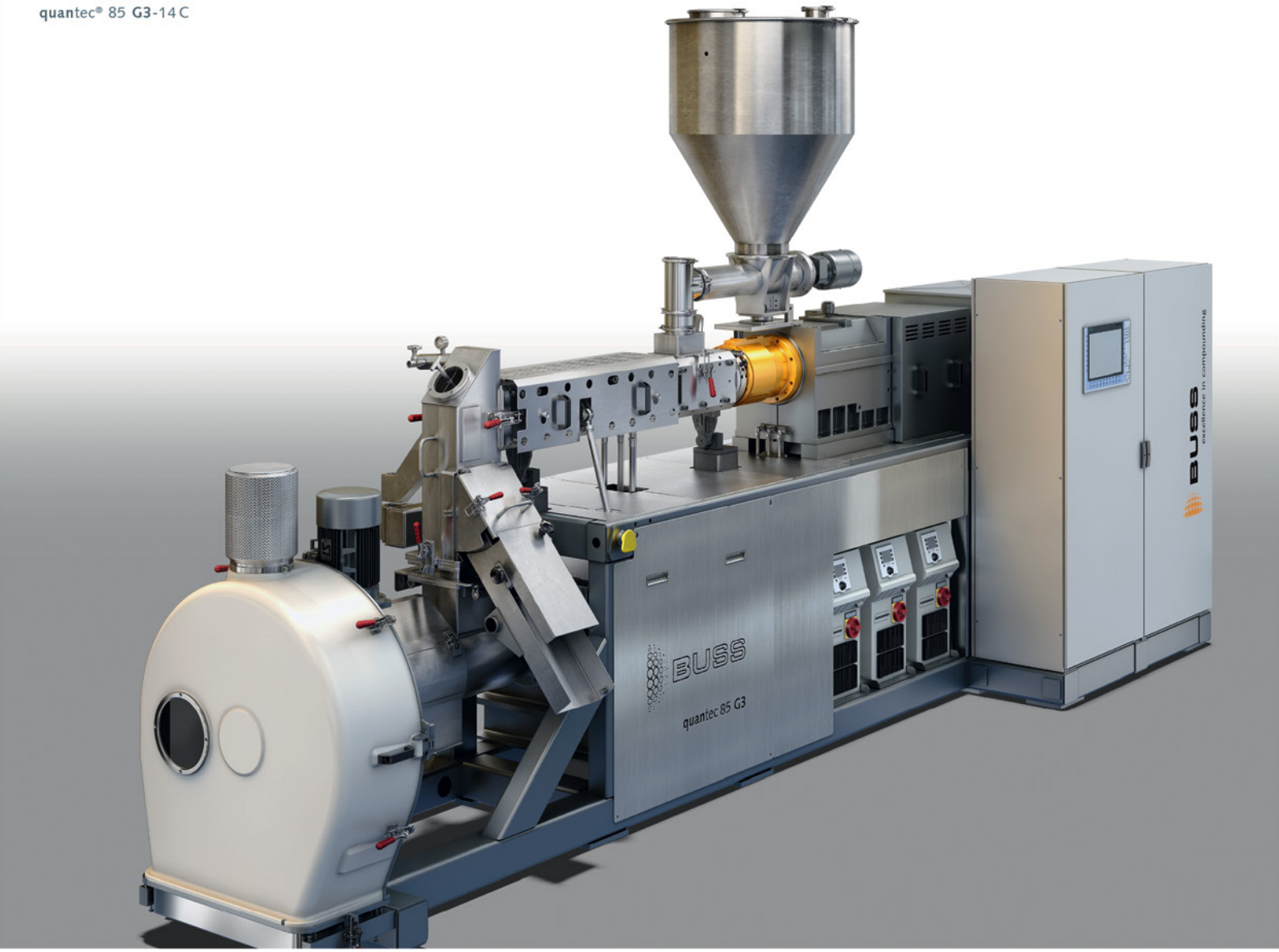
Testing developments

A common test used to demonstrate antimicrobial activity against bacterial growth in PVC and other plastics is ASTM's E1428 test for pink stain. Because this is a bacterial challenge rather than a fungal challenge, it can be a hurdle for most isothiazolinones, which are primarily effective against fungi. Because the current E1428 method is primarily designed for flat sheets, a new method is under development for testing three-dimensional porous substrates such as open cell polyurethane foams for pink staining, says Maria Prioli, Global Marketing Manager at Lonza (and also technical contact for the ASTM project WK48611).

Key differences from the existing test include changes to the inoculum preparation to stimulate Streptomyces growth prior to inoculation and the use of a slurry vehicle, which better coats

Turkish expanded foam packaging producer Erze Ambalaj has developed an antimicrobial tray together with antimicrobial technology provider Parx Plastics that offers performance, measured according to ISO 22196, of 92.5% against Listeria, 96% against Salmonella and up to 96.5% against Staphylococcus Aureus. The Parx technology is said to be based on bio-mimicry rather than biocides, using trace elements to modify only the surface of the plastic parts. It claims the active element is compliant with European food regulations and does not migrate.

www.parxplastics.com



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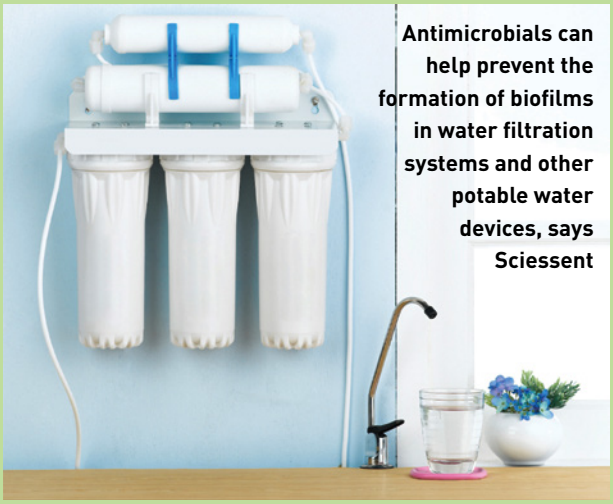
Potential in potable water systems

One of many potential applications for antimicrobial plastic compounds is in potable water systems, such as water filters or ice machines. *Compounding World* spoke with Jeff Trogolo, Chief Technology Officer of Sciessent (which produces Agion silver-based antimicrobials) about this application sector and its regulation.

CW: How are antimicrobials typically used in water systems?

Trogolo: In water systems, antimicrobials are used to inhibit the formation of biofilms, which are layers of bacteria that can form on plastic surfaces and are generally difficult to remove. Biofilms cause functional problems in a number of ways. In biofouling of a water filter, the biofilm can cover the filter media, which increases the pressure drop across the filter, making maintenance or replacement necessary. Some locations in a water system are more likely to form biofilms, which can then slough off and deposit downstream in locations that are harder to clean. An example is a water filter upstream from a beverage system. The carbon filter can seed bacteria that contaminate the small lines and valves of the system, which are difficult to clean.



Antimicrobials can help prevent the formation of biofilms in water filtration systems and other potable water devices, says Sciessent

CW: What are the requirements for antimicrobials in these applications?

Trogol: In the US, antimicrobials used in contact with drinking water must be registered for food and water contact with the EPA and cleared for use in food contact applications by the FDA. In the EU, products are approved by EFSA.

www.sciessent.com

uneven substrates with the inoculum. The end result is a much more reliable test, according to Prioli.

A new **Sanitized** product, PL 14-32, is said to offer effective and durable protection for PVC articles against mould, mildew, fungi and algae. It also exhibits good weathering stability and has no influence on initial colouring.

Recognising the importance of application testing in developing an antimicrobial solution, Sanitized recently opened a new technical center at its Burgdorf, Switzerland headquarters. "Application tests for product optimisation and product development that are usually carried out in the customer`s production facilities, requiring a major expenditure in terms of machinery, time and energy, can be performed on a laboratory scale in the Sanitized TecCenter," says Christine Niklas, Product Manager at Sanitized.

Resinex is to distribute the Sanafor range of antimicrobial masterbatches from Jansenn PMP across Europe. Primarily aimed at applications in the healthcare, textile and home and leisure markets, Sanafor masterbatches allow antimicrobial characteristics to be added to products at the processing stage and can be handled on conventional equipment.

www.resinex.com **www.sanafor.info**

Finding an optimal, cost-efficient alternative to OBPA depends on the application, according to Niklas. In addition to efficacy against various microbes, the thermal stability, water stability, and compatibility with other additives in the formulation are all of great importance.

Also this year, Troy opened a state-of-the-art Microbiology Center at its New Jersey, US, global headquarters. The company says the new laboratory is equipped to test preservatives in customer materials for efficacy using standard test methods from recognised institutions, such as ASTM, JIS, ISO, and AATCC.

Click on the links for more information:

www.troycorp.com
www.lanxess.com
www.valtris.com
www.lonza.com
www.riverdaleglobal.com
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AMI and Compounding World magazine are pleased to announce the Compounding World Asia 2016 conference, which will take place on 22-23 September 2016 at the Grand Copthorne Waterfront Hotel in Singapore.

The conference provides a vibrant meeting place for thermoplastics compounders from across Asia and beyond. It will build on the considerable success of the first Compounding World Asia conference, as well as the well established Compounding World Forum in the USA and the Compounding World Congress in Europe.

Selected by the editorial team of Compounding World magazine, the event's high-level program will explore and develop many of the magazine's most popular themes in a live event.

The conference will cover business strategies and new materials technologies, as well as providing practical advice on getting the most from compounding lines.

Its primary focus will be on the production of technical compounds based on engineering thermoplastics, thermoplastic elastomers and performance polyolefins for demanding applications in markets such as the automotive, electrical/electronic, medical and industrial sectors.

Dedicated sessions will focus on the latest additives and formulations for adding value and new functionality to thermoplastics. In addition, there will be analysis of key market trends in the compounding industry, plus discussions on how to grow business in an increasingly competitive global arena. Experts will also cover new developments in processing technology and provide tips on how to optimize compounding operations.

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The table top package includes one exhibition space in the room where registration, all coffee breaks and the Cocktail Reception are held, as well as 1 delegate place.

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Gain a competitive advantage from the insight and information provided by the high-level conference program. Networking breaks will give you a chance to further develop your business contacts, while the focused exhibition will provide a chance to catch up on the latest developments from leading suppliers.

For companies wishing to register two or more delegates, group discounts may be available. Please contact the Conference Organiser for more details.

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2. **Discover new additive and materials technologies for adding value to compounds**
3. **Learn practical tips for getting the most from compounding lines**
4. **Gain insights into global industry trends, successful business strategies, and growth opportunities in Asia's most dynamic markets**
5. **Network with other professionals from the plastics compounding supply chain**

Turn page for booking details ➤

COMPOUNDING WORLD ASIA 2016

Thursday 22nd September 2016

09.00 Registration and welcome coffee
10.00 Opening announcements

SESSION 1 - EXPLORING MARKET OPPORTUNITIES AND STRATEGIES FOR SUCCESS

10.10 **Analyzing trends in the global plastics market and the growing importance Asia's compounding industry**
Mr. John Nash, Head of Strategic Research,
AMI CONSULTING, United Kingdom

10.40 **PANEL DISCUSSION: Exploring opportunities and strategies for growing a profitable compounding business in Asia**

Mr. Derek R. Bristow, Senior Vice President and General Manager, Asia Pacific,
A. SCHULMAN Inc., Hong Kong

More panellists to be announced

11.40-12.10 Morning coffee sponsored by: coperion confidence through partnership

SESSION 2 - SEEKING STABILITY – THE LATEST ADVANCES IN STABILIZATION

12.10 **Inherently dissipative polymers (IDP) in plastics for static control applications**
Mr. Jukka Hillberg, CTO,
IonPhasE OY, Finland

12.40 **Mineral fillers for increasing the thermal conductivity of plastic materials**
Mr. Péter Sebö, Market Development Manager,
QUARZWERKE GmbH, Germany

13.10 **A new methodology for the systematic assessment of flame retardants**
Dr. Daisy Li, Technical Manager,
ICL, China

13.40-15.00 Lunch

SESSION 3 - DEVELOPING COMPOUND FORMULATIONS FOR NEW MARKETS AND APPLICATIONS

15.00 **New high-temperature compound materials for molded interconnect devices (MIDs)**
Dr. Oliver Frey, Head of Compounding Department,
ENSINGER GmbH, Germany

15.30 **Developing high-performance compounds and alloys for automotive applications**
Dr. Rajeev Basargekar, Technical Director,
APPL INDUSTRIES LIMITED, India

16.00 **Using BioPBS to improve the service temperature and impact strength of bioplastics compounds**
Mr. Ryuichiro Sugimoto, President,
PTT MCC BIOCHEM, Thailand

