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December 2015

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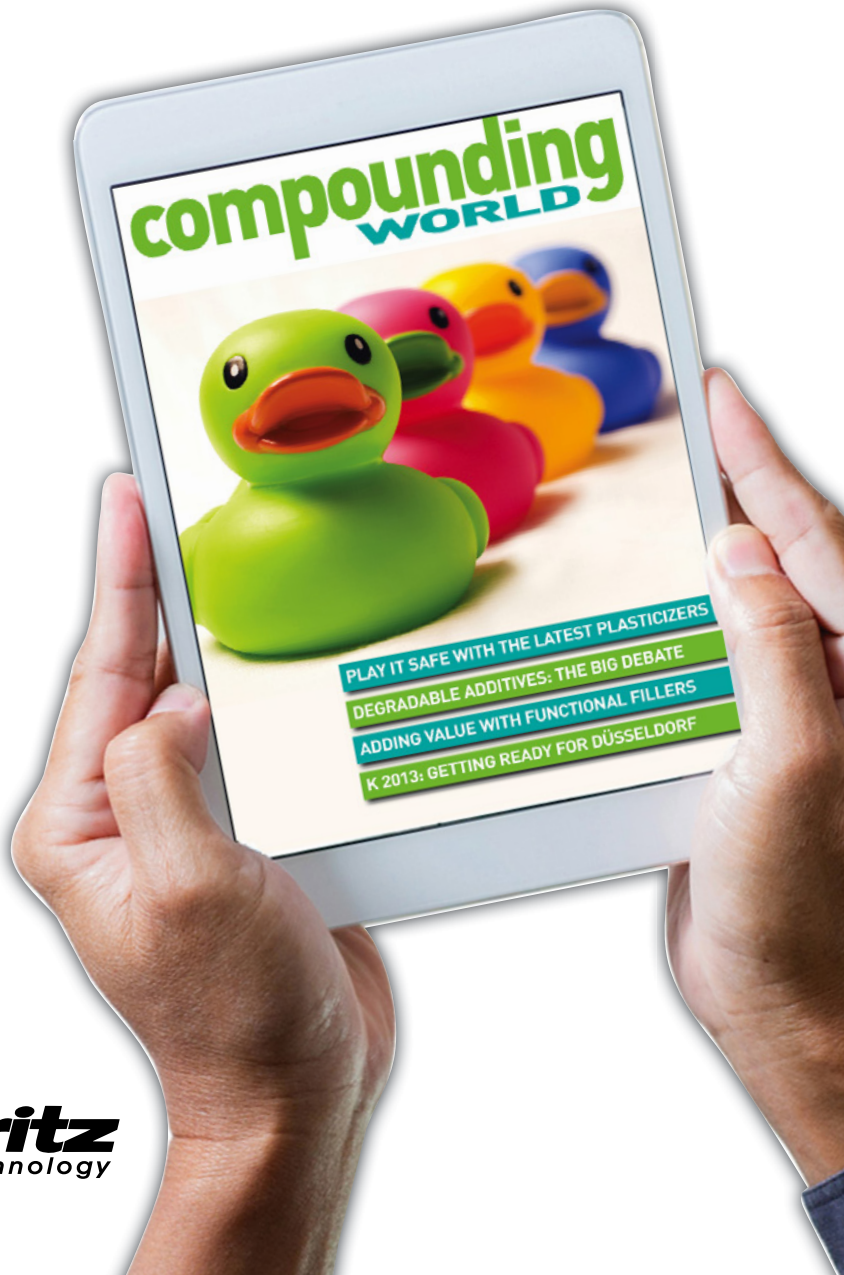

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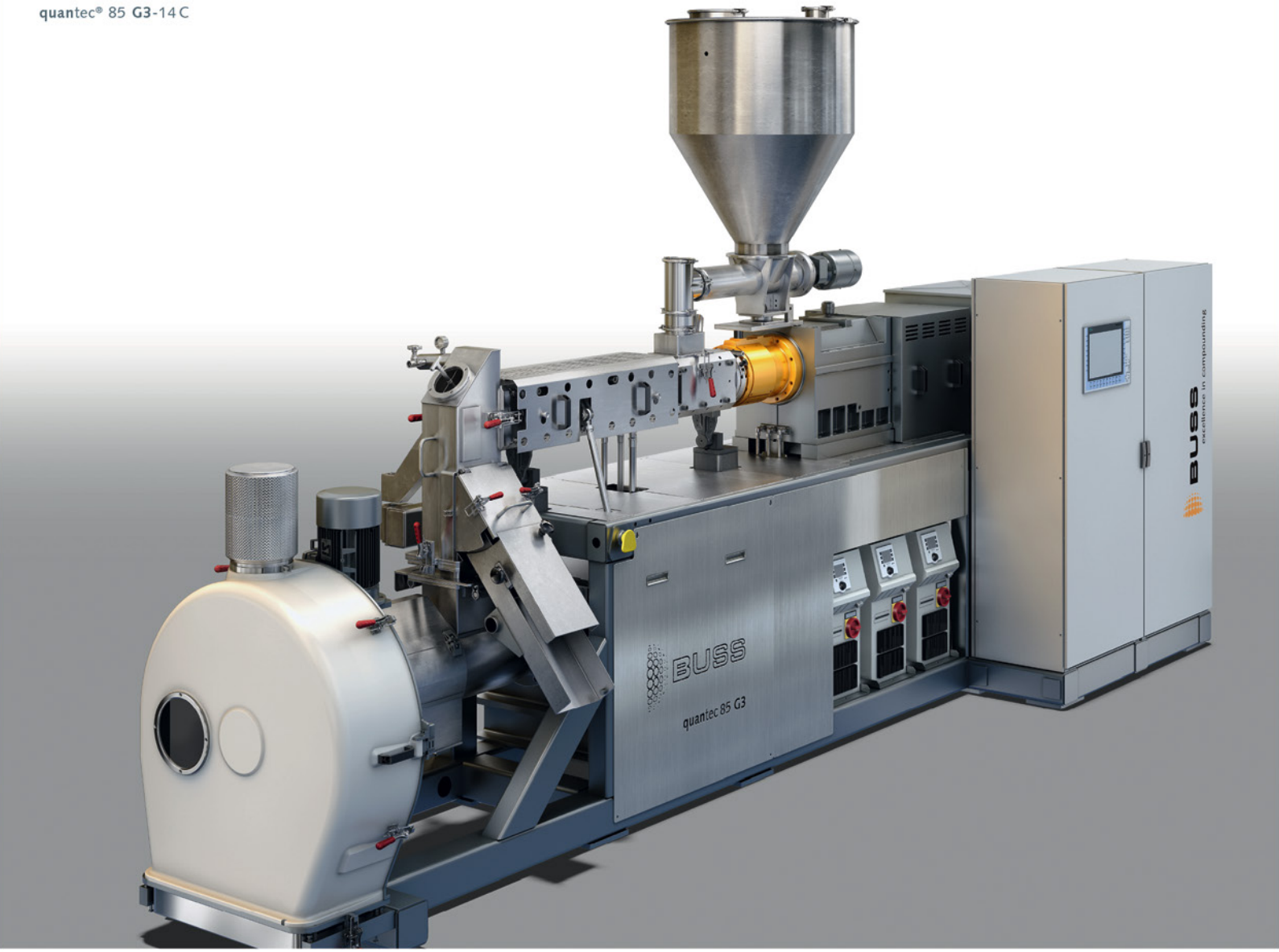

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LyondellBasell grows in India

LyondellBasell has entered into a definitive agreement to acquire the polypropylene compounding assets of India's Zylog Plastalloys, including its manufacturing sites at Sinar and Chennai.

The move will double the size of the company's automotive customer base in India and make it the third largest producer of PP compounds in the country with an annual capacity of 44,000 tonnes. It follows LyondellBasell's acquisition earlier this year of SJS Plastiblends, a manufacturer of PP compounds located at Aurangabad.

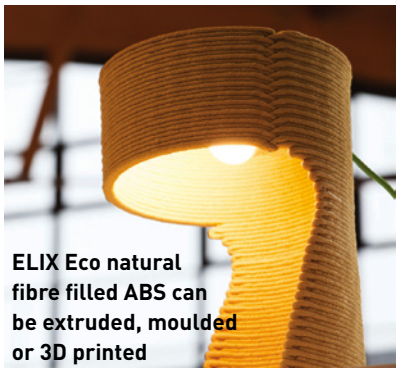
"We are very optimistic about India's economic growth and rapidly expanding automotive market," said Bhavesh (Bob) Patel, CEO and Chairman of the Management Board of LyondellBasell. "The acquisition of SJS and Zylog are part of our plan to strategically expand our footprint where it makes sense from an economic and strategic perspective."

LyondellBasell claims to be the world's largest producer of PP compounds with an annual capacity of 1.2m tonnes. It has supplied the Indian market through imports and tolling arrangements since 2009. The Zylog transaction is expected to close in early 2016, the company said.

India is the fourth largest growth market for automobiles globally with some 3m vehicles produced each year.

www.lyondellbasell.com
www.zylogplastalloys.com

ELIX develops natural fibre reinforced ABS



ELIX Eco natural fibre filled ABS can be extruded, moulded or 3D printed

ELIX Polymers, a specialist in high performance ABS materials based in Tarragona, Spain, has introduced a new generation of natural fibre-reinforced ABS.

ELIX Eco ABS-NF has been developed for processing on injection moulding machines and specific extrusion processes without the need for equipment modifications. It is targeted at applications in industries such as automotive and furniture.

Key benefits are said to include high stiffness, heat resistance, low moulding shrinkage ratios, low emissions and weight reduction when compared to glass fibre-reinforced ABS (due to its lower density). The material has also been tested successfully for 3D printing.

The new grade was developed with a European Economic Area & Norway Grant for development of sustainable ABS materials and composites.

www.elix-polymers.com

Perstorp secures US supply

Perstorp has secured a permanent storage tank for its Emolten 100 brand of DPHP plasticiser in New Jersey as part of its plans to improve service to US customers.

The new supply is expected to be operational from the start of 2016 and, the company said, should lead to shorter lead and delivery times for its rapidly growing customer base in the US.

www.perstorp.com

Recycled PP excels in trials

UK-based compounder Luxus announced that its Hycolene high recycled content PP for automotive interior parts has surpassed expectations in commercial scale trials performed by development partner International Automotive Components (IAC).

The trials showed that the Hycolene compounds – which contain up to 60% recycled content and a new light weight filler package – provided improved scratch resistance compared to current talc-filled alternatives. The compound also delivered an 8-12% cycle time saving along with reduced density.

"This was a very encouraging first trial, although further trials are required to fully optimise the product," said IAC product engineer Dave Jenkins. "A range of components also need to be run, so we can understand the material's strengths and weaknesses. These will commence once the initial component lab testing is completed satisfactorily."

Luxus said its high recycled content PP has "surpassed expectations" in latest trials

Luxus and IAC are part of a development consortium, together with compounding equipment producer Coperion and car maker Jaguar Land Rover, that secured £1.4m fo funding under the EU Eco-Innovation programme to commercialise the Hycolene technology.

www.luxus.co.uk

EPO upholds DSM's Diablo heat stabilisation patent

The European Patent Office (EPO) has upheld an appeal by DSM against an earlier decision to revoke a patent covering its Diablo heat stabilisation technology for polyamides.