16.30-17.00 Afternoon tea sponsored by: SONGWON

SESSION 4 - OPTIMIZING THE FORMULATION AND PRODUCTION OF REINFORCED COMPOUNDS

17.00 **Unlocking the potential of natural fiber reinforcement for compounders**
Mr. Jeremy Warnes, Business Development Manager,
SCION, New Zealand

17.30 **Analyzing the effect of different fiber loadings in carbon-fiber-reinforced polypropylene compounds**
Mr. Philip F. Chu, Lead Chemist,
ZOLTEK/TORAY, United States

18.00 **Producing medium-length-fiber-reinforced polypropylene (MLFR-PP) compounds for automotive parts, including process, benefits and drivers for change**
Mr. P B Raman, Advisor,
STEER ENGINEERING Pvt. Ltd., India

18:30-20.00 Networking Cocktail Reception

Friday 23rd September 2016

09.00 Registration and welcome coffee
09.30 Opening announcements

SESSION 5 - SEEKING STABILITY – THE LATEST ADVANCES IN STABILIZATION

09.40 **Light stabilization of automotive compounds**
Mr. Gregor Huber, Global Competence Centers – Head Automotive,
BASF SWITZERLAND, Switzerland

10.10 **High performance stabilization systems for selected polyolefin applications**
Dr. Baburaj S. Iyer, Regional Technical Service – India & SEA,
SONGWON SPECIALTY CHEMICALS – INDIA Pvt. Ltd., India

SESSION 6 - SPECIFYING AND OPTIMIZING COMPOUNDING LINES

10.40 **More torque or more volume? Which is more important for compounding?**
Dr.-Ing. Thomas Winkelmann, Head of Department Plastics Technology,
KRAUSSMAFFEI BERSTORFF, Germany

11.10-11.40 Morning coffee

11.40 **Sustainable material handling solutions for a modern compounding process**
Mr. Michele Fona, Sales Area Manager,
PENTA S.r.l., Italy

12.10 **Specifying twin-screw compounding extruders – how to identify the right machine for the job**
Mr. Adam Dreiblatt, Director of Process Technology,
CPM CENTURY EXTRUSION, United States

12.40 **How to design highly flexible and efficient compounding lines for small lots and quick product changes**
Mr. Manfred Wiedmann, General Manager Business Unit Modular & Turnkey Systems,
COPERION GmbH, Germany

13.10-14.30 Lunch sponsored by: Penta A Piovan Company

14.30 **Comparing strand and underwater pelletizing technologies for optimized compounding lines**
Mr. Klaus G. Arlandt, Sales Manager Asia,
MAAG AUTOMATIK GmbH, Germany

SESSION 7- IMPROVING THE CONTROL AND MONITORING OF COMPOUNDING OPERATIONS

15.00 **Industry 4.0 for PP-large scale compounding - an example of an inline MFI closed-loop control measurement**
Mr. Sven Wolf, Managing Director,
LEISTRIZ EXTRUSIONSTECHNIK GmbH, Germany

15.30 **New ways to inspect and improve plastic pellet quality, both on-line and off-line**
Mr. Holger Lieder, Sales Director,
SIKORA AG, Germany

16.00 Afternoon tea and conference ends

Conference lanyard sponsored by: STEER

iPad prize draw sponsored by: Leistritz

AMI reserves the right to alter the programme without notice. See the latest programme and confirmed speakers at: ***www.amiconferences.com***

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If more than one delegate please photocopy form

Title: _____ First name: _____

Surname: _____

Position: _____

Special dietary requirements: _____

Email: _____

Signature: _____ Date: _____

PAYMENT DETAILS

All payments to be made in USD

Please tick box and write amount:

❑ Early bird admission fee: *(Until 22nd July 2016)*	USD1320	_____
❑ Admission fee thereafter:	USD1450	_____
❑ Table top exhibition package (includes 1 delegate place)	USD2750	_____
	Total:	_____

METHOD OF PAYMENT

On receipt of this registration form your credit card will be debited. You will be sent an invoice in 7-14 working days.

❑ **Bank transfer quoting:** 'Applied Market Information Ltd. - Compounding World Asia 2016' to: National Westminster Bank Plc Thornbury Branch, 16 The Plain, Thornbury, Bristol BS99 5HD
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COMPOUNDING WORLD ASIA 2016

CONFERENCE INFORMATION

Date and location

22-23 September 2016
Grand Copthorne Waterfront Hotel
392 Havelock Road
Singapore, 169663
Tel: +65 6733 0880
Fax: +65 6737 8880

Registration fee

The registration fee includes attendance at all conference sessions, the Networking Cocktail Reception, lunch and refreshment breaks on all days and a set of conference proceedings.

- ***Early bird registration:*** Register before 22nd July 2016 for only USD1320. Thereafter the cost is USD450.
- ***Group rates:*** For companies wishing to register two or more delegates, group discounts are available. Please contact the Conference Organiser for more details. (Please note to qualify for the group discount delegates must be booked at the same time, otherwise additional delegates may be charged at full price.)

Compounding World Asia 2016 table top exhibition

A limited number of table top exhibition spaces are available in the registration area and coffee lounge directly outside the conference room. The table top exhibition fee is excellent value for money and **includes 1 delegate place**. Exhibitors may either use tables provided by the hotel or bring their own stand or display.

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- ***Networking Cocktail Reception:*** A cocktail reception will be held after a day of conference sessions on the first evening. All delegates are invited to attend and it will offer an excellent opportunity to meet speakers and other colleagues. The Networking Cocktail Reception will run approximately from 18:30 to 20:00 and is included in the delegate fee.

Hotel accommodation

Delegates are responsible for arranging their own hotel accommodation whilst attending the conference. However, AMI have reserved a limited number of rooms for delegates at the Grand Copthorne Waterfront Hotel, at the rate of S$250 (plus taxes) for a superior room and of S$280 (plus taxes) for a Deluxe room including breakfast and Wi-Fi.

To make a reservation, please contact Xavier Chua on
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Please state that you will be attending "AMI's Compounding World Asia 2016", and note that after the 19th August 2016 the above rates and conditions might not be available, so please book early.

Alternatively, download a copy of the hotel booking form from the website www.amiconferences.com

Cancellations

Full refunds, less a cancellation charge of USD300 will only be made on cancellations received prior to 19th August 2016. Thereafter we regret that no refunds can be made. Delegates may be substituted at any time. Please note that refunds will not be given on table top bookings, sponsorship packages or Conference Dinner places.

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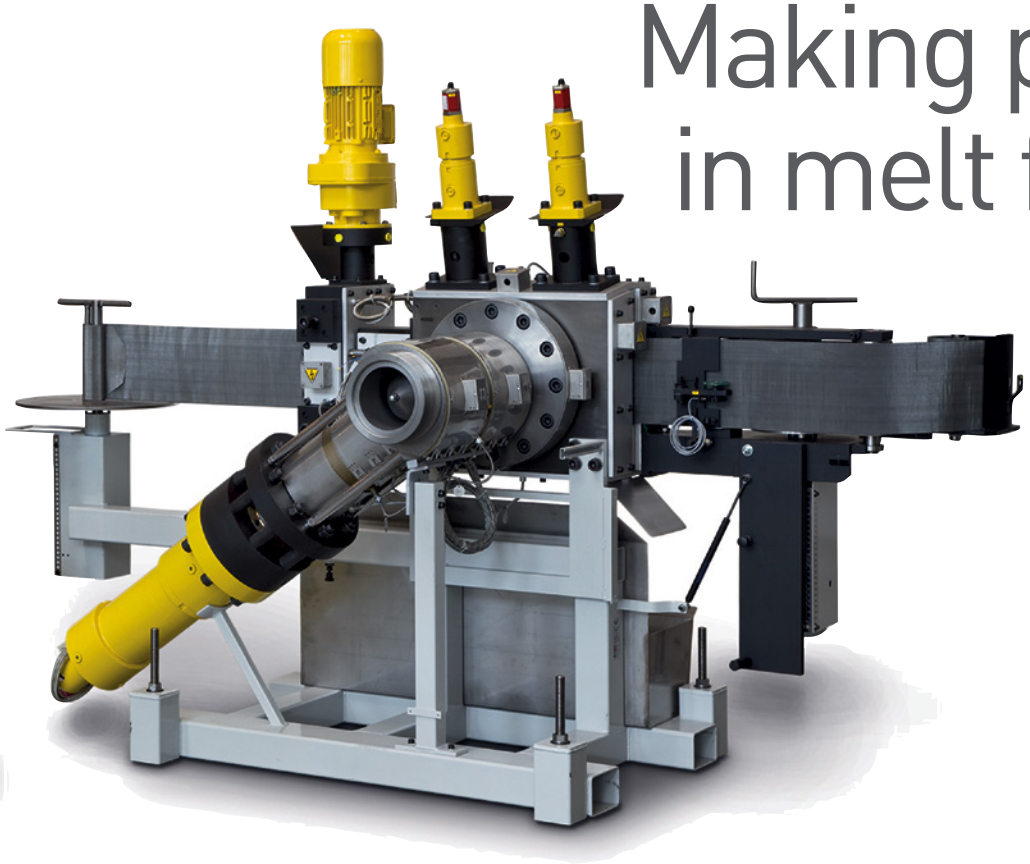
Developers of melt filtration systems continue to focus on improved performance and simpler operation, with much effort focused on challenging heavily contaminated applications such as processing of recycled material. **Peter Mapleston** finds out more

Making progress in melt filtration



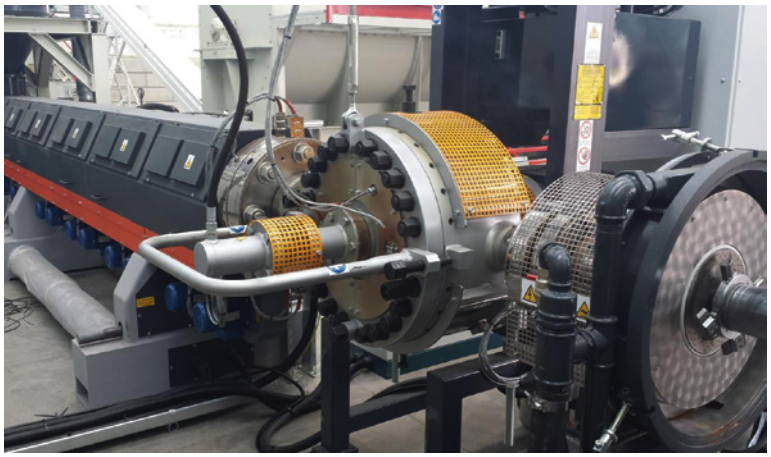
The latest developments in melt filtration and screen changers cover all areas of plastics compounding and processing. While much in the way of development activity has been focused on equipment that makes it possible to reprocess the most heavily contaminated post-consumer waste, there has also been improvement at the opposite end of the processing spectrum. This article takes a look at the latest innovations across the entire processing sector.

Production in Europe of pellets made from recycled polyethylene has reached more than 900,000 tonnes per year and, as quantities have risen, so has quality—to the point where recycled PE (rPE) is good enough for production of thin films. "Part of this success must be attributed to achievements made in the filtration of the PE melt during recycling," says Michael Heinzlreiten, Marketing Manager at NGR, part of the Austrian Next Generation Group that also includes **BritAS Filtration Systems**.

Even after end-of-life PE products are washed and ground into flakes prior to pelletization and reprocessing, the flakes still are considerably contaminated with dirt, dust and other particles, says Heinzlreiten. He adds that to profitably run a PE recycling operation, throughput needs to be higher than 1,000kg/h per production line. "Together with the quality aspects of filtration, high outputs and low operational costs make the task of creating a favourable rPE melt even more challenging," he explains, even taking 24/7 operation of a well automated system into account with the subsequent moderate involvement of operation personnel.

The BritAS Automatic Band Melt Filter provides a high quality melt under the toughest production conditions and in low cost operations, Heinzlreiten claims. There are now more than 170 such filters installed in Europe, allowing the company to claim a "substantial" market share. A number of upcoming innovations on the filter, to be unveiled at K 2016 in

Main image: Austria's BritAS says it will unveil a number of improvements to its Automatic Band Melt Filter at K to further improve operation in recycled PE applications



Above: Fimic continues to develop its melt filtration products, with laser drilled screen the latest additions to the option list

Düsseldorf in October, will make the system even easier to operate, allow for continuous operation and lower the required energy-consumption, he says.

Italian company **Fimic** says it recently installed an RAS500 unit, with a filtering area of 1,912 cm², for processing of washed and unwashed post-consumer LDPE and HDPE at a company in Portugal. It filters the product at 150 microns. "Although the material was initially sorted, this process wasn't particularly accurate," says Sales Director Erica Canaia. As a consequence, contamination—mostly paper labels—was quite high.

During the installation process the customer took the opportunity to test its worst feedstock materials, which it said could not be processed with a manual screen changer. Requirements for the filter in this case included the ability to handle a wide range of melt indices in the materials and also to filter out several different types of contamination (steel, glass, sand, paper board, paper, and other un-melted plastic). "Fimic is by far the best choice for a machine able to adapt to all the different conditions," Canaia claims.

Right: Image showing the high levels of contamination in the discharge from a Fimic recycling application running LDPE

The first material tested during the installation, an unwashed LDPE, was processed working in continuous mode with a 150-micron screen. The scraper was set to turn continuously, but the discharge valve was closed to avoid material waste and opened after a pre-set time to discharge the collected contamination with a minimum percentage of plastic (the image right shows the level of contamination captured in the discharge). The filtered material was then used to make blown film with satisfactory results.

The next day, again using the 150-micron screen, the company switched to an HDPE feedstock. Because of the very low MFI—just 0.3 g/10 min—the speed of the scraper was set to maximum and the period the valve stayed open was increased. "Two complete shifts with HDPE with high level of moisture, because of the rain that had been pouring for the whole week, caused no damage on the 150-micron screen, although the material had a very high level of sand (evaluated around 10%)," Canaia says.

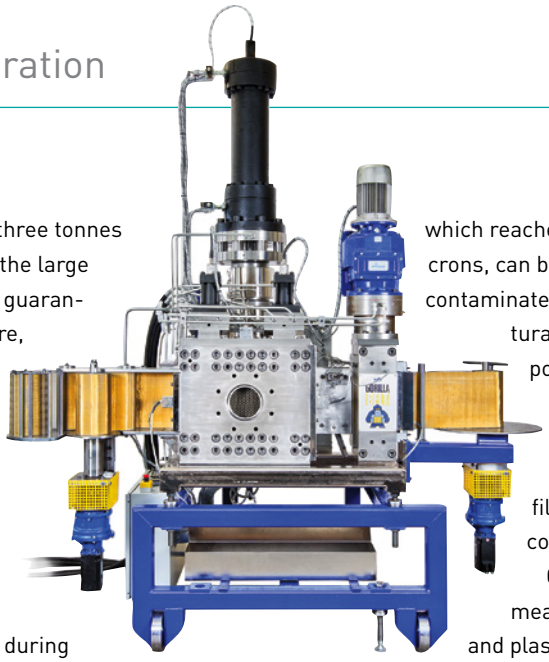
On the third day, the customer decided to process an LDPE feedstock again. The wash line had not been operating for the three previous days and, even though the level of paper, wood and copper in the waste was higher, the level of pressure remained consistent at 140 bars, discharging every six minutes for four seconds. "We can confirm that the filter successfully passed the extreme filtration challenges it faced," Canaia claims.

Laser drilled options

Fimic says it continues to improve and refine its new generation of self-cleaning melt filters. Most recently, it added laser-drilled screens to complement its established range of punched stainless steel types. Laser technology allows the formation of smaller holes on a thicker screen, "so that there is the correct balance between level of filtration, hole diameter, strength of the screens and open area," says Canaia. The finest filtration that Fimic can now supply is 100-micron (140 mesh).

The laser-drilled screens are also easier and more forgiving to clean. "The thickness of the sheet gives the possibility of burning the screens in a pyrolytic oven a number of times and reuse them," she notes.

Fimic supplies filters with diameters from 325mm to



Right: Cofit claims its Gorilla Belt systems cope well with even the most heavily contaminated material streams

700mm for line outputs up to three tonnes an hour or more. Canaia says the large filtering area of its equipment guarantees a lower operating pressure, resulting not only in reduced power consumption but also in less wear on the extruder screw and barrel. The range of melt flow indices the Fimic filters can deal with is also very wide – anywhere from 0.01 to 200 g/10 min.

Fimic filters are kept clean during operation with a scraper located inside the filter body. As contamination progressively blocks the perforations, the pressure build up inside the filter is monitored by a control probe that sends a scraper activation signal to the unit's PLC controller. The scraper is driven by a shaft and has two steel blades that collect the dirt lying on the sheet and convey it to the discharge.

Cofit International is another Italian company aiming an automatic screen changer at compounders working with recycled materials. It says its Gorilla Belt, which reaches a filtration level to 80-microns, can be employed for filtering highly contaminated materials such as agricultural and building films and other post-consumer materials. "Even with the most contaminated materials, Gorilla Belt screen changer ensures several filtering screen changes," the company says.

Cofit claims that its design means that only the dirt, impurities and plastic sticking to the filtering screen surface are discarded, so overall process waste is minimised. The equipment can work with any kind of contamination, offering maximum output of 3,000 kg/h. Each 50m screen roll provides 125 screen changes and rolls butt weld together without interrupting or slowing down the extruder speed, says Cofit president and sales director, Alessandro Fabbri. Screen roll replacement is said to take about 10 minutes.

In terms of control, Fabbri says the company has recently developed an app for handheld devices running iOS and Android systems that enables easy configura-

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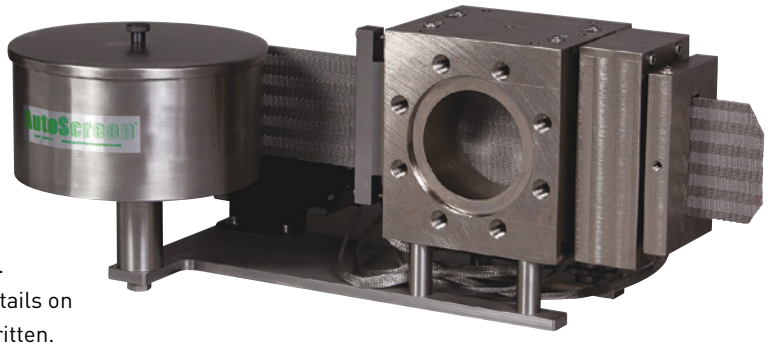


Right: The Melt Filtration Products AutoScreen units combine modern technologies with a 50-year pedigree

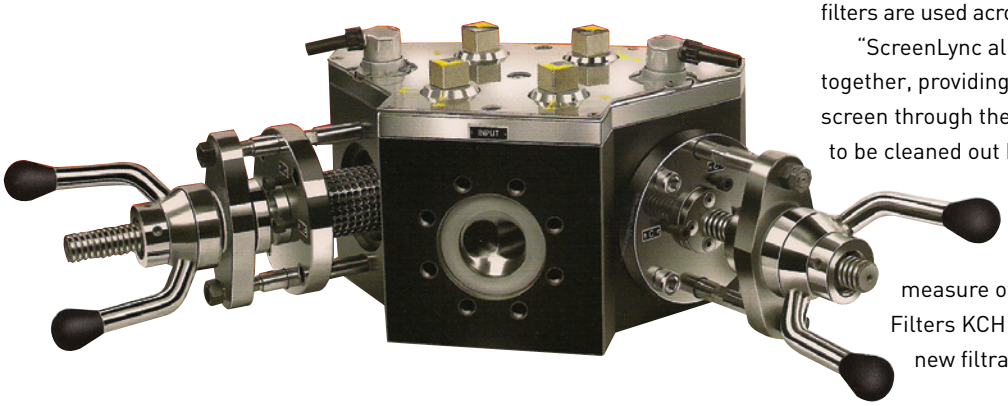
tion of all parameters, as well as remote operation monitoring. "Thanks to this tool it is very easy to be always updated about what is going on at your production line," he says. Cofit has also developed a new breaker system, with a design that allows higher output and longer screen change intervals due to an improved full/empty ratio. However, Fabbri declined to provide more details on the technology at the time this article was written.

Evolving story

The AutoScreen screen changer by US-based **Melt Filtration Products** may be able to trace its origins back to the original developed in the UK some 50 years ago by Peter Kalman at Process Development, but it continues to evolve. "We have taken that original design and added features that have improved the control of the pressure, temperature and screen movement," says Melt Filtration's Bob Phillips. The company's Auto-Screen and AutoScreen MAX now have the ability to control screen movement by time, pressure or pressure differential.

Process Developments passed on the manufacturing know-how and the AutoScreen trade name to Melt Filtration Products in 2008. It initially worked with Cofit to manufacture the unit, later bringing all the design and manufacturing over to the US. "We have continued to work with Kalman to improve the unit and add PLC control that insures that all the operational requirements are met," Phillips says.

Extrusion Pressure Control (EPC) uses feedback from pressure transducers to automatically maintain a selected melt pressure delta. "This allows the compounder to extrude within a tight pressure range with no deviations due to changes in material bulk densities," Phillips says. The AutoScreen automatically introduces fresh filter screen when it is required for maintaining consistent extrusion pressures. The company continues to add new features, such as a "low filter ribbon" warning indicator, intended to make operation simpler and safer.



Below: The Rajhans RJSC unit can be supplied in manual and automatic screen pack change versions

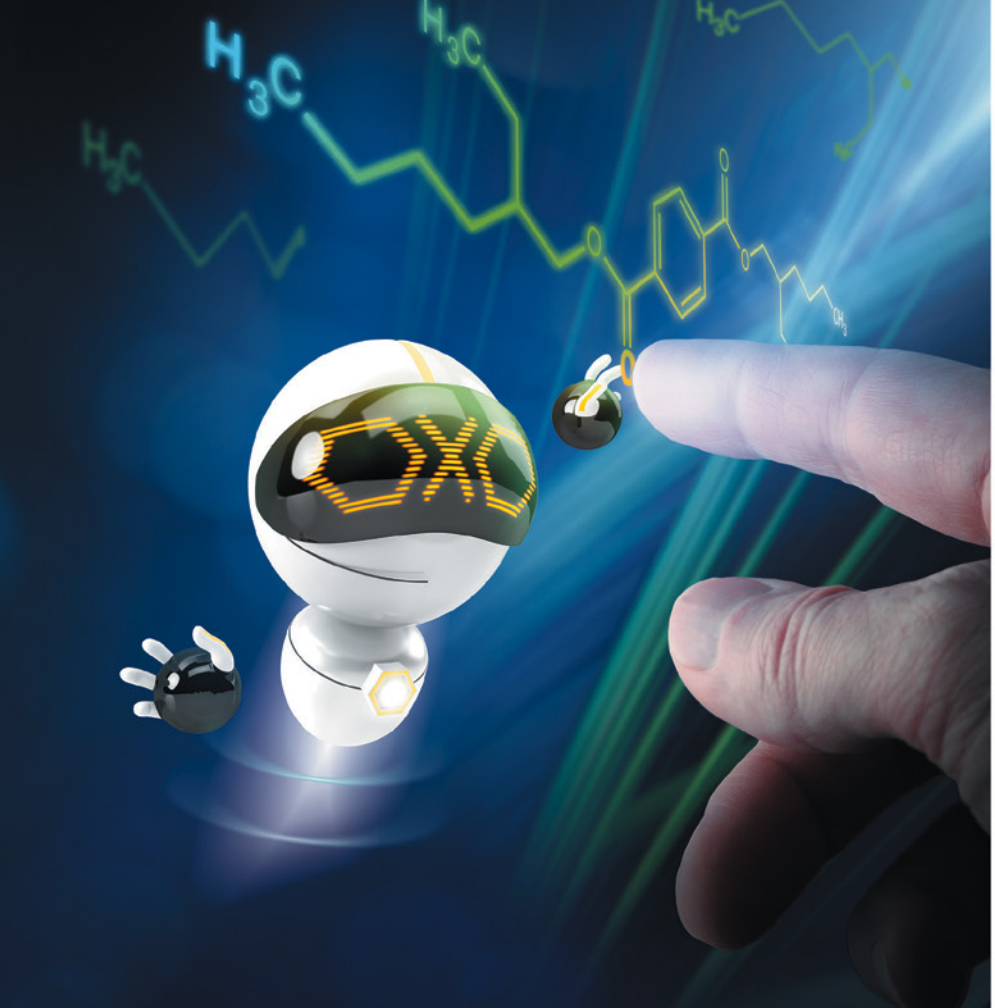
Indian equipment producer **Rajhans Plastic Machinery** supplies a wide range of screen changers, primarily for domestic consumption but also to overseas markets. In the US, Rajhans equipment is sold by **Process Filtration Products**, which highlights the PolyFilter RJ "continuous filtration/flow" line in particular. This comprises the RJC and RJSC series. The RJC screen changer requires a manual change of the dual screen packs, while the RJSC incorporates back flushing. Process Filtration Products also offers Rajhans' "dual bolt" screen changers.