The decision by the Board of Appeal at the EPO in Munich on 29 October confirms DSM's intellectual property rights over the technology, which is used to improve long-term temperature resistance of its Stanyl and Akulon polyamides. Typically used in automotive industry applications where high temperature resistance is required over extended periods, the Diablo technology is also licensed for use to a number of other polyamide suppliers.

An automotive inlet manifold produced in DSM's Stanyl Diablo 46 polyamide

According to DSM, the long-term heat-ageing of materials using Diablo differentiates them from competing materials. The company claims that stable mechanical performance is maintained over 3,000 hours continuous use at temperatures higher than 200°C.

"If you do not see a drop in performance in these conditions, then the chance is high that DSM's Diablo technology is being used, whether or not it is correctly licensed," said Kurt Maschke, Global Segment Manager Air/Fuel. "I strongly recommend part makers to check the legal situation before starting an expensive part validation process."

www.dsmep.com

Axxom to buy Thornton assets

Axxom has entered into an asset purchase agreement with bankrupt plastics distributor and brokerage firm Thornton & Co. (TCI) of Connecticut, US, under which it will acquire substantially all of the business of Thornton for $3.7m.

The agreement (under Section 363 of the US Bankruptcy Code) was reached in early November subject to the receipt of higher or better offers ahead of an auction on 23 November. However, as none were forthcoming it now appears certain the Axxom deal will go ahead. TCI is expected to resume normal resin brokerage operations as a part of Axxom.

The bid comprised $2.7m from Axxom's owner, Chemical Resources (CRI) of Princeton, New Jersey, and $1m from Thornton's management. It includes all of Thornton's inventory and IP but not its accounts receivable or other litigation assets.

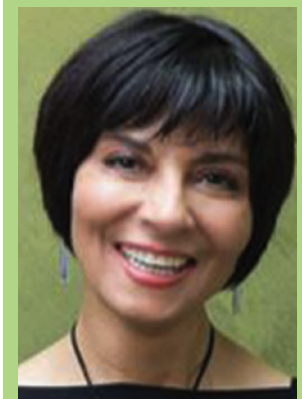
CRI was reportedly approached by Boston-based Tiger Group, which was running the liquidation process. It said that it saw synergies between Thornton's activities and its own, which include compounding plants in Chesapeake, Virginia, US, and Guangdong, China, plus a recycling plant in Jacksonville, Florida, US.

Thornton generated an annual turnover of $200m in 2014 on sales of around 135,000 tonnes of PE and PP. It filed for Chapter 11 bankruptcy in August, citing the fall in petrochemical prices since 2014 for a 20% decline in sales. Its main bank, People's United, declined to accept a proposed repayment plan but later reached an agreement with it to continue operating and sell off inventory.

www.chemres.com

www.axxomchemical.com

Techmer PM strengthens design



Techmer PM Design & Innovation Lead Shashi Caan

Techmer PM, the Tennessee, US-based producer of colours and additives for plastics and fibres, has appointed Shashi Caan to the newly created post of Design & Innovation Lead.

The appointment formalises an ongoing partnership, the company said, and "further promotes direct collaboration with designers". Caan will act as a sounding board to designers as Techmer PM seeks to translate their work into high performance materials.

Caan was global president of the International Federation of Interior Architects/Designers from 2009 to 2014 and is also the former chair of the interior design department at Parsons The New School of Design in New York. She previously founded the SC Collective, an architecture and design firm, in 2002.

www.techmerpm.com

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ECPI 'disappointed' at DEHP vote

The European Council for Plasticisers and Intermediates (ECPI) has said it is "disappointed" by a recent plenary vote in the European Parliament against a Commission (EC) proposal to authorise the recycling of soft PVC containing the plasticiser DEHP.

"ECPI respects the right of the European Parliament to oversee an implementing measures but it is essential to underline that the Commission has been strictly adhering to its mandate under REACH. This is a highly complex and technical process based on thorough scientific and socio-economic impact assessments", said Stéphane Content, general manager of ECPI.

The association said the decision has the potential to undermine the recycling of PVC in general, which now amounts to some 200,000 tonnes/year. "PVC recycling enhances resources efficiency, reduces emissions and brings environmental benefits," it said.

The EC made its proposal following recommendations by the European Chemicals Agency's Risk Assessment and Socio-Economic Analysis Committees in September. Based on an evaluation of the available data, they recommended the Authorisation of DEHP under REACH for use in specific applications, including recycled soft PVC containing it. The EC will make a final decision and is not obliged to follow the European Parliament's opinion.

www.ecpi.org

Sappi has high hopes for wood PP

Forest products firm Sappi has developed a cellulose-reinforced PP aimed at applications in the automotive, consumer electronics and furniture markets.

The material, which uses cellulose fibres from trees, has been tested by polymer engineers at Intertek. It is said to offer good mouldability, high rigidity with low density, low odour, good colouring possibilities and good scratch resistance, as well as being easily processable.

Symbio, a corporate start-up initiative within Sappi, has now begun a collaboration with Intertek to support development of the next generation of cellulose-reinforced materials. Intertek will provide testing and polymer processing expertise for injection moulding and extrusion.

www.sappi.com

Kraiburg TPE Americas expands

Kraiburg TPE Americas has relocated and expanded its manufacturing facility in the US. The new 6,500m² plant at Buford in Gwinnett County, Georgia, US, will provide increased production capacity for its Thermolast K and A, Copec and For Tec E product lines for automotive, consumer, industrial and medical applications.

Kraiburg TPE's new US manufacturing plant

The expanded plant houses three production lines (two of which were moved from the company's former site at Duluth) as well as a sample line. It employs 75 people.

Kraiburg TPE said the new facility will supply the US market and provide an export base for the rest of the Americas.

www.kraiburg-tpe.com

Steer develops jute compounds

India-based Steer has developed technology to process jute-filled polypropylene compounds that it claims "will have the capability to replace minerals and fibres and help reduce product cost, density and carbon footprint, while improving product performance."

It is producing the PP compounds containing up to 50 wt% jute using its co-rotating twin-screw compounding technology with special fractional-lobe elements. Applications for the materials are foreseen in under-the-hood automotive parts, such as air intake manifolds, radiator end-caps, fans and shrouds, as well as construction materials and microwavable cooking containers.

"The new material has formidable advantages – it is strong, flexible and heat-resistant, not to mention that it is also an economical, lighter and eco-friendly reinforcing agent for plastics," said Steer's founder and managing Dr Babu Padmanabhan.

India is one of the world's largest producers of jute, growing about 1.5 million tonnes/year. Traditionally most of India's jute has been used in relatively low value applications, notably packaging materials, burlap, hessian and sacks, arenas in which it has faced intense competition from LDPE bags in recent years. Steer believes that its use in polymers could dramatically revive prospects.

http://steerworld.com

www.kraussmaffeiberstorff.com

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* As compared to previous generation extruders of identical size

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Celanese to add PEEK grades

Celanese is to bring two premium industrial grades of polyether ether ketone (PEEK) into its high performance polymer portfolio in the second half of 2016, including high flow and high flow reinforced grades.

A Celanese spokesperson said base PEEK polymer will be sourced from external suppliers and will be modified using its advanced flow technology and compounded in the US. The company said the high flow products will mean it will be possible to injection mould components that would otherwise have to be machined. Thermo-mechanical properties will be maintained, it said.

Applications are envisaged in the automotive sector, notably small parts in aggressive service conditions such as under-the-hood electrical connectors; in thin-wall electrical and electronic parts such as capacitors, connectors, resistors and micro-switches; stock shapes for machined parts used in the oil and gas and general industrial sectors such as rings, seals and highly filled profiles; and in complex miniature parts for diagnostic and analytical instruments that are exposed to a wide variety of liquids and gasses.

www.celanese.com

Americhem opens UK tech centre

Americhem Europe has opened a new technical centre at Manchester, UK, to support its colour and additive customers in the fibre sector.

The new centre includes a pigment lab with several extruders and feeders. Dedicated fibre equipment includes two fibre spinning lines, one a low speed spin line for PA and PP products and the other a low and high speed line covering PET, PA and PP. There are also spectrophotometers and light cabinets.

www.americhem.com

Compounding World Congress 2016 programme announced

AMI has revealed the programme for the Compounding World Congress 2016, which will take place on 18-20 April at the Maritim Hotel, Cologne, Germany. Building on the sell-out success of the debut conference in 2015, the event features an impressive line-up of speakers from the international compounding industry.

The expanded programme focuses on 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. It includes an opening panel discussion exploring strategies for growing a profitable compounding business. Participants include Massimo Pavin, CEO of Sirmax in Italy, and Murat Cansever, Managing Partner of Eurotec Engineering Plastics in Turkey.

The conference also features presentations on a range of innovative materials technologies. These include: the return of polyketones; optimising filled and reinforced compounds; and developments in conductive compounds.

The headline sponsor for the event is HPF The Mineral Engineers and conference attendees will have the opportunity to visit its mine and R&D laboratories before the conference starts. Additional sponsors include Azo, Steer, Dreyplas, Penta, ICMA San Giorgio, Leistritz, KraussMaffei Berstorff, Farrel Pomini, Imerys, JSW, Buss and Coperion.

For information on participating in the Compounding World Congress as a delegate, sponsor or exhibitor, contact Kat Langner: **kl@amiplastics.com**, +44 117 314 8111. To see the full programme and to benefit from the €100 early booking discount visit: **http://bit.ly/CWC16B**

Elasto Sweden starts up new medical TPE line

Elasto Sweden has started up a medical line at Åmål, Sweden. The new line is part of the company's continued focus on medical thermoplastic elastomers (TPEs) and supports sales of its Mediprene TPE compounds for medical applications, such as tubing, IV systems, catheters, respiratory equipment, syringe plunger seals and wound care products.

The company has also expanded its technical centre at the site with the addition of a new pilot line and further investments in analytical equipment, including FTIR, DSC and TGA equipment.

"As a supplier to the medical device industry it is critical that we operate to the highest-standards by investing in advanced compounding and product development processes. The new line and investment in technical resources is part of our on-going commitment to supply leading quality TPE products and expertise to our growing medical customer base," said Elasto Sweden Managing Director Thomas Nilsson.

www.hexpoltpe.com

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Coperion joins ProTec for LFTs

Coperion has joined fellow German company ProTec Polymer Processing to offer complete installations for the production of long fibre-reinforced thermoplastics (LFTs).

The two companies said they are already working on their first joint client project in Europe. No details of the project were disclosed, but they said that the automotive industry is one typical area for LFT use.

Under the agreement, Coperion and ProTec will offer complete installations for LFT pellet manufacturing. In addition to Coperion's ZSK Mc18 or STS Mc11 twin screw extruder series, this will include a specially designed ProTec-developed impregnation die head that cannot clog with filler material, plus roving unwinding, pre-warming and individual fibre spreading systems designed to achieve optimum fibre impregnation.


LFT prodution technology by ProTec

The two companies said the production systems can handle a variety of polymers in combination with special additives, additional fillers and regrind material. ProTec's testing centre in Bensheim, Germany, will be available for support and development of customer-specific formulations.

www.coperion.com
www.sp-protec.com

BASF adds compound capacity

BASF is to expand compounding capacity for its engineering plastics in Europe by 70,000 tonnes/year.

The company said the new capacity at its site at Schwarzheide in Germany will come on stream in 2017 and will be used to produce Ultramid PA and Ultradur PBT compounds. The investment will take the firm's global compounding capacity for the products to 700,000 tonnes/year.

The expansion is intended to strengthen the company's leading position in engineering plastics in Europe, according to Dr Melanie Maas-Brunner, head of BASF's Performance Materials Europe division.

www.basf.com

LMD gets a better grip with PP

Lehmann&Voss has developed a new high performance PP powder that is being used by Germany-based LMD Innovation for production of laser sintered robot grippers.

LMD Innovation has been using laser sintering technology to manufacture custom robot grippers and suction cups for 10 years and sees the new Luvosint 65-8824 grade opening up new opportunities in application.

"The low specific density of the polypropylene results in a 10% saving in weight over PA12, which is an important figure for high-speed robot applications," said LMD Innovation Managing Director Michael Hümmeler.

www.lmd-innovation.de
www.lehvoss.de

Sabic supports 3D-printed car

Sabic supplied the thermoplastics used in the 3D printed LM3D Swim car made by US firm Local Motors, which is based in Phoenix in Arizona.

Described as "the latest rapid vehicle iteration leading to a fully homologated 3D-printed vehicle, designed to be safe, smart and sustainable", pre-sale of the first LM3D models is expected to take place in early 2016. Manufacturing and delivery will follow in 2017, when Local Motors plans to have completed its micro-factory in Knoxville, Tennessee, and secured necessary crash testing and highway certifications.

The 3D printed LM3D Swim car uses Sabic polymers

The LM3D Swim is the follow-up to the 3D-printed car shown at the SEMA show in 2015 and was itself exhibited for the first time at SEMA in Las Vegas this year. This followed a competition hosted on Local Motors' co-creation platform, Open IO, and won by community member Kevin Lo.

www.local-motors.com
www.sabic.com

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Polykemi adds Chinese compounding capacity

Polykemi has completed an expansion of its site at Kunshan in China's Jiangsu province, near Shanghai. The facility, like Polykemi's original site at Ystad in Sweden, mainly supplies the automotive sector, but has also grown in other fields and recently celebrated its tenth anniversary of operations.

This new investment takes the size of the facility from 4,500 to 11,500m^2. It will more than double production capacity from 9,500 to nearly 20,000 tonnes/year, according to Magnus Lindahl, managing director of Polykemi Compounds China.

With the additional space, Polykemi China is planning to focus on the materials supplied by its Scanfill subsidiary to the packaging industry. A special clean room area is planned, where this material can be further developed and refined.

www.polykemi.se

SKZ tests NMR cure technique

The German Plastic Centre (SKZ) has said it is testing the use of single-sided nuclear magnetic resonance (NMR) for non-invasive determination of the degree of cross-linking of thermoplastics and thermosets.

The project is funded by the Federal Ministry for Economic Affairs & Energy through the programme for the Promotion of Cooperative Industrial Research and Development (IGF).

www.skz.de

Fighting fire on every front

Demand for flame retardants is growing fast but increasingly tough performance and environmental requirements present tough challenges for FR additive manufacturers. **Peter Mapleston** reports

Global growth in the world flame retardant market is pitched to grow at 5-10% per year for the coming decade, but this comes with major challenges for compounders and flame retardant suppliers. Especially in the building and furniture sectors, regulators are pushing for increasing fire safety and calling for products to not only resist ignition but also to burn with lower heat emissions to delay fire "flashovers" that can limit escape opportunities for those inside burning buildings and increase dangers for firefighters. At the same time, flame retardant (FR) product development is also being geared to increasingly demanding environmental and health requirements. In particular, concerns about end-of-life issues and the effects of smoke and soot on fire professionals need to be addressed. And the ongoing debate over the use of halogenated materials also continues.

Pinfa, the Phosphorus, Inorganic and Nitrogen (PIN) Flame Retardant Association (part of Brussels, Belgium-based Cefic), says PIN-containing, non-halogenated flame retardants can be seen as a response to these challenges. They are said to offer good environment and health profiles throughout production, processing, product use and disposal. "PIN FRs enable low-smoke, low-corrosivity solutions essential to reduce fire danger and enable escape in enclosed spaces, such as transport and buildings, as well as limiting damage to electronic systems (which are vital in case of emergency)," says Pinfa.

"Reducing smoke can also mean lower production of toxic soot and fire residues. PIN substances are compatible with materials recycling and work is underway to improve knowledge in this area." Pinfa began such a project earlier this year with the **Fraunhofer LBF Institute** for Structural Durability and System Reliability.

"An increasing range of PIN FR solutions is available for nearly all thermoplastic applications and compounds, and considerable progress has been made to ensure full compatibility of processing and finished polymer quality and characteristics," says the organisation. It notes that some PIN FRs are produced from bio-sourced materials (including biological materials such as chitin or DNA) and are compatible with renewable polymers based on feedstocks such as lignin and polylactic acid (PLA).

Nanostructured research

Development of highly efficient flame-retardant non-halogenated additives for thermoset and thermoplastic polymers is also currently being undertaken within the European Union sponsored Phoenix project—again involving Fraunhofer LBF. This is concentrating on nanostructured materials and innovative processing routes, with the aim of "finding a true cost-effective and sustainable alternative" to halogenated flame retardants that will also deliver a significant improvement in mechanical properties and processability.

"New compounding techniques such as the Nanodirekt process [developed by the Fraunhofer institute for production of nano-suspensions and their direct dosing into thermoplastic matrices], and highly innovative systems such as ultrasound mixing systems coupled to

Main image: Flame retardant producers are working hard to develop additive technologies that meet the latest performance, environmental and health requirements

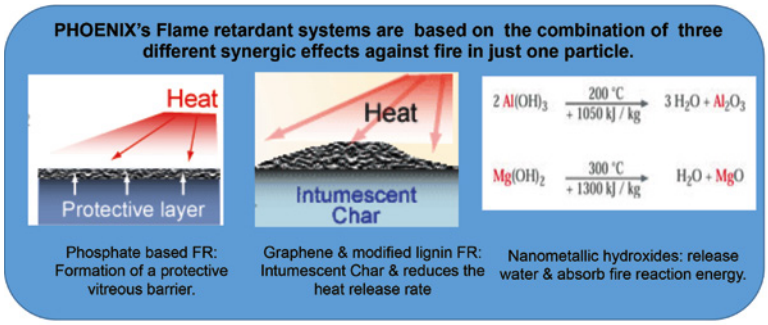

Figure 1: Phoenix project schematic shows the effect of each type of FR particle and the mechanism to protect plastics from fire

extrusion and injection equipment, will assure high nanoparticles dispersion in the polymer nanocomposites and in the final pieces, thus achieving optimal properties," according to Phoneix project partners.

Begoña Galindo, Technical Coordinator of the Phoenix project at Spanish plastics technology institute Aimplas, says that nanotechnology "allows the replacement of hazardous chemicals to produce sustainable flame retardants additives based on nano-layered structures produced using innovative green chemical routes. Nano-layered nanoparticles such as metallic nanohydroxides and graphene nanoplatelets are being synthesised and functionalised. The synergic effect of combining different nano-layered nanoparticles is studied by preparing flame retardant systems by means of a self-assembly process (Figure 1).

"Hollow nanoparticles are produced to allow the encapsulation of organic flame retardant aiming to increase their heat resistance during production. The last development of new FR additives is based on modified lignins from renewable sources." Lignins are modified in order to contain phosphorous functional groups. Nanoparticles are dispersed in thermoplastic polymers by melt compounding.

Fire tests have shown promising results to date, says Galindo. UL94 V-0 classification has been achieved with an additive content of 15% in polyolefins. Fire behaviour has been improved in ABS with phosphorylated lignins by decreasing the heat release rate in 58% and reducing the time to ignition in 50%. Further trials are being carried out with ABS and other high temperature polymers.

Polyolefin solutions

The range of applications for polyolefins continues to multiply, thanks in part to the abundance of low cost raw materials, according to **Adeka**. However, since polyolefins are combustible materials, the addition of a flame retardant is necessary for those applications where flame retardance is required. On the other hand, polyolefins have poor weatherability and it is necessary to add light stabilisers to inhibit photo-degradation of polyolefins for outdoor applications, which the company says can impact on fire performance.

In general, hindered amine light stabilisers (HALS) are used to improve the weatherability of polyolefins. However, it has been difficult to provide polyolefins that are flame retarded using halogenated systems with good weatherability because HALS is deactivated by hydrogen halide generated during processing by the flame retardant. For this reason Adeka has been developing a new halogen-free intumescent flame retardant system, the ADK STAB FP-2000 series, for polyolefins. It says the new system can depress smoke density and generation of carbon monoxide gas during combustion. "Moreover," it says, "ADK STAB FP-2000 series offers excellent weatherability by the combination with HALS because of low acidity. This may help expand the scope of the flame retarded polyolefins." See Figure 2 for more data.

Huber Engineered Materials is also working on functional halogen-free fire retardant additives (along with ground calcium carbonate fillers for a variety of applications) and has been building up its flame retardant business in recent years. Its 2010 acquisition of Sherwin-Williams' Kemgard flame retardant and smoke suppressant business was followed three years later by that of the specialty hydrate flame retardant business from Almatis. This June, Huber acquired Safire nitrogen and phosphorus halogen-free fire retardant technology from Floridienne Group and Catena Additives.

Safire products are specialised char-forming additives that Huber says impart high levels of fire retardance and smoke suppression in engineering plastics and also coatings. The company intends to integrate the technology within its existing halogen-free portfolio, and rapidly develop a line of commercial products.

Producers of cable compounds can gain a performance advantage from Huber's expertise in surface

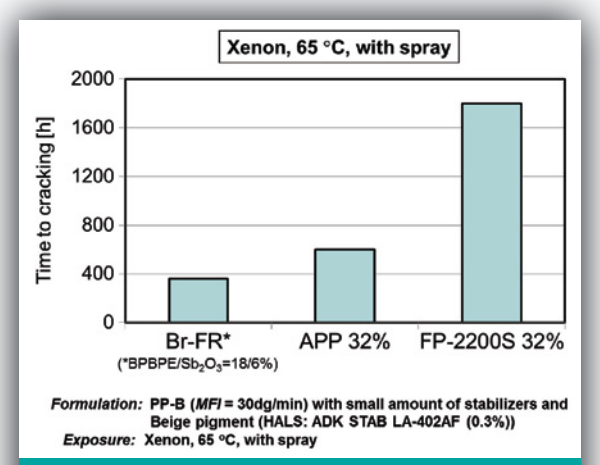

Figure 2: Weatherability of PP-B with FP-2200S in the presence of HALS
Source: Adeka

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Right: Cables are a key market for LKAB Minerals' Ultracarb halogen-free FR additive

treatment technology, claims Don Mills, Global Sales Director in Huber's Flame Retardant Additives business unit. From the company's range of alumina trihydrate (ATH) and magnesium hydroxide (MDH) flame retardant products, he highlights two particular grades of magnesium hydroxide, Vertex 100 SP and Zerogen 100 SP. He says Vertex 100 SP, with a median particle size of 1.5 microns and a surface area of 14 m^2/g, allows compounders to achieve a UL-94 V0 rating with very low smoke generation in halogen-free cable jackets. Zerogen 100 SP has an ultrafine particle size, low surface area and high purity, and is designed to provide superior high temperature, wet electrical properties in halogen-free wire and cable compounds. Median particle size and surface area are 0.8 microns and 5 m^2/g respectively.