Optimised screens

Process Filtration Products was formed by Bob Vogel, who was earlier involved with Melt Filtration Products. "Filter screens support is also extremely critical," he says. "In those instances where our customers have an established relationship with a vendor, we will provide our input and expertise to optimise the filtration process. We also recognise that many applications require a special or non-standard weave for successful filtration and operation; to address those needs we have established relationships with selected screen manufacturers."

Parkinson Technologies has introduced what it claims is a first-of-its kind feature to its Key Filters brand that will lend added safety and efficiency to continuous belt screen changer operation. Called ScreenLync, the function enables the operator to hook up a new full RDW (Reverse Dutch Weave) roll to the end of the depleted RDW roll in less time than currently required, thereby reducing operational downtime. High tensile RDW steel filters are used across the Key Filters range.

"ScreenLync allows an operator to link two screens together, providing a fast and easy way to feed the screen through the machine because it no longer needs to be cleaned out before the new screen is installed," says Parkinson Technologies Marketing Manager Brian Lundgren. ScreenLync also provides a measure of added safety when used in the Key Filters KCH model, he adds. Since it enables the new filtration screen to be pulled directly



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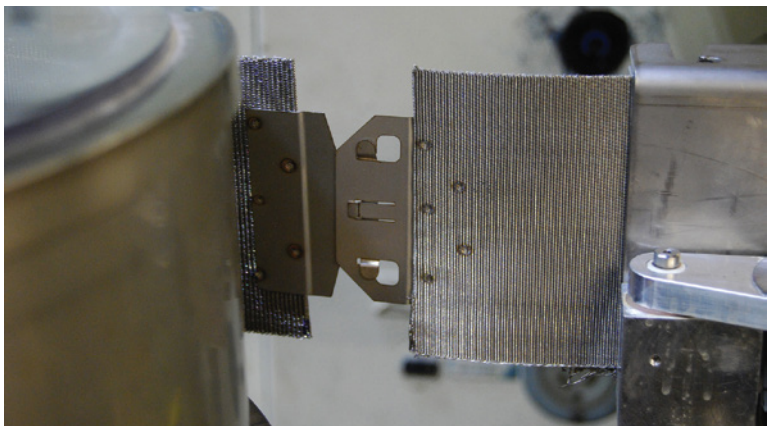

Above: Parkinson Technologies' ScreenLync simplifies screen replacement and makes for a safer and faster change

through the chamber, the operator is able to avoid contact with this high-heat area of the machine, thereby minimising their handling of the screen roll.

Germany's **Gneuss** points to several innovative new developments in the range of rotary filtration systems that it has introduced over the past couple of years, all of which it says are now successfully in operation in a variety of applications. With its fully automatic, process constant operation and its novel segmental back flushing system, the RSFgenius is said to offer un-matched performance with regard to product quality and efficiency.

The latest variant of this design – RSFgenius M – is available now for processing of highly contaminated materials and several of these units are said to be running successfully in Europe. "Synchronisation of the drive and back flushing systems of the RSFgenius enables a significant increase of the screen area exchange rate and represents a further optimisation of this back flushing system," says a Gneuss representative.

The Rotary Filter KF, meanwhile, is a very rugged and compact discontinuous screen changer, especially suited for fast colour changes. Gneuss says examples are successfully operating in various compounding and PE applications.

The PVC challenge

The SFpvc is the latest Gneuss screen changer for the PVC processing sector and was specifically designed for recycling of highly contaminated materials. Gneuss says this is perhaps "the most challenging application for an already challenging material." The SFpvc unit is characterised by its adaptability to exactly match the

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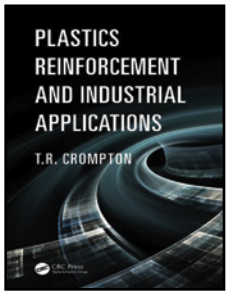

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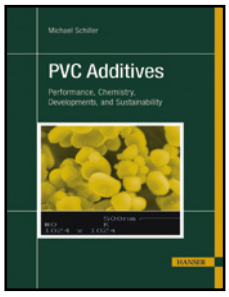

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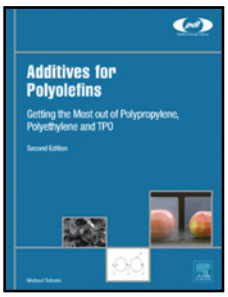

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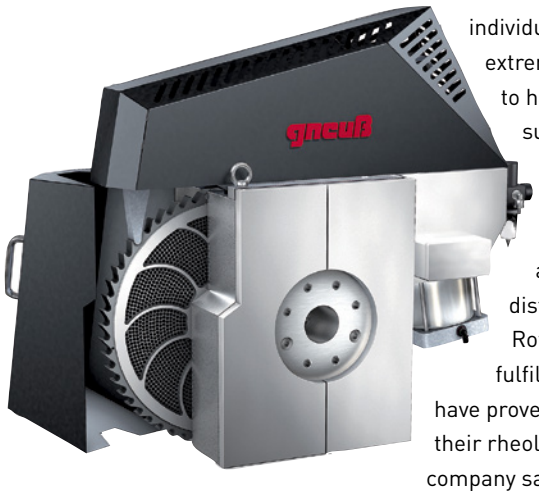

Above: The Rotary Melt Filtration System SFpvc 175 by Gneuss is designed for highly contaminated PVC recycling

individual extruder and by its extremely robust drive system to handle contamination surges.

Gneuss says it is especially important when processing PVC to avoid interruptions and disturbances of any kind. "SF Rotary Filtration Systems fulfil these requirements and have proven themselves through their rheological advantages," the company says. More than 200 systems have been supplied worldwide for these applications. Melt viscosity is held constant independently of the contamination level and a notable design feature is that the shape of the active filter area is tailored to the geometry of the twin screw extruder.

In Switzerland, **Berhalter** highlights its Becoscreen model, which the company targets at high-end applications such as BOPP and PET film extrusion. "With its ease of use, high energy efficiency and the solid construction, the Becoscreen works absolutely maintenance-free, leak-free and is used for almost all polymers," the company claims.

Global dispensing engineering group **Nordson**, which produces melt filtration systems and screen changers under the Kreyenborg and Xaloy brands within its Nordson Polymer Processing Systems business unit, says it is in advanced preparation of what it claims will be a very unusual new screen changer. The company says the new design will be introduced at K 2016 this October so declined to provide further information.

Click on the links for more information:

- **www.britas.de**
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- **www.cofit.com**
- **www.meltfiltrationproducts.com**
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Looking ahead to the first Smart Packaging conference

AMI is set to stage Smart Packaging 2016, a new international conference that will focus on the latest technological developments aimed at adding value and functionality to flexible and rigid packaging. The event will take place on 20-21 September in Cologne, Germany.

It will bring together brand owners, retailers, packaging producers, plastics and additive suppliers, active and intelligent technology developers, and processing machinery experts to explore the full range of available and emerging technologies. The event will provide the ideal environment in which to explore the packaging needs and expectations of brand owners and consumers, as well as the challenges of implementing active and intelligent technologies within existing supply chains.

Here we preview the event with a closer look at the line up of expert speakers focusing on different areas of smart packaging.

Evolving consumer needs and markets

'The Customer is always right' is a time-honoured phase which still holds true in today's world. Smart Packaging's opening session will focus on understanding consumer trends. **Dr. Benjamin Punchard,** global packaging insights director from market research firm **Mintel** will start proceedings by providing a global view of consumer trends and implications for FMCG packaging innovations. **Dr. Cormac Neeson,** director of external affairs at leading food and drink company **Crown Packaging** will then give an insightful overview of smart packaging trends.

A range of regulations, such as REACH, biocides restrictions and food contact legislation, can impact on the specification and use of smart packaging technologies. **Dr. Anna Gergely** of global law firm **Steptoe & Johnson** is an expert in these areas and will explain the key issues that you need to be aware of.

Retail and brand owner perspectives

The next session will focus on how smart packaging is

We preview the first Smart Packaging conference which will take place in Cologne in September

Main image: The Smart Packaging conference will examine how customer needs are evolving

playing an important role in customer satisfaction.

AMI has secured a presentation from **Tesco,** one of the world's largest retail organisations, which will focus on the opportunities and pitfalls of using smart packaging to catch the attention of customers. Tesco's **Paul Earnshaw** will share his valuable experience in a packaging environment, which has taken in stints with major FMCG brands including Boots and Coty.

The next talk will be given by **Tom Lawrie-Fussey** who is technology business development leader at **Cambridge Design Partnership.** His presentation will focus specifically on how smart/connected packaging capabilities can enhance the user experience at all packaging price-points.

Concluding this session, **Guido Schmitz,** director of packaging design at **Bayer Healthcare,** will discuss holistic design and what smart packaging means to Bayer, Germany's multinational chemical and pharmaceutical company. Mr. Schmitz has over 35 years' international experience in the consumer healthcare industry specializing in packaging, branding, design, and process technology innovation

Smart packaging journeys

Innovation and change is important in any line of business. The conference's third session will provide an opportunity for delegates to find out about latest technological trends and discuss case-studies where developments and application have aided progress in the world of smart packaging.

Professor Edward Kosior is managing director at **Nextel**, a technical consultancy which designs and tests new facilities, and also conducts process evaluations to optimise performance in the packaging sector. He will explain how the application of intelligent labels and invisible smart market technology can increase recycling rates of waste packaging.

Recycling and plastics are currently hot topics and **Will Mercer,** group research & development Director at leading polymer extruder/moulder **Coveris** will give a converter case study with the tile "Enhanced freshness and reducing waste from field to fork".

Veronica Cornini from **Coopbox Group**'s R&D department will wrap up the session with another case study on how antimicrobial rigid packaging solutions can help to keep packaged meat as fresh as possible.

Below: Smart packaging for the pharma market will be discussed by Guido Schmitz, director of packaging design at Bayer Healthcare

Overcoming obstacles to adoption

Change is usually a good thing but most ideas face opposition from the outset. The final session of the first day is built around a panel discussion whereby packaging experts will discuss and debate how best to overcome obstacles to adoption.

Panel members will include **Assia Ouchchen**, R&D manager at barrier sheet extrusion specialist Cobelplast**.** Her background has given her a comprehensive understanding of the development and consumer factors that influence market trends and dynamics.

Prabhat Mishra, who is senior associate principal at **Mondelez International**, will bring to the panel a wealth of knowledge in the world of packaging from ideas to implementation concerning strategy, innovation and product development.

To round off the day's proceedings a cocktail reception will be held in the hotel where delegates and speakers can discuss the conference so far and network with industry peers.

Day two of the conference will start off by continuing the theme of overcoming obstacles to adoption. **Christopher Waterhouse**, managing director at UK based consultancy **iDi PAC**, will argue the case for adopting smart packaging in the pharmaceutical sector and present the associated opportunities and challenges.

Advances in smart packaging

Smart packaging is currently playing a vital role in enhancing the quality of packaging through extending shelf life, increasing product safety and reducing waste. Our next session will take a look at on-going innovations in this field.

Dr. Debbie Allen, product development manager at label manufacturer **Insignia Technologies**, will present on the latest developments in intelligent labels and the use and potential for smart inks and pigments in flexible packaging applications.

Functional coatings will be the subject of the next presentation, given by **Lorena Rodriguez** from the Spanish plastics technology centre **AIMPLAS** in Valencia. Her paper will describe how functional coatings can be used to enhance gas barrier and physico-mechanical properties for food packaging.

Such is the constant innovation and changes within the smart packaging industry, our discussions on advance in this sector will continue with another

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The use of antimicrobial additives in rigid packaging will be discussed by Veronica Cornini from Coopbox Group's R&D department

session focusing on improving anti-counterfeiting and supply change efficiency.

Dr. Alan McCelland from **The Centre For Process Innovation** will present his paper on how best to build the supply chain to commercialise smart packaging. **Professor Wim Deferme** from **Hasselt University's Institute For Materials Research** will present on how functional materials in smart packaging can be used to improve anti counterfeiting.

In a growing industry that is so linked to technological developments, **Stefan Đurdević** from the **University of Novi Sad** will explore the opportunities that augmented reality can provide for smart packaging solutions. He will be followed by **Barbara Operschall**, CEO of **Speechcode**, explaining how high-capacity printed data codes can be used to enable products to communicate with customers.

A smart and sustainable future

The final session of the conference will focus upon the challenge of making smart packaging sustainable, an area of great significance for the entire plastics industry. **Sven Sängerlaub**, business field manager in packaging at **Fraunhofer IVV** will discuss how recycling affects polypropylene blends containing iron-based oxygen scavengers.