With Actilox CAHC, **Nabaltec** offers an LDH (layered double hydrate) based on calcium and aluminum (CAHC stands for Calcium-Aluminum-Hydrate-Carbonate). It works as an acid scavenger in polyolefins or PVC, particularly as a co-stabiliser in Ca/Zn systems, as well as an extender for tin stabilisers. The company claims it also performs well as a co-flame retardant in PVC compounds.

Nabaltec says that if PVC compounds require strict flame retardant properties and low smoke emissions, then typically antimony trioxide (ATO) or a huge amount of ATH (aluminum hydroxide) are added as flame retardant additives. "While flame retardant low smoke compounds with high ATH loadings have to struggle with mechanical restrictions, ATO is under pressure due to its suspected carcinogenic potential for humans," Director Michael Klimes says. "The flame retardant effect of Actilox CAHC is comparable to that of metal hydrates like ATH or MDH (magnesium dihydrate). In case of fire the material decomposes under absorption of energy."

This decomposition leads to a cooling effect while the released carbon dioxide and water vapour dilute the burnable gases. The remaining calcium-aluminum-oxide forms a stable char, which prevents the polymer from further decomposition and also acts as an effective smoke suppressant. "If an ATH like our Apyral 40CD is combined with Actilox CAHC, a synergistic flame retardant effect can be obtained," says Klimes. "This results in lower heat emission and less smoke production compared to pure ATH filled compounds. Furthermore, the total amount of filler can be reduced, which has a positive effect on the mechanical properties."

Right: LKAB Minerals produces Ultracarb halgoen-free FR from hydromagnesite and huntite deposits

Klimes also notes that some compounders may use zinc borate as an effective smoke suppressant in PVC, but have to fight "zinc burning" behaviour. "To avoid or balance this decomposition of PVC, Actilox CAHC as acid scavenger can help and enhance the thermostability," he says, adding that with a combination of different inorganic flame retardants, it is possible to reduce or even replace ATO in the formulation.

Attractive economics

At **LKAB Minerals**, Business Area Manager Peter Duifhuis says the company "clearly sees a trend towards an economically attractive alternative to chemically produced halogen-free fire retardants. He says that in UltraCarb, a halogen-free fire retardant produced from LKAB Minerals' own natural hydromagnesite and huntite deposits, the company is well-placed to address that trend.

The hydromagnesite supports the water release starting at around 220°C whereas the huntite is responsible for CO_2 release at around 450°C. At around 600°C the char stabilization begins. UltraCarb is especially good at reducing smoke in thermoplastics such as PVC, the company says.

LKAB Minerals is currently working on a lifecycle analysis of UltraCarb and results will be published in 2016. "We are currently implementing our next generation grades of UltraCarb for the use in halogen-free thermoplastics to provide 100% halogen-free solutions to the industry," says Rob Lammertink, the company's R&D Manager.

Paxymer says it has designed a novel flame retardant mechanism that works by propagating cross-linking in the backbone of the polymer in a fire

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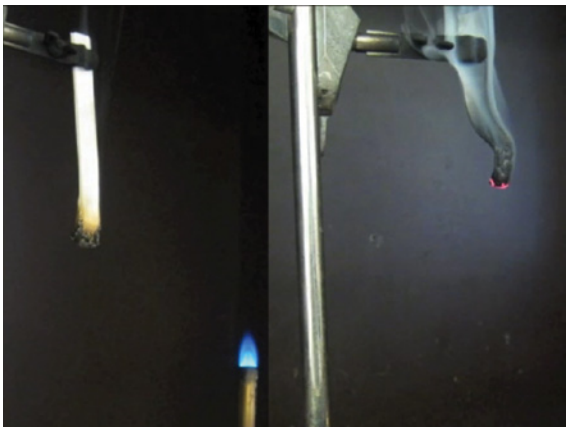
situation using functional polymers. The activation temperature of the system is over 400°C, "which provides for safe and efficient processing in twin- and single-screw extruders," the company notes. The system is intended for combination with conventional halogen-free products for use in polyolefins.

The system, also called Paxymer, works synergistically with HFFR additives and improves burning behaviour. It reduces the amount of HFFR additives needed to achieve a specific burning standard, and also reduces the dripping, heat release rate and burning speed of materials through its cross-linking action. Paxymer is said to improve the mechanical and processing properties of formulations due to its functionality and the reduced amount of additive required to fulfil burning standards. The supplier further notes that Paxymer is free from persistent and endocrine disrupting chemicals.

Paxymer founder Swaraj Paul introduced the first generation of the company's products at the AMI Flame Retardants in Plastics conference in 2009. He says the current product family (the 700-series) is designed primarily for converters and delivers standalone flame retardant functionality. Paxymer will launch a new generation of products onto the market, the 300-series, in early 2016.



Left: This 1.6mm thick PP copolymer function shows the Paxymer technology on the left against a standard brominated sample in a UL94-V0 evaluation

Paul says the synergistic product family for combination with existing HFFR technologies is designed to boost fire and mechanical performance of compounds and increase compounders' flexibility for customising HFFR formulations. Paxymer is suitable for products with thin and thick wall thicknesses.

Polymer Dynamix says it has expanded the use and

Right: Paxymer's FR system propagates cross-linking in a fire situation and works synergistically with HFFR products

suitability of it DynaSil FR synergist platform. Depending on the polymer type and the flame retardant, DynaSil FR products can be used in combinations with bromine, metal hydrate, phosphonate and phosphinate type chemistries. "The use of DynaSil FR allows compounders and formulators greater flexibility in designing flame retardant compounds in resins like PP, PE, EVA, nylons, polyesters, PVC and TPU," says Marketing Director Viggy Mehta. "DynaSil FR can be used to improve fire properties such as lower smoke, slower flame spread and improved vertical burn tests. It can also be used to lower the amount of flame retardant used in a system helping to boost physical properties and improve the processability of fire retardant compounds."

Mehta says this is made possible "due to the unique activity of the DynaSil FR additive during a fire test allowing it to help form a fast acting char causing a break in the fire tetrahedron [this is the classical fire triangle of oxygen, heat and fuel, with the addition of a fourth component, the chemical chain reaction]." DynaSil FR is available as a 50% concentrate in a variety of resin systems.

Cornerstone of **Thor**'s FR portfolio for thermoplastics is the Aflammit PCO range of products (PCO 700, 800, 900 and more recently PCO 820) based on phosphonates. The company says they are distinguished by high efficiency (very low loadings), particularly when combined with special synergists such as amino ether HALS compounds (Flamestab NOR116 from BASF or Hostavin NOW from Clariant, for example), which allows lower loadings in polyolefins compared to traditional halogen/ATO combinations.

"Introduced many years ago to masterbatch producers, they today increasingly find application in thin-walled articles (films, thermoplastic foams, fibres) where such combinations offer an unmatched range of benefits (improved physical properties, maintenance of transparency, excellent UV stability compared to BFR/ATO) at affordable cost - and where added costs apply, they often offer added value," says Jerome De Boysere, Group Business Manager, Flame Retardants for Plastics.

Meanwhile, he says, Aflammit PCO grades and their synergistic combinations have also been successfully developed in thicker parts (injection moulded or extruded articles such as seats and corrugated pipes) to meet specifications other than UL 94 V-0, but at higher thicknesses they also compete against other FRs so their potential use in other applications must be evaluated individually.

Thor is also developing a growing family (general purpose and customised grades) of intumescent FRs, the Aflammit PPN range, which De Boysere says is increasingly finding success in many polypropylene and TPE applications to meet UL 94 V-0 (or 5V) requirements at 0.8 or 1.6 mm.

Engineering developments

For use in polycarbonate and PC/ABS resins (transparent and coloured applications including LED components), **MPI Chemie** is promoting its new Mileflame HPCTP flame retardant, which it says can yield flame retardancy in compounds up to V-0 while the oxygen index can reach 33%. The addition rate to achieve V-0 in polycarbonate is 8-10% while for a PC/ABS blend it is around 10-12%, the company says.

The main structure of Mileflame HPCTP consists of phosphorus and nitrogen. MPI Chemie says the structure is stable, after burning it will produce little to no smoke, and the thermal stability is good. It can endure temperatures exceeding 250°C for an extended period of time, as well as very low temperatures.

"After using HPCTP, the PC is water and oil-proof, and will not be attacked by organic solvents," the company claims. "The required dosage is relatively low (approximately 50% lower than BDP and RDP). Due to the stable structure and low dosage, the quality of the final product will not change (in fact it could even

Right: Reducing smoke generation is a priority in FR development

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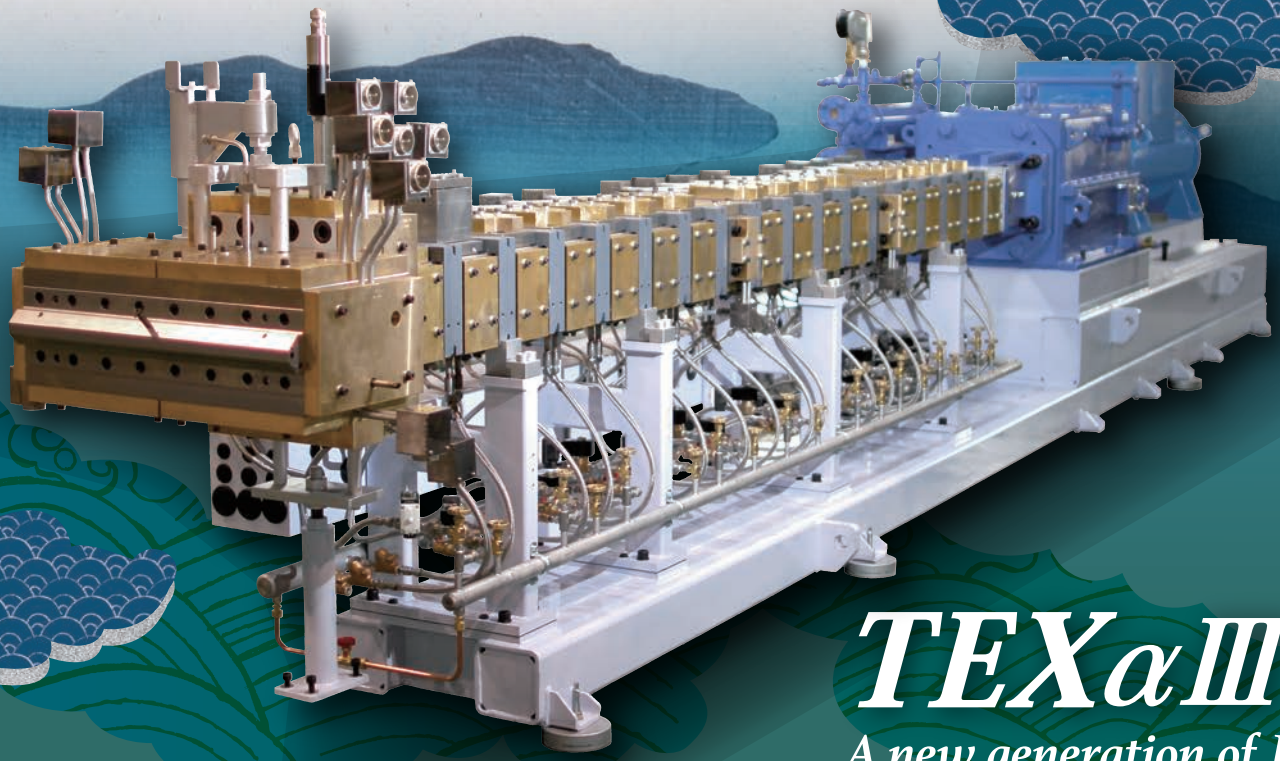

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improve compared to the use of other flame retardants)," it claims.