He will be followed by **Roland Schultz,** the global director for marketing packaging at **Albis Plastic** who will discuss the "packaging challenge" – how to balance price, performance and recyclability with smart structure films. Closing the conference will be **Dr. Victor Peinado Canudo**, who is research projects manager at **AITIIP Technological Centre**. He will cover the development of biodegradable and multifunctional packages based on nanotechnology, looking at the improvement of structural and barrier properties, smart features and sustainability.

More information

Smart Packaging 2016 will take place on 20-21 September at the Maritim Hotel, Cologne, Germany. For information on participating in the event as a delegate, exhibitor or sponsor, please contact the conference organiser Emily Renshaw – email: er@amiplastics.com, tel: +44 117 314 8111. To download the conference brochure with full programme details plus a booking form, please visit: **http://bit.ly/Smart16B**

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PHOTO: BMW

Taking the heat under-the-hood

Looking to the future, improvements in automobile fuel efficiencies and further reductions in CO_2 emissions will come mostly through lightweighting and improvements to engine and drive train performance, including the introduction of electric motors. In all cases, plastics will play a major part. However, there is a lot of work to do to meet increasingly tough fuel economy standards.

In the US, fuel economy standards mandate fleet average CO_2 emissions for 2017 model year cars of 212 g/mile, equivalent to a fuel (petrol) consumption of just over 41 mpg (US) or 5.74 litres/100 km. The target figure for 2025 model year cars is 143 g/mile (61 mpg, 3.84 litre/100 km), a reduction of more than 30%. In Europe, legislation on carbon dioxide emissions translates to a fleet average target for 2015 of 120 g/km (petrol engines), equivalent to around 5.1 litre/100 km, and is to be reduced by more than 20% to 95 g/km (4.1 L/100 km) by 2020.

Given that some small cars already return figures close to the US 2025 target, getting there doesn't sound that difficult at first glance. But with many SUVs often achieving less than 30 mpg (7.8 litre/100 km), it really is. The challenge depends to a certain extent on whether the numbers in the sights are drawn from manufacturer test date or from real life on-the-road performance, but in either case, the improvements called for over the coming years are considerable.

Plastics will pay a key part in achieving the fuel efficiency goals of the car industry. **Peter Mapleston** looks at innovations for increasingly demanding under-hood applications

Lightening up

So what are plastic materials suppliers doing to make the road to the future easier to travel? "Lightweighting remains a key driver for the whole industry, to support the reduction of CO_2 emissions, and UTH (under-the-hood) engine applications are not immune to it," says **DuPont**'s Global Automotive Market Leader Patrick Cazuc. "DuPont supports several metal part replacement programs to turn to lighter weight thermoplastics solutions on engine

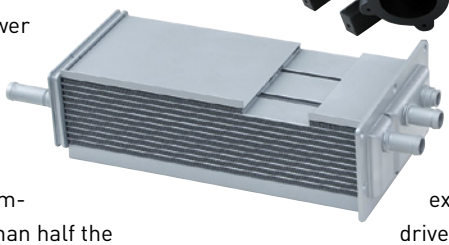
Main image: Space is becoming tighter under-the-hood and temperatures are rising, placing tough demands on plastics

PHOTO: MAHLE

Right: Polyamides are being used in charge air cooler applications to reduce weight

mounts, oil pans and transmission area."

Temperatures are rising in the engine compartment as engines pack more power into less space. This is driving the evolution of high temperature thermoplastics, especially in the polyamide family, Cazuc says. Turbocharging and supercharging are commonplace in today's smaller capacity high power output engines. Air intake manifolds are virtually all made in polyamides already and charged air coolers are going the same way. Oil sumps are now increasingly made in polyamides too - compared with metal versions they are less than half the weight and half the cost. Polyamides are also being used to reduce frictional torque in drive systems.



Targeting resistance

Developing under-the-hood polymers with high thermal resistance will continue to be a key target for DuPont (soon to become Dow following the planned merger of the Dow Performance Plastics, Performance Materials & Chemicals, Infrastructure Solutions and Consumer Solutions businesses with the DuPont Performance Materials segment) over the next five years, according to Cazuc. "We plan to continue broadening our PA range to respond to increasing temperatures and chemical resistance and tailor our offerings to the needs of the industry," he says.

To that end, DuPont will soon launch a new grade of PA - Zytel XT - that Cazuc says: "Will give us a continuum in the offerings we currently have from PA6, PA66 and PPA [polyphthalamide]. So our portfolio will include the traditional Zytel, Zytel XT, Zytel Plus and HTN." Zytel XT is a PA66-based product, which will be aimed at various air induction system applications. Cazuc says DuPont is also working on developing new offerings addressing the most severe combination of temperatures and chemical resistance required for EGR (Exhaust Gas Recirculation) applications.

Plastics also help to provide an improved driving experience. One of the things drivers of hybrid vehicles sometimes complain about is the whining sound that the petrol engine makes when it kicks in. The BMW i8 plug-in hybrid sports car features a resonator made of glass-fibre reinforced DuPont Zytel Plus 95G35 that is tuned to reduce the typical high-frequency air intake sound to a lower level. The resonator is installed between the air filter and turbo charger (located in the rear of the i8).

Below: Oil sumps produced in polyamide are much lighter than metal alternatives

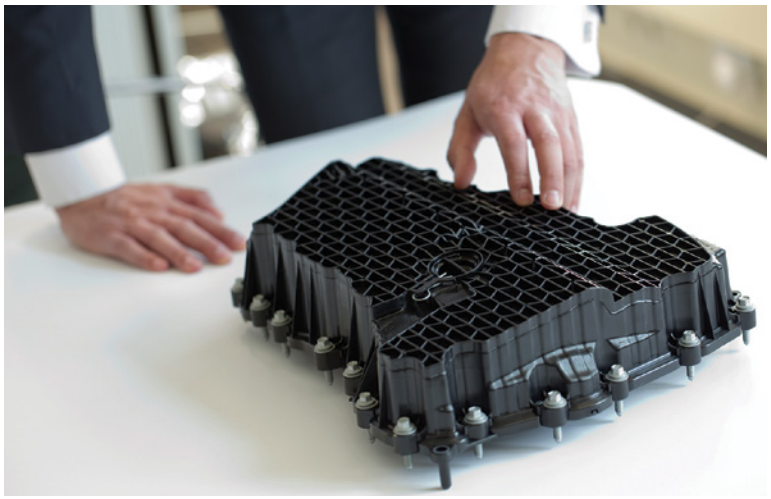


PHOTO: DSM

Stabilising technology

Zytel Plus is a high-performance family of polyamides that incorporate DuPont's Shield technology to provide improved long-term resistance to high temperatures and aggressive fluids typical of under-the-hood applications. DuPont says the resonator has a relatively large volume but, thanks to an optimised design and the use of the very stiff and strong grade of Zytel Plus, weighs just 1.5 kg. It was developed by BMW Group together with DuPont Performance Materials and component maker Mann+Hummel.

According to DuPont, Shield technology involves the combination of a new polymer backbone, polymer modifications, and a special set of additives. It is claimed to double or triple the service life of standard PA on exposure to hot environments and aggressive chemicals such as hot oil, automotive coolants and road salt. Zytel Plus 95G35 is the core product in the family and is aimed at cylinder head covers, exhaust mufflers and oil pans, as well as resonators. It shows no significant drop in its ability to withstand load even after 4,000 hours of testing at 180°C.

DSM tells a similar story with its Stanyl Diablo. Stanyl is a PA46 and Diablo is DSM's proprietary patented high temperature resistance technology (which it says it licenses to several un-named competitors). The company says that a hot charge air duct with an integrated resonator produced in the material now in use on a popular US-built SUV is saving 32% in weight over metal and 25% in cost, as well as providing better design freedom.

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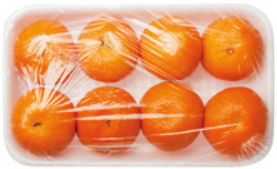

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Above: This resonator for the petrol engine on BMW's i8 hybrid is produced in Zytel Plus resin from DuPont

Lifting the limits

Ascend Performance Materials, whose portfolio is exclusively based on PA66, has made considerable progress in stretching the limits of the polymer, especially when it comes to engine compartment applications such as radiator end tanks and charge air cooler tanks. One of its latest offerings is Vydyne R530HR, a 30% glass fibre reinforced compound with improved resistance to ethylene glycol solutions at high temperatures. It is said to easily meet requirements for retention of mechanical properties after 3,000 hours at 120°C, for example.

"Polyamide 66 has higher tensile strength and chemical resistance than PA6 and, for applications where high temperature polymers like PA46 are possibly over-engineered, it provides a significantly better system cost," says Vikram Gopal, Ascend's Chief Technology Officer.

Lanxess says it is expanding its range of highly reinforced polyamides (and polyesters) for the design of extremely strong structural components. Its Durethan BKV 60 EF and XF PA6 series are being joined by Durethan AKV 60 XF, a PA66 with a glass fibre content of 60%. "The material exhibits excellent strength and stiffness," says Ralf Heinen, a plastics specialist at the company.

The new compound can be used as a substitute for metals in components under the hood. Potential applications include valve covers, transmission and engine oil pans, brackets and intake pipes. Engine mountings and coupling rods in the chassis area are also viable applications for the material.

Durethan AKV 60 XF's 13.3-GPa modulus of elasticity (conditioned, room temperature) is more than double that of Durethan AKV 30 H2.0, a PA66 with a glass fibre content of 30%. Heinen says this enables thin-walling, and hence weight-saving, without loss of mechanical performance. The new material also offers better chemical resistance than PA6 grades with the same glass content while its deflection temperature under 0.45 MPa load (ISO 75), at 250°C, is almost 40°C higher. Maximum long-term service temperature is 180°C, some 40 °C higher than for PA66 grades with a standard heat stabiliser.

Despite its high glass fibre reinforcement content, Durethan AKV 60 XF is said to exhibit the same flow as polyamide 66 with 35% glass. It can be injection moulded at the same temperatures but can often be demoulded earlier because of its good stiffness at high temperatures, the company claims.

Electricifying performance

Developments in electric cars and hybrids, as well as the general growth in the use of electronics in all types of road vehicles, are pushing development of materials, and especially polyamides, with particular electrical properties. **DuPont**'s Cazuc refers to them as electronic friendly or EF resins. Among other characteristics, these offer a zero or extremely low halogen content that reduces the risk of corrosion at interfaces with metal components.

Solvay Engineering Plastics announced at Chinaplas 2016 the introduction of a new Technyl range of polyamide 66 for automotive electronics. The company says the new family of unfilled and glass fibre reinforced and heat-stabilised engineering plastics feature a specified and controlled halogen content tailored to fit sensitive electrical and electronic automotive requirements.

"Uncompromising reliability of sensitive electrical and electronic applications, such as sensors, relays, bobbins, chargers and control units, is increasingly important to automotive manufacturers," says James Mitchell, Global Automotive Market Director. He says that in all these cases, customised Technyl grades for electronic applications are demonstrating very good retention of properties, including high chemical and hydrolysis resistance, even after long-term exposure to elevated temperatures, while at the same time enduring demanding mechanical loads.

"Continuing miniaturisation and engine downsizing in these application areas have created new challenges in terms of heat performance and electrolytic corrosion resistance," Mitchell adds.

The broader use of electronic components in automotive engineering has resulted in a stronger focus on the interaction of conductor paths and over-moulding materials used as carriers and electric insulators. Solvay says chemical additives such as commonly-used inorganic heat stabilisers tend to interact with metallic alloys on conductor paths and can reduce the isolation

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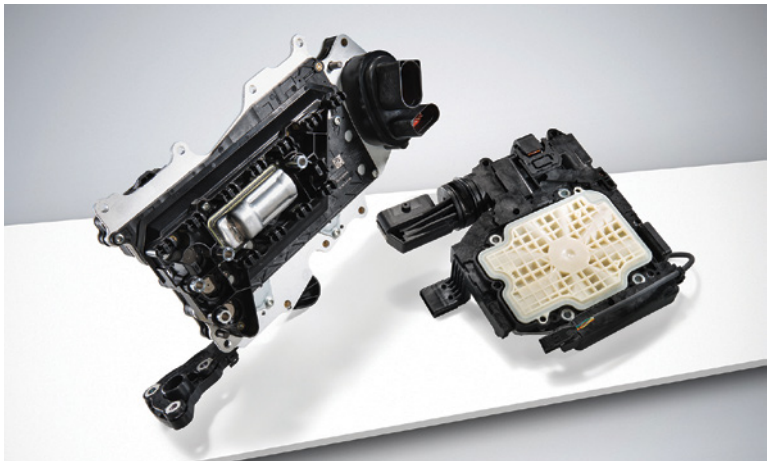
properties of the polymer, potentially causing electrolytic corrosion and subsequent malfunctions, notably in hot and humid Asian climates. "Due to specific additive systems, our new Technyl formulations can help reduce this risk with significant benefits over competing engineering thermoplastics and more expensive specialties," Mitchell says.