The material is primarily supplied in powder form, but can also be supplied in a liquid (less concentrated) form, to better correspond with existing polycarbonate production processes.

Daihachi Chemical highlights its PX-200 halogen-free phosphoric acid ester flame retardant, which it says is an easy to handle powder type product with a melting point of 95°C. It is said to display superior hydrolysis resistance and is widely used for engineering plastics in the Asia Pacific area, according to the company. Daihachi Chemical also has a developmental halogen-free flame retardant, PX-202, which has higher heat-resistant and stronger hydrolysis resistance than PX-200.

Bromine developments

Suppliers of brominated products have a fight on their hands when it comes to arguing environmental benefits or otherwise of FR additives. But **ICL Industrial Products**, which is the largest producer of elemental bromine in the world and a leading supplier of brominated FR products (as well as other inorganic and phosphorus-based types is prepared to make the case. Earlier this year, it unveiled what is describes as a new science-based assessment tool for flame retardants, called SAFR (Systematic Assessment for Flame Retardants). The tool, which is for use across all flame retardants, assesses the sustainability profile of individual flame retardants according to their application.

Ilan Elkan, ICL-IP's VP of Sustainability and Advocacy, says that for SAFR to fulfil its intended use, it needs to be adopted by all parts of the value chain, "where it will enable purchasing decisions to be made based on the sustainable use of a product in a specific application. SAFR is a step-change for the industry and marks a new level of transparency. Not only will our direct customers benefit, but those up the user chain will be able to measure not only the hazard, but the exposure of any given flame retardant."

Elkan says that, building on existing accepted hazard criteria, the approach assesses the extent to which potential hazards translate into potential risks due to possible exposure to humans and/or to the environment during the service life of the flame retardant. The SAFR tool provides one of four possible outcomes for each product assessed: uses that are 'recommended', 'acceptable', or 'not recommended' and 'unacceptable hazard'. Flame retardants in applications which have a rating of 'recommended' through to 'not recommended' are all usable. However, users of flame retardants which achieve a 'not recommended' rating will be provided the option of an alternative product with a 'recommended' or 'acceptable' rating.

ICL-IP products that have an 'unacceptable' hazard rating – including those that are still in the development phase - will be, and in many cases have already been, phased out in coordination with the value chain. The company says the methodology behind SAFR can be made available to any interested party upon request.

Lein Tange, Product Stewardship Manager for ICL-IP Europe, says the company's high molecular weight polymeric bromine-based additives exhibit low water solubility, no leaching, no blooming, and low potential for bioaccumulation. He highlights solutions for automotive applications for compounds operating in high temperature service conditions, E&E components such as connectors and relays, electronic and electrical enclosures and numerous building and construction applications.

"In order to comply with processing and allow for high fire safety standards for polyamides and polyesters, brominated polyacrylate (FR-1025), brominated polystyrene (FR-803P) and high molecular weight brominated epoxy polymers (F-2000 and F-3000 series) are offered," says Tange. The latest provide efficient flame retardancy to styrenics compounds as well.

For XPS and EPS thermal insulation, ICL has launched FR-122P a high molecular weight brominated butadiene / styrene block copolymer. Innovative, solid and dust-free pastillated Fyrolflex Sol-DP, an efficient phosphate based flame retardant is recommended for styrenic and styrenic alloys such as PC/ABS and PPO/HIPS.

Regulatory restriction

In October this year, **Chemtura** announced its exit from the manufacture and sale of hexabromocyclododecane (HBCD)-based flame retardant products. "Increasing regulatory restrictions on the use of HBCD-based flame retardants and the commercial development of a viable and 'greener' alternative, Chemtura's Emerald Innovation 3000 flame retardant, have resulted in an unsustainable commercial environment for HBCD," the company said.

Chemtura will permanently discontinue production of HBCD-based flame retardants during, or prior to, the fourth quarter of this year. Sales of HBCD will continue until inventories are depleted.

One of the key factors in the success of any new

Table 1: Impact of additive loading on FR system cost

FR Additive Product	Product A	Product B
Price per pound	$ 5.00	$ 18.00
Loading level	5 %	0.5 %
Cost contribution	$ 0.25 per pound	$ 0.09 per pound

Source: Flame Retardants Associates

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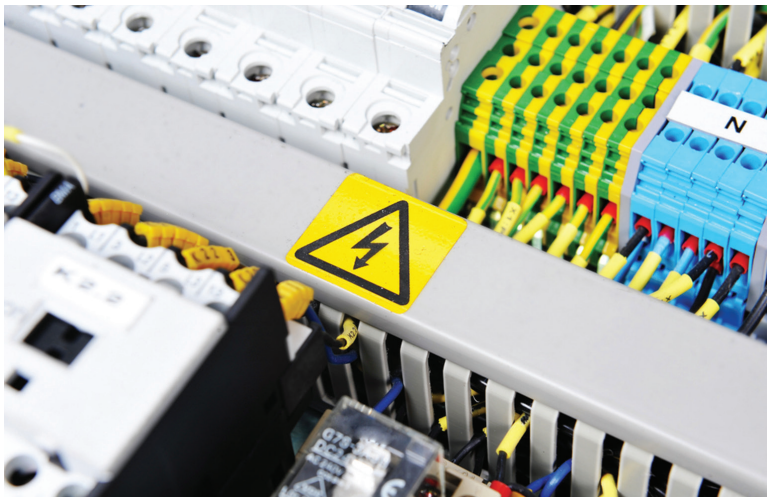

Above: Electrical connectors and relays are said to be a potential market for ICL-IP's high molecular weight polymeric bromine-based FRs

product technology is the price/performance issue. Specifically, purchasing agents and formulators must understand fully how to compare new products to determine the actual cost to their business units.

One consultant in this area, Flame Retardants Associates, says it repeatedly finds that pricing of flame retardant additives used in thermoplastics is not well understood. It says that it recently received an inquiry for pricing on a sulphonate FR for polycarbonate from a purchasing agent in Asia. "The problem is that this agent was about to make his FR selection on a direct and simple dollar per kilo comparison. There was no comprehension of the need to consider loading level typically used," says Ann Innes at the consultancy firm.

Table 1 shows how loading level affects price comparisons of FR additives. "A selection of FR Product A or B based solely on a simple price per pound comparison would result in the selection of Product A at $5.00 per pound," says Innes. "However, understanding and applying the differences in usage levels and calculating the cost contribution to the formulation shows that Product B which contributes a cost of only $0.09 per pound is actually by far the less costly approach.

"Business managers with an eye on the bottom line must make sure their purchasing agents and formulators are provided with adequate guidance on how to correctly assess price comparisons for any thermoplastic additives. Another very important cost comparison factor, particularly for complicated injection moulding thermoplastic compounds, is specific gravity. The cost assessor (purchasing agent and/or formulator) must understand how to accurately compute the effects of specific gravity of formulation components on the cost contribution to the injection moulding compound as well as the loading level effects explained above. "

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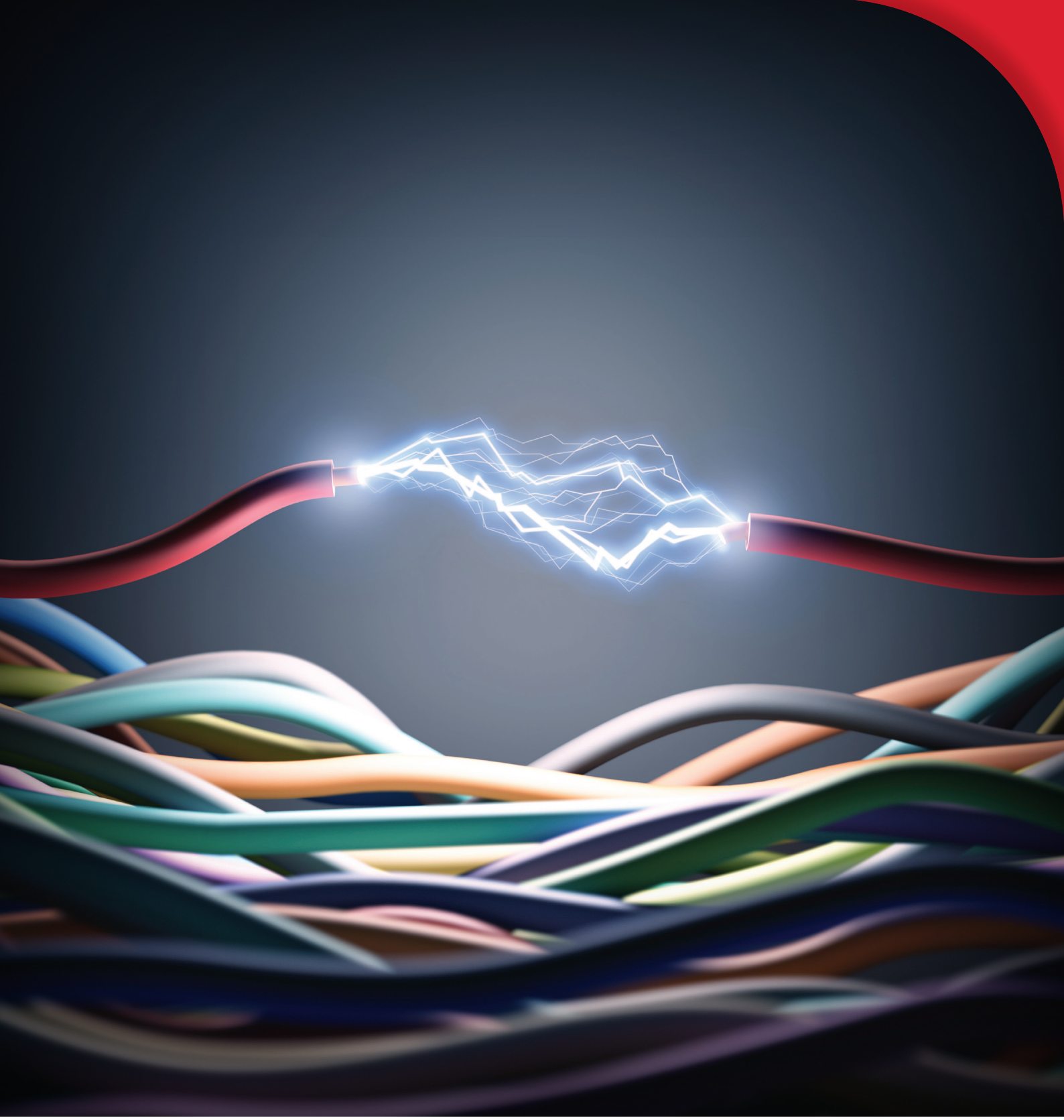

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A variety of halogen-free flame retardants are available for polyamide resins. Clariant head of flame retardant development **Dr Sebastian Hörold** details the options available to compounders

Formulating fire retardant PAs

For some 15 years now, the use of various halogen-free flame retardants (HFFRs) has been increasing in engineering thermoplastics in general and in polyamides in particular. They have now become the main flame retardant systems for such polymers, due to their good environmental credentials and ability to meet end use requirements without compromising safety.

The growth in HFFRs has been spurred by regulations such as RoHS (Restriction of Hazardous Substances), REACH (Regulation on Registration, Evaluation, Authorisation and Restriction of Chemicals) and WEEE (Waste Electrical and Electronic Equipment). These are all European but similar regulations exist today in many other countries.

Also having an influence, although less so, is the new pan-European fire protection standard for railway passenger vehicles, EN 45545, which comes fully into force in March 2016. The new standard specifies test methods and limit values and establishes requirement sets (R1 to R26) for components. For materials used in connectors, for example, R22 and R23 are the maximum applicable requirement sets (the first is for internal applications, the second for external), mandating values for Limiting Oxygen Index (LOI), smoke density and the toxicity of any gas produced. Hazard levels HL1 to HL3 indicate the testing severity, with HL3 being the most severe.

There are no norms or laws currently calling for flame retardance in automotive components and systems, except for the US Federal Motor Vehicle Safety Standard (FMVSS) 302 for interior components (FMVSS 302 is a flame spread test - foams, films and textiles need flame retardants to pass it but injection moulded parts normally do not). However, the industry is clearly moving in the direction of increased fire safety, as evidenced by the publication of the US National Fire Protection Association (NFPA) guide to fire and hazard (NFPA 556) at the end of the last decade.

The bulk of flame retarded polyamides are used in electrical and electronic applications, as well as in civil engineering and in transportation. Automotive has been emerging as a key development area, since materials need to offer a particularly high performance mix of mechanical, electrical and flammability characteristics for applications such as battery housings, connectors, sensors and – perhaps for the future - fuel cell separators. Automotive applications account for around 45% of the total market for injection moulded polyamides, but today most of them are not flame retarded.

More than a quarter of the total market for injection moulded polyamides is accounted for by electrical and electronic applications, the overwhelming majority of which call for stringent flammability requirements, often UL 94 V0—and this is increasingly called for at wall thicknesses down to 0.4 mm. Close to 10% of the total market is accounted for by general industrial and engineering applications – for example in circuit

Above: Optimising the performance of flame retarded polyamides requires an in-depth understanding of the different additive options available

Table 1: Flame retardants for polyamides detailing mode of operation

	Halogen + Antimony trioxide	Melamine salts	Organic phosphinate + Nitrogen	Red Phosphorus	Magnesium Hydroxide
Gas phase	+		+	+	
Char formation		+	+	+	+?
Cooling/ Dripping		+			+
Inert gas		+	+		+

Source: Clariant

breakers and switches – where once again flame retardance is a requirement.

New applications such as LED lighting and photovoltaics, as well as automotive electronics, are providing the highest growth opportunities for halogen-free flame retarded polyamides. LED applications in particular also require materials with high resistance to UV radiation. Growth opportunities can be seen as well in computer server farms for cloud computing and the "Internet of Things".

Polyamides 6 and 66 are semi-crystalline polymers known for their good mechanical properties and good thermal stability at a competitive price. But they are not inherently flame retardant. In fire situations, polyamides show a higher heat release rate than polycarbonate but less than polyester. This affects the amount of flame retardants necessary to pass industry fire test standards.

Fibres and flame retardance

In many applications, polyamides are required to be reinforced with glass fibres and this negatively affects their flammability performance - as it does in fact with other polymers - because glass fibres tend to act like a wick in a candle. So while an unreinforced standard polyamide may have a UL94 V2 flammability rating, a glass reinforced compound of the same polymer is likely to not achieve any classification.

Along the supply chain from polymer producer to OEM there are numerous trends and economic drivers that have an effect on the development of new flame retardants and flame retarded compounds. These include: the emphasis on "green" credentials, colourability, laser markability, speed of processing and miniaturisation. Compounders and injection moulders, therefore, need to have a deep understanding of what kind of flame retardants are available for the plastics they are processing, how and how well they perform, what effect they have on other important properties in a particular application, and how they can be considered in terms of sustainability.

Table 1 outlines the various types of flame retardant for polyamides and their principal mode of operation.

Not only do these various additive systems work in different ways, but they also work at different addition rates and so have different effects on the properties of the polymer. Magnesium hydroxide, for example, needs to be added at a level of more than 45% by weight in a glass reinforced PA6 to obtain a V0 performance, while brominated polystyrene/antimony trioxide synergistic systems provide the same result with a loading of just over 26%. An organic phosphinate with a nitrogen-containing synergist comes out even better, requiring a loading of 20% in polyamide 6 and 66, and in semi-aromatic polyamides as little as 12-15%.

Reviewing the options

Magnesium hydroxide has the advantage of low smoke density. Electrical properties are also good, and parts can be coloured. But the high addition rates give problems in processing, in mechanical properties and in part density.

Melamine cyanurate is the standard flame retardant for non reinforced polyamide applications. It is added at the same levels as organic phosphinate. But in glass fibre reinforced polyamides it can only achieve a V2 performance. It cannot be used in PA66 either, since it begins to degrade at temperatures above 275°C (the melting range of PA66 is around 45°C higher than that of PA6). It does have good electrical properties though, and parts can be made in any colour. So, for applications where moderate flame properties are required, it can be a cost-effective solution.

Red phosphorus achieves a V0 rating in polyamide 66 with glass fibres with a loading of just 7%. Since it is a flammable powder, it is commonly used a a masterbatch. Finished parts have good mechanical and electrical properties but caution is called for during processing due to phosphine emissions and in hot and humid environments corrosion of copper conductors is sometimes reported. Colour options in finished parts are severely limited to dark red, brown and grey/black shades.

On paper, brominated polystyrene synergized with antimony trioxide is a very good solution - parts have good mechanical properties and high glow wire ignition temperatures, and they can be coloured. But electrical properties are not the best and, for components where weight counts, the high density of the additive system works against it. A standard 30% glass reinforced polyamide 66 has a density of around 1.35 g/cm^3, but a grade flame retarded with a Br/AtO system weighs in at just under 1.70 g/cm^3. And in consumer electronics, where public image counts much more than it does in industrial E&E, the fact that it is a halogenated solution is an important negative.

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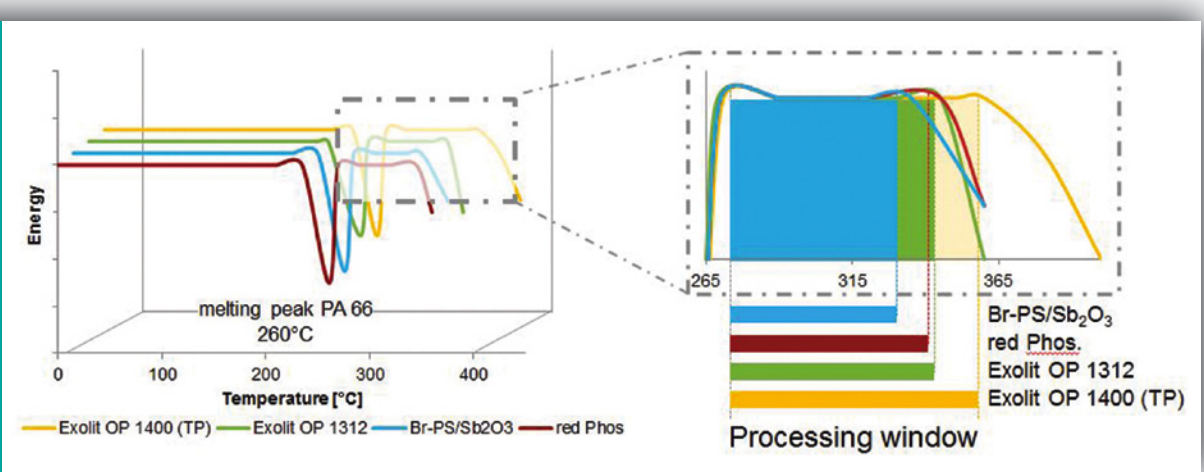

Figure 1: DSC data shows phosphinate flame retardants based on P-P synergism, such as Clariant's Exolit series, can provide an extended processing window

at low addition rates and parts have good electrical and mechanical properties. They can also be coloured. Typical density of a 30% glass reinforced PA66 retarded with such a system is around 1.46 g/cm^3. Compared to compounds containing the brominated polystyrene/antimony trioxide system, 14% less total material by weight is consumed to make the same number of injection moulded parts using phosphinates.

Improving synergists

Over the last few years, it has been found that the nitrogen synergist limits thermal stability of the polyamide compounds and a great deal of work has gone into creating systems that use a different synergist. Clariant has identified and now commercially produces a suitable phosphorus-based flame synergist.

Phosphinates based on phosphorus-phosphorus (P-P) synergism are distinguished by their enhanced processing stability. DSC data (Figure 1) indicate a processing window considerably wider than phosphorous-nitrogen (P-N) systems, red phosphorus, and brominated types.

Right: Demand for flame retarded polyamides is growing across all market sectors

Cone calorimeter tests show that new P-P systems have heat release rate curves similar to those of P-N types. Flammability ratings and glow wire performance are also similar. With a system such as Clariant's Exolit OP 1400, for example, it is possible to achieve a V0 rating at thicknesses down to 0.4 mm.

Exolit OP 1400 provides very good electrical properties such as comparative tracking index (CTI), so it is especially good for polyamides as used in connectors, circuit breakers, switches, and the like. It has enhanced processing stability, with no blooming, and has a negligible effect on the mechanical properties of the compound. And a PA66 GF30 compound flame retarded with a P-P system has a significantly lower smoke toxicity index than one using a P-N system, because less hydrogen cyanide (HCN) is produced. Smoke density is also lower, which makes this system useful for railway and other transport applications. Polyamides with glass fibres and Exolit OP 1400 can achieve the highest safety level under EN 45545, HL 3, due to their high LOI together with low smoke density and toxicity.

Processing performance

As noted earlier, polyamide 66 generally requires flame retardants that can resist processing temperatures of up to around 300°C, and it is not unknown for temperatures to reach as high as 340°C. Polymer degradation, formation of decomposition products and discolouration can all occur when additives with insufficient thermal stability are compounded and processed. Differential scanning calorimeter (DSC) analysis shows that that reinforced PA66 compounds containing phosphinate flame retardants synergized with phosphorus have the broadest processing window of any flame retarded PA66.

Clariant currently produces Exolit OP 1400 in a pilot plant but it is in the process of extending capacity. A fully commercial plant is scheduled to come into operation during the first quarter of 2016.

Several compounders are already producing

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Right: The EN 45545 railway standard has set tough new performance limits for plastics in all rail applications

materials containing Exolit OP 1400, including PA specialist Nilit Plastics Europe. "Halogen-free FR systems have dramatically developed over the past 10 years to help PA6 and PA66 become major materials for electrical and electronic components that meet safety regulations while accommodating important E&E trends, notably thinwalling," says Dr. Wolfgang Diegritz, responsible for Marketing & Business Development Europe North at Nilit Plastics Europe. "They allow PA compounds to keep their position as materials with the best cost: performance ratio among flame retarded and inherently flame retardant resins. Exolit 1400 should support continuing progress in the E&E industry."

About the author:

Dr. Sebastian Hörold is head of development for flame retardants for thermoplastic polymers at Clariant in Gersthofen, Germany. He is also head of application technology, plastics in Clariant's Additives business unit. He holds a PhD in technical chemistry from the university of Braunschweig and Oldenburg and has worked with Clariant (and previously Hoechst) since 1994.