Safer circuitry

BASF has also developed a portfolio of various polyamide 6 and 66 grades that help prevent damage to circuits by electric corrosion, saying the grades are suitable for production of high reliability micro-electronics for sensitive automotive applications such as control units and sensors. The different Ultramid EQ grades (Electronic Quality) are said to be high purity, which BASF says means they have very little electrically-active or corrosion-generating content yet still offer good resistance to heat aging. The portfolio consists of uncoloured and black grades with glass fibre contents of 30% and 35%.

Right: This two-part waste gate actuator housing is moulded in Evonik's Vestamid HTplus. The components are laser welded

The company says that electronic assemblies in modern transmission control units or safety-related applications such as airbag and anti-lock systems are becoming ever more compact and complex and are often exposed to high ambient temperatures and aggressive media such as oil. The delicate circuits are also more frequently connected to semi-conductors by wire bonding. "In such surroundings, disruptive effects such as corrosion, ion migration, electrolyte formation, and creep currents can arise and in extreme cases cause entire assemblies to fail," BASF says. "Plastics for housings and components have to be equipped in such a way that they do not react with the metals involved and thus prevent electronic failure."



Below: BASF's EQ polyamides are formulated to minimise electric corrosion

All Ultramid EQ grades use an organic heat stabiliser with a low halogen content of less than 1 ppm. This prevents halogens like iodine or bromine from damaging metal wiring, ions from reacting with the metals, and undesired electric currents from arising. The new portfolio is also well-suited for use in electric and hybrid vehicles with elevated AC and DC voltages.

Evonik illustrates the performance capabilities of its Vestamid HTplus (a PPA based on PA6T) with the example of the housing for the latest waste gate actuator series from Hella. The actuators control the flow of gas inside the turbo charger and the components are used at a temperature of 160°C. The housing consists of a main body and a cover that are welded together using a laser. This is made possible due to the different material properties of the components; the cover is made from the specially developed laser-transparent Vestamid HTplus M1034 while the body is made from the laser-absorbing Vestamid HTplus M1634 grae. Laser welding has several advantages over the more commonly used ultrasonic welding – it carries no risk of damage to internal electronic components, offers a narrow heating zone, results in a high welding seam strength, and creates no welding spatter. Both housing components are reinforced with 40% glass fibre and, offer high rigidity, good dimensional stability, and very good chemical resistance.

Metal squeezed

DSM says ongoing innovations in its ForTii portfolio of materials, based on PPA produced from PA4T, will lead to further replacement of die-cast metal components under the hood and across other industries. The company says ForTii offers a "class-leading combination of processability and high mechanical performance over a wide temperature range." Until now, the ForTii line-up has been best known for its use in small electronic components, typified by USB Type-C connectors. However, the portfolio also includes grades that offer advantages over die-cast aluminium and zinc and this range will be further expanded over the course of this year.

ForTii retains its high stiffness and strength, even in high-temperature, high-humidity environments. It also exhibits outstanding dimensional stability over a wide temperature range and keeps its impact strength at low temperatures. Significant weight savings - sometimes as much as 50% - can be achieved by injection moulding parts designed specifically for production ForTii. DSM says total part costs can be reduced by as much as 20-30%.

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Focused on friction

Lightweighting is not the only way to improving fuel efficiency. Car makers are constantly trying to improve the torque they can obtain from their engines, so they can reduce engine capacity - and hence fuel consumption - without loss of mechanical performance. Part of this strategy is to reduce frictional torque, the negative force caused when a rotating object moves against another surface.

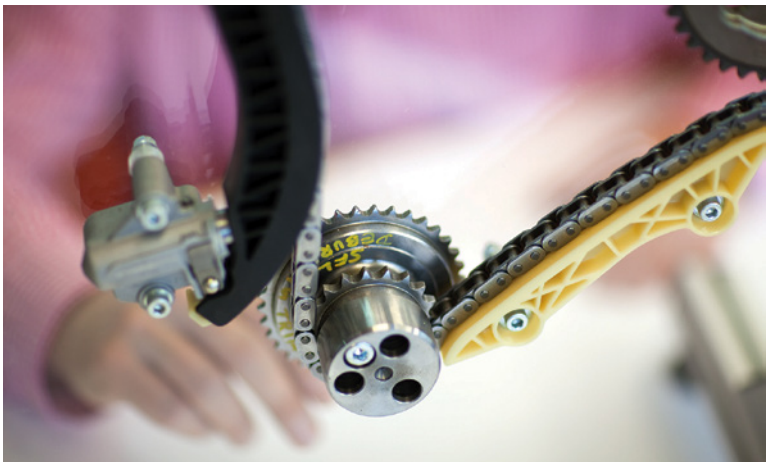
Earlier this year, DSM unveiled Stanyl HGR1, which is based on PA46, for reducing frictional torque in automobile engine timing systems. It says the material will provide OEMs with a highly cost-effective tool for reducing fuel consumption. Part of the frictional torque in engine timing systems arises from the timing chain moving over the element that keeps it under tension. This chain tensioner is often injection moulded in polyamide 66, but DSM says it is increasingly being replaced by Stanyl PA46, due to its improved performance in terms of mechanical properties, as well as its frictional and wear characteristics.

Stanyl HGR1 and the next generation Stanyl HGR2, which will be introduced soon, offer further enhancements in friction reduction. "Extensive tests have proven that chain tensioners in Stanyl HGR1 produce lower frictional torque than any other material at relatively low engine speeds ranging from idle to 1800 rpm," says Bill Burnham, DSM Business Development Manager. "By substituting PA66 with Stanyl HGR1 in the timing system's chain contact surfaces, frictional torque can be cut by 0.65 Nm. This equates to a fuel efficiency improvement of over a mile per gallon [more than 0.4 km/litre) over the drive cycle. That's a substantial amount."

In comparison to PA66, Stanyl HGR1 delivers 10% lower frictional torque within the critical engine speed range between 650 and 1800 rpm, the company claims. The HGR1 grade has already made its market debut on the latest version of the Pentastar V6 engine, built by Fiat Chrysler Automobiles in the US and fitted to numerous vehicles.

Racing ahead

The Polimotor 2 plastic race car engine continues to take shape and **Solvay Specialty Polymers** continues to make announcements about use of its materials in this application (the goal of the Polimotor 2 project is to manufacture an all-plastic four-cylinder, double-overhead CAM engine for the Aurora Motorsports Norma M-20 race car).



Above: DSM supplies its Stanyl PA 46 for low-friction timing system parts

In April, Solvay said Polimotor 2 would incorporate two of its specialty polymer technologies in the fuel injection assembly "to support engine weight-out goals, and deliver outstanding reliability and performance under demanding competitive racing conditions." A 46-cm fuel rail will be injection moulded from Ryton XK-2340 40% glass reinforced polyphenylene sulphide (PPS), while seven O-rings will be fabricated from Tecnoflon VPL 85540 fluoroelastomer (FKM).

"While certain grades of Amodel PPA would have made a suitable metal alternative for the fuel rail, we felt Ryton XK-2340 PPS delivers a better balance of high-temperature chemical resistance and dimensional stability," says Matti Holtzberg, the man behind Polimotor 2. In conventional race and production vehicles, fuel rails are often multi-part welded steel assemblies. However, replacing steel with a high performance thermoplastic not only allowed the fuel rail to be injection moulded as a single piece, it also enabled a 25 to 30% reduction in part weight, according to the company.

Left: This fuel rail for the Polimotor 2 all-plastic race car project is moulded in Ryton PPS from Solvay

PBT innovations

Polybutylene terephthalate (PBT) is increasingly in demand as a material for sensors, plug connectors and housings of actuators and control units due to its favourable combination of electrical properties, dimensional stability, chemical resistance and ability to withstand continuous elevated temperature. **Lanxess** says it has developed a wide range of hydrolysis-stabilised PBT grades for safety-related components that need to remain functional in the hot and moist environments found under-the-hood.

The company cites Pocan BF 4232 HR, which is said to offer very good hydrolysis stability and flame

Right: A headlight connector Pocan B 3216 HR, one of several hydrolysis-resistant PBTs from Lanxess

retardance. "This combination of properties makes the material particularly suitable for applications in electric vehicles where flame retardance requirements are stricter due to the higher currents," says Product Development Specialist Jochen Endtner.

The new PBT, which uses 30% glass fibre reinforcement, has a UL94 V-0 flammability rating down to 0.4 mm. "It achieves this excellent classification in all colours required for the test, which is the exception rather than the rule for materials of this type," says Endtner. The product's good hydrolysis resistance is demonstrated in a climatic aging test at 85°C and 85% relative humidity, which is prescribed in numerous technical specifications. Even after 100 days' storage the tensile stress and elongation at break are still over 80% of the baseline values.

Special effect

BASF highlights a recent application for its Ultradur HR in a new type of Hall Effect sensor carrier developed by processor and mould maker Rosenberger Spritzguss und Formenbau. It combines the housing and printed circuit board in one component and is injection moulded in a single, fully automated production step. The Hall Effect sensor measures the position of the valve in the exhaust gas recirculation system (the component is mounted as a cover on exhaust gas recirculation modules, which are fitted as standard in many automobiles in Europe).

Below: This Hall Effect sensor housing is moulded in BASF's Ultradur HR by Rosenberger in a one-step process

"Materials used for exhaust gas recirculation modules (EGR) have to withstand high thermal, mechanical and chemical loads and must therefore be highly creep and corrosion resistant," says BASF. "Ultradur B 4330 G6 HR extends the service life and tightness of the component considerably - including in the temperature range from -40 to 140°C - which is demanded by automotive manufacturers as a result of an ever more compact design in EGR and the engine compartment," the company claims. The new grade is also said to show substantially increased resistance to alkaline media, which can trigger stress corrosion cracking.

During production of the component, the printed circuit board is inserted into the housing mould and secured in place so it can be overmoulded without the use of external hold-down devices. As climate variations can trigger pumping effects in the housing, a thin PET membrane is ultrasonically welded into the sensor cover to allow pressure compensation. It is permeable to air, but water-tight.

DuPont has also been focusing on its PBT products. The company recently developed Crastin HR5331F, which offers hydrolysis resistance and is said to satisfy the requirements for EGR applications.

Foam solutions

Automotive components can also be lightweighted using physical foaming. Harald Heitkamp, Sales Manager for **Trexel**'s MuCell injection moulding process, points to numerous applications in European vehicle under-hood parts. Foaming not only takes weight out of parts, but it can also assist in filling even thin-walled parts by improving flow properties, he points out.

Germany's Pöppelmann is a long-standing Mucell user and now has several of Trexel's units hooked up to injection moulding machines that it is using, among other things, to produce various brackets, wire harnesses and housings found in the engine compartments of numerous Mercedes models. "There are several MuCell valve covers in series production at Tier One suppliers like ElringKlinger and Mahle," Heitkamp adds. Automotive OEM's for these parts include Ford, BMW and Volkswagen.

Several major polymer suppliers now offer grades specifically for these foaming processes. One of these is **SABIC**, which, in the wake of the reorganisation of its various plastics activities, says it is now increasing its focus on key market segments and places "foaming and lightweighting" among them.

Much of SABIC's attention will be on applications for softer foams for packaging and insulation. However, the company also points out the importance of foaming its various engineering plastics as a means of creating

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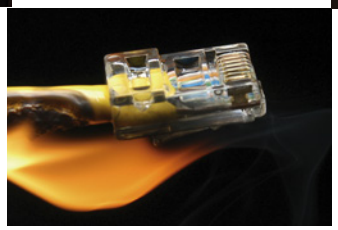


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high performance parts that are not only lighter but which also can provide improved sound insulation.

Independent options

Major independent compounders are also increasingly active under-the-hood. **PolyOne**, for example, is ramping up its services for customer development projects in areas such as metal replacement, which it says usually requires expertise in both material science and product design. The company has been emphasising this expertise for some time but with the recent introduction of its IQ Design Labs service in Europe, PolyOne says it is now able to offer the automotive industry (and others) the same level of design service it does in North America.

"For customers, that service can mean collaboration with designers skilled in 3D CAD/CAM programs, who are teamed with experts in polymer science," a representative says. "IQ Design Labs collaborates with customers in the early stages of a product launch to inspire creativity in design or performance and drive greater manufacturing efficiency. [This] can significantly shrink the time required for design and introduction of new automotive parts."

Samuel Lesaout, Automotive Market Development Manager for PolyOne, says the company is registering interest around the world in its material solutions that manage heat and provide above average levels of strength and stiffness. The company also has colour and additive offerings as well as thermoplastic elastomer materials for auto applications, noting that TPEs and additives often play a significant role in UTH applications. "In addition, TPEs are a key tool for part consolidation," he says.

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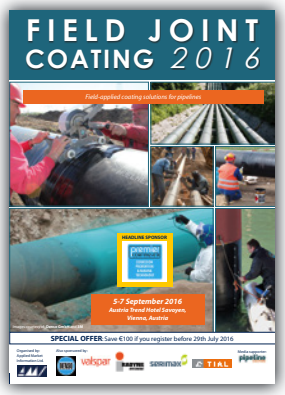

AMI's third Field Joint Coating conference takes place in Vienna, Austria, on 5-7 September and will again provide a learning and networking venue for all involved in materials, equipment and technologies for in-field application of protective coatings.

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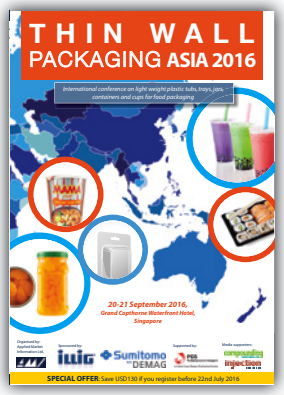

The first Thin Wall Packaging Asia conference will be held in Singapore on 20-21 September. This brand new event will build on the successful track record of AMI's European and US events and will bring together brand owners, retailers, specifiers and producers.

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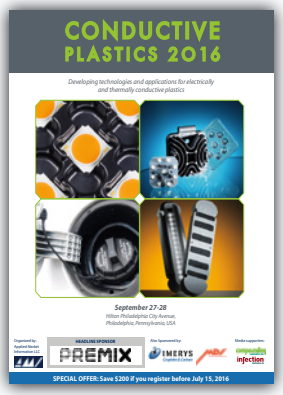

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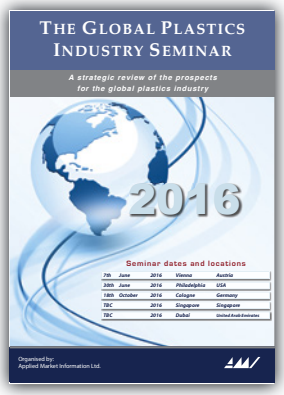

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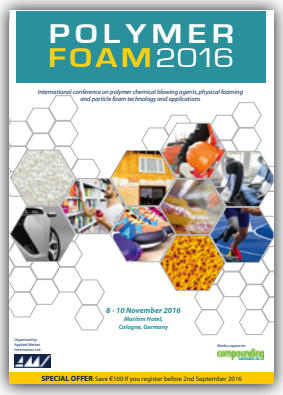

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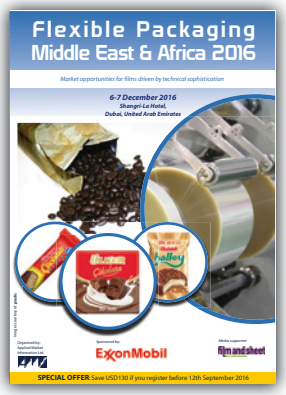

Newly expanded to include Africa, AMI's Flexible Packaging MEA takes place from 6-7 December in Dubai providing the ideal opportunity to explore technical and commercial developments in these fast growing markets.

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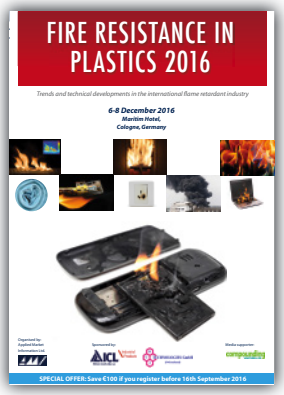

The 11th Fire Resistance in Plastics conference takes place in Cologne in Germany on 6-8 December 2016. This international event explores the latest regulatory and technological developments in the flame retardants sector.

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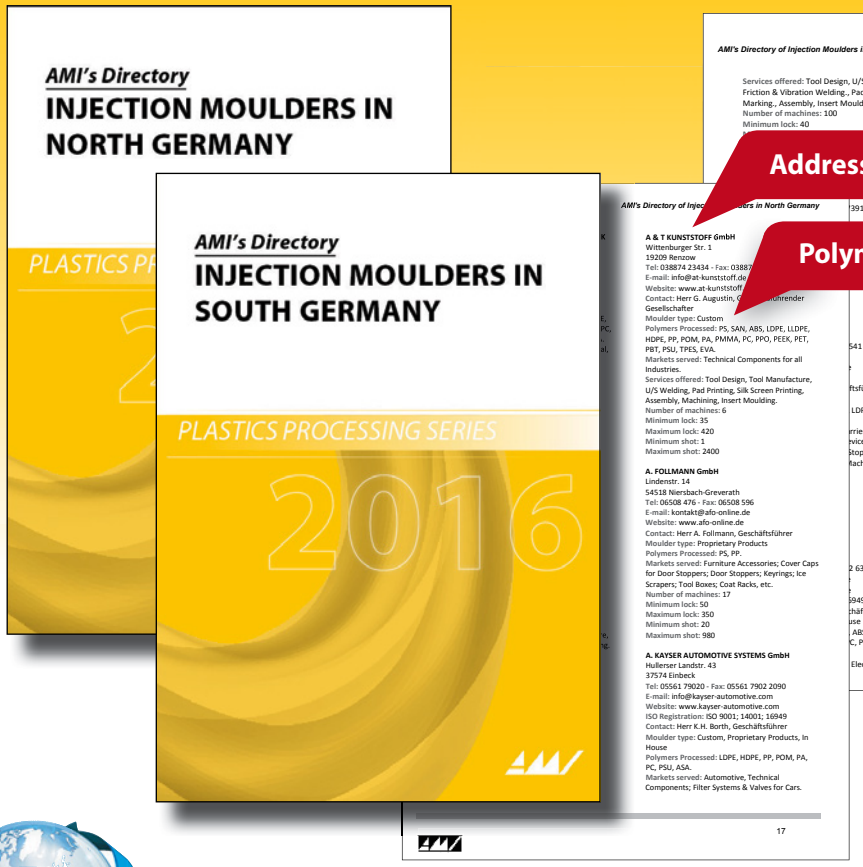

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- Additional information on the main polymers bought and main end use markets.

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sales@amiplastics.com
www.amiplastics.com

Wofoo Plastics Ltd

Head office location:	Hong Kong
Date founded:	1980
Chairman:	Dr Joseph Lee
Ownership:	Privately-owned
No. of employees:	60
Sales 2015:	€25m (AMI estimate)
Plant locations:	Wofoo Plastics has three production sites in China: Fauchon Plastics (Shenzhen) Co Ltd; Wofoo (Ningbo) Plastics Industrial Co Ltd; and Comtech Plastics (Shenzhen) Co Ltd.
Production Capacity 2015:	More than 100,000 tonnes.
Profile:	Wofoo Plastics traces its roots back to the 1960's when the parents of current chairman Dr Joseph Lee founded Wofoo Industrial Co Ltd. Wofoo Plastics Ltd was established in 1980 by Dr Lee as a successor to Wofoo Industrial. Today it is one of the largest PVC compound manufacturers in Asia, with an annual capacity of more than 100,000 tonnes and export markets in Europe, America and Japan.
Product line:	Wofoo Plastics produces branded rigid and flexible PVC compounds, plastisol and TPEs for application sectors including toys, cables and electrical appliances.
Product strengths:	Production to individual customer specification, including natural, transparent and coloured PVC compounds and grades suitable for high melt flow injection moulding. Technical support covering various aspects of PVC and TPE application.

To be considered for 'Compounder of the Month' contact Elizabeth Carroll at ec@amiplastics.com

compounding WORLD

Forthcoming features

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

August
PVC Plasticizers
Functional fillers
Screw and barrel protection
K2016 - visitor guide

September
Colour pigments
Materials testing & analysis
Antioxidants & UV stabilizers
K2016 show preview

Editorial submissions should be sent to Chris Smith: cs@amiplastics.com

For information on advertising in these issues, please contact:
Levent Tounjer: lt@amiplastics.com Tel: +44 (0)117 314 8183
Claire Bishop: claire@amimagazines.com Tel: +44 (0) 1732 605976/667474

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Compounding World – June
The June edition of Compounding World looks at the benefits and application of multiple-screw compounding systems. It also reviews the latest developments in additives for PVC, innovations in bioplastics, and new thinking for WPCs.

➤ Click here to view

Compounding World – May
The May edition of Compounding World looks at the latest developments in PP nucleation and clarification. This issue also explores innovations in LFT production technology, polymers for 3D print applications, and compounds for the cable industry.

➤ Click here to view

Injection World – June
Under-the-hood automotive innovations feature in the June edition of Injection World magazine. We also review the Chinaplas 2016 trade show, update on new printing and decorating technologies, and look at equipment for plastic scrap recovery.

➤ Click here to view

Injection World – May
The May edition of Injection World magazine takes a look at how 3D printing technology can be used by moulders to improve productivity. This issue also looks at innovations in plastic welding, TPEs, and thermally conductive polymers.

➤ Click here to view

Pipe and Profile – Jul/Aug
The July/August 2016 edition of Pipe and Profile Extrusion looks at the latest polymer applications in the Oil & Gas industry.This issue also explores new developments in extruder technology and additives for PVC formulation.

➤ Click here to view

Film and Sheet – June
The latest innovations in thermoforming feature in the June edition of Film and Sheet Extrusion magazine. This issue also looks at pouch packaging, blown film dies and PVC recycling, as well as reporting on the latest print technology news from the Drupa show.

➤ Click here to view

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compounding WORLD injection WORLD pipe and profile EXTRUSION film and sheet EXTRUSION

Global exhibition guide

26-30 September	Colombiaplast, Bogota, Colombia	www.colombiaplast.com
19-26 October	K 2016, Dusseldorf, Germany	www.k-tradefair.com
6-9 November	Pack Expo, Chicago, USA	www.packexpointernational.com
14-17 November	Emballage, Paris, France	www.all4pack.com
2017		
8-10 January	Arabplast, Dubai	www.arabplast.info
19-23 January	Plastivision India, Mumbai, India	www.plastivision.org
24-26 January	Swiss Plastics, Lucerne, Switzerland	www.swissplastics-expo.ch
24-27 January	Interplastica, Moscow, Russia	www.interplastica.de
8-10 March	JEC World, Paris, France	www.jeccomposites.com
20-24 March	Plástico Brasil, São Paulo, Brazil	www.informagroup.com.br
4-6 April	EU Coatings Show, Nuremberg, Germany	www.european-coatings-show.com
3-5 May	JEC Americas, Atlanta, GA, USA	www.jeccomposites.com
4-10 May	Interpack, Dusseldorf, Germany	www.interpack.com
16-19 May	Chinaplas, Guangzhou, China	www.chinaplasonline.com
17-21 May	Feiplastic, Sao Paulo, Brazil	www.feiplastic.com.br
30 May- 2 June	Moulding Expo, Stuttgart, Germany	www.moulding-expo.com
8-10 June	Kenya Plast, Nairobi, Kenya	www.kenyaplast.in
13-16 June	FIP, Lyon, France	www.f-i-p.com
7-10 July	Interplas Thailand, Bangkok	www.interplasthailand.com

AMI conferences

13-15 Sept	Polyolefin Additives, Vienna, Austria
20-21 Sept	Smart Packaging, Cologne, Germany
22-23 Sept	Compounding World Asia, Singapore
27-28 Sept	Conductive Plastics, Philadelphia, PA, USA
4-5 Oct	Polymer Sourcing & Distribution, Philadelphia, PA, USA
8-10 Nov	Polymer Foam, Cologne, Germany
6-8 December	Fire Resistance in Plastics 2016, Cologne, Germany

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

www.amiplastics.com

Turn page for the full programme ➤

FIRE RESISTANCE IN PLASTICS 2016

Trends and technical developments in the international flame retardant industry

6-8 December 2016
Maritim Hotel,
Cologne, Germany

Organised by:
Applied Market Information Ltd.

Sponsored by:
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Where needs take us
MCA TECHNOLOGIES GmbH (Switzerland)

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SPECIAL OFFER: Save €100 if you register before 16th September 2016

FIRE RESISTANCE IN PLASTICS 2016

6-8 December 2016, Maritim Hotel, Cologne, Germany

Fire Resistance in Plastics, the international conference on flame retardancy organised by Applied Market Information Ltd. has become the essential meeting place of the fire retardants industry and its entire associated supply chain. At its 11th edition in 2016, this yearly event attracts an ever-growing number of participants, who come to learn about the latest developments in flame retardancy and flame retardant plastics, as well as network and share expertise with their colleagues from various regions of the world.