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18 - 20 April 2016

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18-20 April 2016, Maritim Hotel, Cologne, Germany

AMI and Compounding World magazine are pleased to announce the 2nd edition of their Compounding World Congress, which takes place on 18-20 April 2016 at the Maritim Hotel, Cologne, Germany.

This conference will build on the success of the first Compounding World Congress, creating a vibrant meeting place for thermoplastics compounders from throughout Europe and beyond.

Selected by the editorial team of Compounding World magazine, the event's high-level programme 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 optimise compounding operations

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Delegates can visit the HPF mine and processing facility, as part of the conference. More details can be found on the next page.

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The exhibition at the Compounding World Congress 2015 in Cologne featured all these leading suppliers:

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CONFERENCE PROGRAMME

Monday 18th April 2016

13.00-17.00 Site visit to HPF The Mineral Engineers, a division of Quarzwerke Group

Delegates will be taken by coaches to and from the HPF facility in nearby Frechen. There will be a tour of the R&D laboratories and a company presentation followed by a networking break.

17.00-19.30 Registration
18.00-19.30 Welcome Cocktail Reception

There are no conference sessions on this day

Tuesday 19th April 2016

08.00 Registration welcome coffee
09.00 Opening announcements

SESSION 1 – MARKET TRENDS AND STRATEGIES FOR SUCCESS

09.10 **Analysing trends in the global thermoplastics compounding industry**
Mr. Andy Beevers, Publisher, Compounding World magazine, APPLIED MARKET INFORMATION Ltd., United Kingdom

09.40 **Strategies for growing a profitable compounding business in an increasingly competitive global marketplace - panel discussion with:**
Mr. Massimo Pavin, CEO, SIRMAX SPA, Italy
Mr. Murat Cansever, Managing Partner (Technical), EUROTEC ENGINEERING PLASTICS, Turkey
More panelists to be confirmed

10.40-11.10 Morning coffee sponsored by: JSW THE JAPAN STEEL WORKS, LTD.

SESSION 2 – SCALING UP YOUR COMPOUNDING BUSINESS

11.10 **Realising lab scale R&D innovations on a complex global manufacturing environment – challenges & approach**
Dr. Shyam Sathyanarayana, Polymer Processing Expert, BASF CORPORATION, United States

11.40 **Industry 4.0 for PP-large scale compounding – an example of an inline MFI – closed loop control measurement**
Dipl.Ing. Sven Wolf, Managing Director, LEISTRITZ EXTRUSIONSTECHNIK GmbH, Germany

12.10 **Advances in polyolefin and polyamide compounds for automotive components: effects of raw materials & processing**
Dr. Abdullah Al-Mamun, Material & Process Development, Corporate Research & Development, ADLER PELZER GROUP, Germany

12.40-14.10 Lunch sponsored by: Penta — A Piovan Company

SESSION 3 – EXPLORING RECYCLING OPPORTUNITIES

14.10 **Re-compounding: The up-cycling approach that enables a second life for plastics waste**
Pd.Dr. Manica Ulcnik-Krump, Head of R&D BU Recycled Resource, ALBA GROUP / INTERSEROH DIENSTLEISTUNGS GmbH, Germany

14.40 **Should recyclers compound or will compounders recycle?**
Mr. Michael Heinzlreiter, Head of Marketing & Business Development, NEXT GENERATION RECYCLINGMASCHINEN GmbH, Germany

SESSION 4 – NEW OPPORTUNITIES FOR COMPOUNDERS

15.10 **The return of polyketones: developing new compounds and applications including long-fibre grades and tribological components**
Mr. Dipl.-Ing. Thilo Stier, Sales Director, Innovation Manager, AKRO-PLASTIC GmbH, Germany

15.40-16.10 Afternoon tea sponsored by: IMERYS

16.10 **Using reactive extrusion to produce polyamides – how compounders can become polymer manufacturers**
Mr. Quentin Huck, Commercial Manager, SETUP PERFORMANCE, France

SESSION 5 – BOOSTING POLYMER PERFORMANCE

16.40 **Compatibilisation of styrene based engineering plastics**
Mr. Ardy Doelen, Sales and Business Development Manager, POLYSCOPE POLYMERS B.V., Netherlands and
Mr. Michael Sommer, Business Development Manager Plastics, GUSTAV GROLMAN GmbH & Co. KG, Germany

17.10 **New developments in processing additives for polyolefins and engineering plastics**
Mr. Juan Bravo, International Technical Manager – Plastics, STRUKTOL CO. OF AMERICA, United States

17.50 End of Tuesday's conference sessions

20.00 Conference Dinner sponsored by: STEER

Wednesday 20th April 2016

08.00 Registration and welcome coffee
08.30 Opening announcements

SESSION 6 – OPTIMISING FILLED AND REINFORCED COMPOUNDS

08.40 **Specifying and processing functional minerals to increase scratch resistance, reduce warpage and add reinforcement**
Dl. Veronica Mayer, Application Manager, KAERNTNER MONTANINDUSTRIE GmbH, Austria

09.10 **Enhancing the mechanical properties of thermoplastic composites with innovative coupling agents**
Ms. Elisa Conte, Technical Development Manager Polymer Additives, AKZONOBEL, Netherlands

09.40 **Optimisation of emission behaviour of PP-talc compounds**
Ms. Shilpa Khare, Research Engineer, FRAUNHOFER INSTITUTE FOR STRUCTURAL DURABILITY AND SYSTEM RELIABILITY LBF, Germany

10.10-10.40 Morning coffee sponsored by: BUSS excellence in compounding

SESSION 7 – NEW DEVELOPMENTS IN CONDUCTIVE COMPOUNDS

10.40 **Thermally conductive polycarbonates – a product class for the electronic industry**
Dr. Klaus S. Reinartz, Director Marketing LED EMEA, COVESTRO DEUTSCHLAND AG, Germany

11.10 **Developing a new generation of material additives for increasing the thermal conductivity of plastics while maintaining good mechanical and flow properties**
Mr. Péter Sebö, Market Development Manager, HPF THE MINERAL ENGINEERS / A DIVISION OF QUARZWERKE GROUP, Germany

11.40 **Exploring a new porous carbon material developed at Delft University of Technology for thermally and electrically conductive plastics**
Ms. Daniela Sordi, Chief Technology Officer, CARBON X, Netherlands

12.10-13.20 Lunch

SESSION 8 – MAKING THE MOST OF YOUR COMPOUNDING LINES

13.20 **How to improve the energy efficiency of plastics compounding operations**
Ing. Corrado Moneta, Technical Sales Manager, ICMA SAN GIORGIO S.p.A., Italy

13.50 **Reducing VOC levels of automotive compounds by optimising devolatilisation in twin-screw extrusion process**
Mr. Kenji Inagawa, Process Engineer, JAPAN STEEL WORKS EUROPE GmbH, Germany

14.20 **Advanced plant solutions for compounding industry: four concepts based on practical examples**
Mr. Thomas Stegmeier, Sales Manager AZO®POLY, AZO GmbH + Co. KG, Germany

14.50-15.20 Afternoon tea sponsored by: coperion

15.20 **Sustainable material handling solutions for a modern compounding process**
Mr. Pierluigi Mondati, General Manager, PENTA Srl, Italy

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

16.20 **Process optimisation - Techniques and options for more profitable twin-screw compounding**
Mr. Frank Lechner, Head of Process Technology Compounding & Extrusion, COPERION GmbH, Germany

16.50 Closing announcements and conference ends

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Signature: _____ Date: _____

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All payments to be made in Euros

Please tick box and write amount:

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❑ 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	€2500 + €475* = €2975	_____
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COMPOUNDING WORLD CONGRESS 2016

CONFERENCE INFORMATION

Date and location
18-20 April 2016
Maritim Hotel
Heumarkt 20
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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 4th April 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).

Compounding World Congress 2016 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.

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Social events
The social events organised for Compounding World Congress 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 19th April 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 Compounding World Congress 2016" conference on:
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Cancellations
Full refunds, less a cancellation charge of €200 will only be made on cancellations received prior to 18th March 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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CONFERENCE HOTLINE

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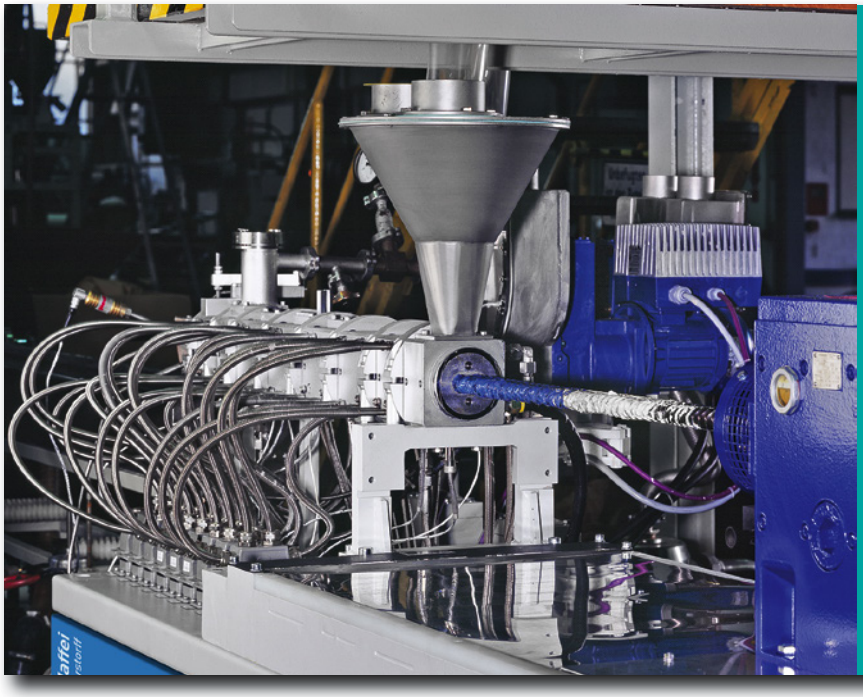

Compound development has never been more important so it is little surprise to see so much innovation going in to laboratory-scale extruders. **Peter Mapleston** looks at the latest introductions

Mixing it up in the lab

Exhibitions are good places to see laboratory extruders because they easily fit on the stand – some even fit on a table. That made the Fakuma show in Germany in October an excellent opportunity to catch up on the latest laboratory compounding system innovations. This article takes a look at what suppliers were showing there and presents a round-up of lab compounding equipment news from around the globe.

Several companies offer equipment in the 25-27 mm range that can do duty as both small production units and also laboratory test-beds. **Feddem**, for example, illustrated its MTS range with a 26mm unit at Fakuma. This is the smallest but, the company says, the most versatile parallel twin-screw extruder in the range. It can be fitted out for diverse process tasks from laboratory work to production of high-performance polymers. The technology is similar to that of the larger extruders in the MTS series and thus creates optimal scale-up conditions, the company says. Depending on the area of application, production rates range from 10 to 150 kg/h.

As with the larger extruders in the MTS model series, a wide selection of equipment options and accessories are available. Depending on the job, screw units are available in various grades of steel – from nitrided to special HIP (hot isostatic pressing) alloys. And thanks to its modular design, the company says the extruder can be extended in just a few steps, for example, from 32D to 52D or even higher. The entire electrical system is integrated into the frame and the machine stands on castors, making it relatively easy to move.