Increasingly stringent fire safety, health and environmental protection requirements drive the need for more sophisticated flame retardant systems in electrical and electronic goods, construction, transportation, etc.

A panel of expert speakers will deliver papers discussing the state of the art in flame retardant plastics, as well as the latest developments in markets, materials, technology, applications, testing and regulatory framework.

As usual, the conference will offer an unparalleled opportunity to network and exchange ideas with colleagues, customers and suppliers, as well as with leading scientists and academics from around the world.

The associated table-top exhibition will enable companies to showcase their products, services, achievements and technology.

For users of fire retardant plastics, as well as for suppliers of additives, reactants, synergists, systems, equipment and technology, testing and certification services, etc., this conference is a not-to-be-missed event.

FIVE GOOD REASONS WHY YOU SHOULD ATTEND:

1. **Get up-to-date on the latest developments in fire retardant technologies**
2. **Find out about the latest testing and regulatory requirements**
3. **Review market trends, opportunities and unfulfilled needs**
4. **Benchmark your company against other leading players**
5. **Network with other professionals in the fire retardant industry**

Save €100

Register before 16th September 2016

EARLY BIRD REGISTRATION OFFER

Register before 16th September 2016 and pay €1090* saving €100 on the full price of €1190*. There are additional discounts for group bookings. The registration fee includes attendance at all conference sessions, the Welcome Cocktail Reception, lunch and refreshment breaks on both days and a set of conference proceedings.

EXHIBITION SPACE

Make it easy for the delegates to find you at this busy event with your own table top exhibition space. Bring your own display stand, banners or use the space to showcase samples of your products and ensure that you make an impact. The table top exhibition will run throughout the conference in the spacious lobby next to the main meeting room.

The exhibition package includes 1 delegate place!

Space is limited so to avoid disappointment please register for this service as soon as possible.

SPONSOR THIS EVENT

A variety of sponsorship opportunities are available at this conference to help to promote and enhance your company's products and services to this highly targeted international audience. Contact the Conference Hotline for further information.

HOTEL ACCOMMODATION

Delegates are responsible for booking their own accommodation. AMI has negotiated a limited number of rooms at the rate of €159 for a single room and €197 for a double (tax, breakfast and Wi-Fi included) at the Maritim Hotel in Cologne for a limited time only. To reserve a room, please contact the reservation department and state that you are attending "AMI's Fire Resistance in Plastics 2016" conference on:
Tel: +49 221 2027 849 Fax: +49 221 2027 826
Email: reservierung.kol@maritim.de

CONFERENCE VENUE

Cologne was founded over 2,000 years ago and is a good place for dining out, cultural tours and shopping. The conference will take place at the Maritim Hotel, which is on the banks of the Rhine within walking distance of the old town and ancient cathedral.

CONFERENCE HOTLINE

Contact: Nicola Charlesworth, Conference Organiser
Tel: +44 (0) 117 314 8111
Fax: +44 (0) 117 311 1534
Email: nc@amiplastics.com
Twitter: @AMIconferences #attendAMI

Turn page for booking details ➤

FIRE RESISTANCE IN PLASTICS 2016

Tuesday 6th December 2016

18.00-19.30 Registration & Welcome Cocktail Reception

There are no conference sessions on this day

Wednesday 7th December 2016

08.00 Registration and welcome coffee
09.00 Opening announcements

MARKET OVERVIEW

09.10 **The FR industry: trends, developments and targets**
Mr. Noru Tsalic,
AMI CONSULTING, United Kingdom

SESSION 1 - NOVEL MATERIALS

09.40 **Halogen-free flame retardant system for weatherable polyolefin applications**
Mr. Yutaka Yonezawa, Manager,
ADEKA CORPORATION, Japan

10.10 **Innovative flame retardant solution for polycarbonate and blends**
Mr. Marc Leifer, Technical Marketing Support Manager,
ICL-IP FR DIVISION, Israel

10.40-11.20 Morning coffee sponsored by: MCA TECHNOLOGIES GmbH (Switzerland)

11.20 **Advanced flame retardant systems for polyolefins based on phosphorus and nitrogen**
Dr. Ugo Zucchelli, Global Sales and Technical Assistance Manager,
ITALMATCH CHEMICALS SpA, Italy

11.50 **Flame retardants & fire protective coatings derived from oligomeric partial phosphate esters of carbonific polyols**
Mr. David Aslin, Managing Director,
PROMETHEUS DEVELOPMENTS Ltd., United Kingdom

12.20 **Some novel principles & mechanisms of fire retardancy**
Dr. Bansi Kaul, CEO,
MCA TECHNOLOGIES GmbH, Switzerland

12.50-14.20 Lunch sponsored by: ICL Industrial Products — Where needs take us

14.20 **Advanced offerings of antimony trioxide – positioning ATO versus the pallet of synergists**
Mrs. Ir. Rien Repriels, Product Manager,
CAMPINE, Belgium

14.50 **Synthesis, application and toxicity of new phosphorus based flame retardants**
Dr. Sabyasachi Gaan, Group Leader,
EMPA, Switzerland

SESSION 2 - NEW DEVELOPMENTS IN FR APPLICATIONS

15.20 **Recent advances in halogen FR-UV systems for polyolefins**
Dr. Eli Shulman, Team Leader of the Flame Retardants Group,
TOSAF GROUP, Israel

15.50-16.30 Afternoon tea

16.30 **Non-halogenated flame retardants for polyolefin films**
Mr. Ebrahim Mor, Vice President, Technology,
TECHMER PM, LLC, United States

17.00 **Application of novel, polymeric, non-halogenated flame retardants in transparent and glass reinforced polycarbonate**
Dr. Jan-Pleun Lens, Vice President, Research & Applications,
FRX POLYMERS, United States

17.30 **Fire retardancy in highly filled plastics**
Dr. Alberto Frache, Associate Professor,
POLITECNICO DI TORINO, Italy

20.00 Conference Dinner

Thursday 8th December 2016

08.30 Registration & Welcome coffee
09.00 Opening announcements

SESSION 2 CONTINUED - NEW DEVELOPMENTS IN FR APPLICATIONS

09.10 **Fire retardant halogen-free engineering thermoplastic compounds – synergy between magnesium hydroxide and melamine poly(metal phosphates)**
Dr. Yann Bourgeois, Technical Sales Manager,
HUBER ENGINEERED MATERIALS, United States

09.40 **New developments in flame retardant polystyrene foams**
Dr. Manfred Doering, Head of Dept. Polymer Synthesis,
FRAUNHOFER LBF, Germany

SESSION 3 - TRENDS IN SUSTAINABILITY, REGULATION & TESTING

10.10 **A tough juggling act on the road to innovation: keeping track of developments in materials, regulations and testing**
Ms. Maryline Desseix, Senior Lead Engineer NHFR, Corporate Technology,
POLYONE, Belgium

10.40-11.20 Morning coffee

11.20 **Fire toxicity - myths and reality**
Dr. Eric Guillaume, Chairman,
EFECTIS FRANCE, France

11.50 **From renewable feedstock to fully bio-based flame retarded poly(lactide)**
Dr. Fouad Laoutid, Senior Scientist,
MATERIANOVA, Belgium

12.20 **Environmentally friendly polyolefin elastomer formulations addressing most demanding fire standards**
Dr. Stefan Ultsch, Applications Technology Leader,
DOW EUROPE GmbH, Switzerland

12.50-14.20 Lunch

14.20 **Similitude in fire testing – a realistic approach?**
Prof. Sophie Duquesne, Professor,
ENSCL, France

14.50 **A comparative test campaign between the "mini Single Burning Item" and the standard SBI (EN13823) to assess the correlation between the two testing facilities**
Dr. Anna Rita De Corso, Researcher,
SUPSI, Switzerland

15.20 **How does ageing influence the flame retardancy – an overview**
Dr. Günter Beyer, Lab-Manager,
KABELWERK EUPEN AG, Belgium

15.50 Afternoon tea and conference ends

AMI reserves the right to alter the programme without notice.
The latest programme including any new speakers or changes to schedules can be viewed on our website ***www.amiconferences.com***

Click here for a PDF of the brochure

REGISTRATION FORM

Company: _____

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(Must be completed by all EU Companies)

Company activity: _____

Purchase order No. *(if applicable)*: _____

Invoice address *(if different from above)*: _____

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DELEGATE DETAILS

If more than one delegate please photocopy form

Title: _____ First name: _____

Surname: _____

Position: _____

Email: _____

Special dietary requirements: _____

Signature: _____ Date: _____

PAYMENT DETAILS

All payments to be made in Euros

Please tick box and write amount:

❑ Early bird admission fee: *(Until 16th September 2016*	€1090 + €207.10* = €1297.10	_____
❑ Admission fee thereafter:	€1190 + €226.10* = €1416.10	_____
❑ Conference Dinner:	€85 + €16.15* = €101.15	_____
Table Top Exhibition Package (includes 1 delegate place)		
❑ German resident companies	€1750 + €332.50* = €2082.50	_____
❑ Non - German resident companies	€1750 + €207.10** = €1957.10	_____
(**Only admission fee part of package is VAT chargeable at 19%)		
* German VAT charged at 19%	**Total:**	_____

Please note all delegates have to pay the VAT stated above

METHOD OF PAYMENT

On receipt of this registration form your credit card will be debited. You will be sent an invoice in 7-14 working days.

❑ **Bank transfer quoting:** 'Applied Market Information Ltd. - Fire Resistance in Plastics 2016' to: Commerzbank, Filiale Düsseldorf, Breite Straße 25, 40213 Düsseldorf, Germany
Account number: **1024710** Bank No. **300 400 00**
IBAN: **DE93 3004 0000 0102 4710 00** SWIFT: **COBADEFFXXX**

❑ Visa / Mastercard / Eurocard / JCB

				-					-					-				

If paying by card the following information **must** be given

Name of cardholder: _____

Expiry date: _____ 3-digit security code: _____

Cardholder's signature: _____

Card billing address: _____

Post / zip code: _____

Country: _____

Tel: _____ Fax: _____

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FIRE RESISTANCE IN PLASTICS 2016
CONFERENCE INFORMATION

Date and location
6-8 December 2016
Maritim Hotel
Heumarkt 20
50667 Cologne
Germany
Tel: +49 221 2027 0
Fax: +49 221 2027 835

Registration fee
The registration fee includes attendance at all conference sessions, the Welcome Cocktail Reception, lunch and refreshment breaks on both days and a set of conference proceedings.

- ***Early bird registration:*** Register before 16th September 2016 for only €1090*. Thereafter the cost is €1190*.
- ***Group rates:*** For companies wishing to register two or more delegates, group discounts are available. Please contact the Conference Organiser for more details. (Please note to qualify for the group discount delegates must be booked at the same time, otherwise additional delegates may be charged at full price).

Table top exhibition
A limited number of table top exhibition spaces are available in the spacious lobby area directly outside the conference room. The table top exhibition fee is excellent value for money and **includes 1 delegate place**. Exhibitors may either use tables provided by the hotel or bring their own stand or display.

Sponsor this event and promote your company
A variety of sponsorship opportunities are available at this event that can help to promote and enhance your company's products and services to this highly targeted international audience. For further information, please contact the Conference Organiser on: +44 (0) 117 314 8111.

Social events
The social events organised for Fire Resistance in Plastics 2016 will provide an ideal setting for delegates and speakers to mix business with pleasure.

- ***Welcome Cocktail Reception:*** A welcoming cocktail reception will be held on the first evening. All delegates are invited to attend and it will offer an excellent opportunity to meet speakers and other colleagues. The Welcome Cocktail Reception will run approximately from 18.00 to 19.30 and is included in the delegate fee.
- ***Conference Dinner:*** All delegates are warmly invited to attend the Conference Dinner, which will take place at a local restaurant on the evening of 7th December 2016. The additional cost is €85*.

Hotel accommodation
Delegates are responsible for booking their own accommodation. AMI has negotiated a room rate of €159 for a single room and €197 for a double (tax, breakfast and Wi-Fi included) at the Maritim Hotel in Cologne for a limited time only. To reserve a room, please contact the reservation department and state that you are attending "AMI's Fire Resistance in Plastics 2016" conference on:
Tel: +49 221 2027 849 Fax: +49 221 2027 826
Email: reservierung.kol@maritim.de

Cancellations
Full refunds, less a cancellation charge of €200 will only be made on cancellations received prior to 4th November 2016. Thereafter we regret that no refunds can be made. Delegates may be substituted at any time. Please note that refunds will not be given on dinner places, table top bookings or sponsorship packages.

*+19% German VAT

CONFERENCE HOTLINE

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Fax back to: +44 (0) 117 311 1534 or Email: nc@amiplastics.com