Leistritz demonstrated a ZSE 27i MAXX, which export sales manager Walter Theiler says is suitable for small-scale production as well as lab work, especially for companies producing small batches—something that is increasingly the case, he notes. The machine is said to be good for outputs between 15 and 100 kg/h.

Theiler said that the unit is suitable for developing parameters that can be up-scaled to full production, as long as the scale-up ratio is 1:10 or less. "More than that and it becomes difficult," he says.

KraussMaffei Berstorff is currently introducing its new ZE BluePower twin-screw-extruder series covering screw diameters from 42 – 80 mm. For the time being, the company continues to offer the ZE 25 and ZE 30 models from its proven UTX series for lab applications. According to twin screw extruder sales manager Gerhard Schmitt, sales of these machines is doing quite well. "We do see an increasing need for lab machines over the last 12-18 months," he says. "Companies require them to increase product differentiation and generally keep their noses ahead of the competition."

Both of the UTX units are available in an A-version with high torque and a R-version with high volume. They run at speeds of up to 1,200 rpm and have a flexible screw and barrel concept. The machines are very

Above: The UltraGlide automatic screw pulling feature on KraussMaffei Berstorff's ZE25 lab compounder allows actual mixing performance to be analysed

Right: Century's CXE 26 uses slide mounted feeders to speed up reconfiguration

compact, with the control located in the machine frame under the barrel. The water cooling manifold is also built into the frame. "We call it a 'plug and compound' concept," says Schmitt.

KraussMaffei Berstorff fully tests each unit electrically in-house before delivery to make sure it is bug-free, and Schmitt says it can also test dosing and pelletizing units "when it is in our scope." An optional electrically-driven screw pull-out unit – UltraGlide – can be integrated into the machine frame and takes a maximum of one minute to pull the screw out of the barrel. This makes it possible to examine the actual conditions of the process during test runs, as well as speeding up screw exchange.

Century Extrusion offers the CXE 26 for laboratory applications and General Manager Charlie Spearing points out several key features on the this latest series. "It is feature rich and designed to save space, cost of ownership and to maximise productivity," he says." We have included slide mounted side feeders resulting in a reduced foot print and quick change over/time to reconfigure. We have also included an on-board control system and on-board ancillary systems like barrel cooling unit. This allows for reduced footprint, portability, plug-and-play electrics."

All barrel heater electrics and cooling lines on the CXE26 utilise quick disconnects for rapid changeover. The machine produces a torque density of 15 Nm/cm^3 for maximum process flexibility and throughput.

The company has also developed the CX 26, which includes the same power train as the CXE version but has a more basic specification to enable Century to offer it at what Spearing says is "a very attractive price point."

Focused on speed

Entek's smallest twin-screw model and lab compounder is its QC^3 27MM, part of the same family as the QC^3 43MM model the company launched earlier this year at NPE 2015 (QC^3 stands for Quick-Change, Quick-Clean, and Quality Control). The machines sport many common features including: quick-align shaft to gearbox couplers; shroud covers incorporating single-turn fasteners; quick-open guards for easy access to screw couplings and clutch; an air deflector on the end of motor; and a "point-of-use" tool kit with all the necessary tools mounted in a holder on the machine.

"The response to our new QC^3-43MM machine has been tremendous, and we are happy to be able to now offer our customers the same features on our 27MM and 53MM twin-screw extruders as well," says John Effmann, Entek Extruders' director of sales & marketing. "All of these benefits were things that our customers communicated to us that they wanted to solve common problems, make their lives easier and ultimately improve their productivity."

Japan Steel Works (JSW) introduced a TEX 25 Alpha III laboratory co-rotating extruder earlier this year. It is the smallest of seven TEX Alpha III extruders (which range up to 130mm diameter). JSW says TEX 25 Alpha III series advantages include a new gearbox design combined with enhanced gears and bearings, screw shafts and barrels. "The result is a high torque of up to 194 Nm per shaft (or 387 Nm in total) combined with wider processing windows as well as more powerful kneading and mixing," it says.

A standard torque limiting function on the TEX 25 Alpha III stops the screw to protect machinery and operators, while a low noise water-cooled version of the infinitely variable three-phase motor is optional, as is direct drive instead of the standard V-belt drive.

JSW says its NIC special kneading barrel achieves good mixing/dispersion at low shear rate and high viscosity without dead zones for good compound material properties. The barrel features several longitudinal grooves along its surface for improved screw-to-barrel clearance. A TKD (Twist Kneading Disc)

Right: Leistritz says its ZSE 27i MAXX is suitable for lab and small scale production duties

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Above: Entek's new QC³-27MM with movable controller

kneading screw element with a twisted tip developed for energy-efficiency supports this "tip-clearance technology" by ensuring fast and relatively low temperature material conveying, "while retaining appropriate mixing efficiency." JSW claims such features make the TEX 25 Alpha III the "worldwide highest performance compact twin screw extruder".

JSW says the extruder is well suited for R&D work with frequent material and process changes, as cartridge heaters and a patented barrel clamping mechanism enable easy and rapid barrel section block changes, achieving screw L/D ratios of up to 70 with 20 blocks.

Right: JSW's TEX 25 Alpha III integrates ancillary equipment such as gravimetric feeders and mixers, side feeders, and a variety of pelletizers

Toshiba's TEM-26SX first appeared a couple of years ago, complementing its smaller 18SS and 18DS model. The company says the machine has the highest torque density of any extruder at 18 Nm/cm³. It is available in three versions, Standard, Fast and Super-Fast, with maximum screw speeds ranging from 745 to 1,118 rpm. Units can be configured with between 10 and 16 barrel blocks, giving an L/D ratio of up to 64. Toshiba has indicated the machine could be used for development of normally incompatible polymers, such as bio-derived polyethylene and polylactic acid (PLA).

Noris demonstrated its ZSC 25 unit at Fakuma. The compounder features an integrated PLC that enables control of up- and down-stream units as well as the extruder itself (Noris also produces side feeders and a pelletizer). The unit is not new in itself, but it does incorporate a new drive, says general manager Ralf Tenner. Developed specially for this machine, the compact drive is energy-efficient and quiet, he says. The company also offers the machine in a 20-mm version.

Steer says its advanced compounding platforms provide laboratories and research organisations with the control required to process demanding materials such as natural fibres (jute, wood, sisal, flax, miscanthus grass and the like), synthetic fibres, seaweed, mica-based pigments, and others. The company says its lab extruders, with special elements, eliminate shear peaks that it says are perhaps the biggest cause of damage to materials. They enable processing of temperature-sensitive materials and provide for easy cleaning and changeover, inline process control and, once again, the ability to scale-up when required. Steer's lab extruders are available with DO/DI ranging from 1.49 - 1.71 and in diameters from 10 to 40 mm.

Micro options

Brabender sales manager Bernd Zöller says the company's KEDSE lab compounder continues to be a best-seller. It is capable of processing between one and 20 kg/h and, with its 20-mm diameter screws, it uses regular pellets. A second model, equipped with 12 mm screws and smaller flight depths, requires microgranules or powders (this is mainly used for pharmaceutical applications though) and there is also a conical model intended mainly for processing PVC.

Zöller says the concept of upscaling from lab extruders to full-scale production extruders is an important issue for some compounders, but also "a bit of a dream." The challenge is in the complexity. "There are too many parameters to consider that it is quite difficult to simulate full-scale production on a very small unit and vice-versa. If you have segmented screws, it is possible to imagine thousands of different set-ups.

You can get very close with temperatures and screw settings, but at the end, these are two different worlds.

Right: Toshiba's TEM-26SX can be used for processing of incompatible materials

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Right: Noris says its compact ZSC 25 includes a new energy-efficient drive technology

It can be done, but it takes an awful lot of work. So this is really more for recipe development and working on new materials on a small scale," he says.

Brabender units are very flexible, Zöller says. They accept volumetric and gravimetric feeders and also liquid dosing equipment (these units come from sister company Brabender Technologie). Units can be fitted every 10D. In addition, it is possible to use shorter processing lengths. "The full length of the screw is 40D but, if the first feeder is mounted after 10D, the effective length becomes 30D without having to reset the complete machine set-up," says Zöller. This is particularly useful for working with shear-sensitive materials.

Earlier this year, **Coperion** reported that the IKT Institute for Plastics Technology at the University of Stuttgart had augmented its R&D facilities with a ZSK 18 MEGAlab laboratory compounding extruder. Given a batch quantity of at least 200g, it is possible to achieve a throughput rate of up to 40 kg/h on the machine. Coperion says the system will be mainly used at IKT for studying complex reactive systems, and for compounding of high-temperature materials and highly filled polymers.

IKT also took three metering systems from Coperion K-Tron for very low throughput rates, so enabling the extruder to operate with additive materials reliably at metering rates as low as 20 ml/hour in extreme cases. And to provide the extruder with a very wide application range, it has an extra-long extruder barrel and is rated for high-temperature applications. Coperion claims that

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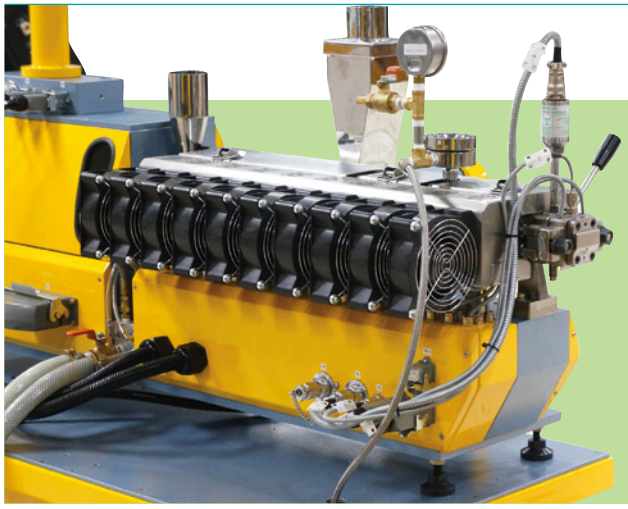

Labtech units range in size from 12mm to 26 mm screw diameter. This example, which was on show at Fakuma, is the LE16/FAC with a 16mm screw and an L/D of 40. Approximate maximum output is 5 kg/h (LDPE). Versions are available with L/Ds up to 60. This new version incorporates electric heating as well as fan cooling on all barrel zones, which the company says gives the same level of compounding efficiency as found on much larger twin screw extruders. Labtech, which produces its machines in Thailand, claims to be the second largest producer of laboratory polymer and pilot plant processing machines in the world (after Dr Collin).

www.labtechengineering.com

reliable scale-up to larger ZSK models is possible. The IKT, which is headed by Prof Christian Bonten, now has four Coperion ZSK twin screw extruders.

On the ZSK 18MEGAlab, utilities such as the water supply system and the vacuum generating unit are integrated into the enclosed base frame together with the motor and extruder control system. Quick release connections permit rapid cleaning of the process section, which means that changeover from one product to another can be accomplished in very little time.

Dr Collin (now owned by Next Generation Recycling-maschinen - NGR) says its modular twin-screw extruders are applicable as co or counter-rotating systems for the development and production of all types of polymer mixtures.

The machines can be equipped with up to seven gravimetric dosing devices (liquid and solid) and by replacing the distribution gear, every co-rotating version can easily be transformed into a counter-rotating version. Strand and underwater pelletizing systems are available. The range of these machines extends from 12mm to 25mm screw diameter, with processing lengths of up to 54D. The throughput range is from 50 g/h to 70 kg/h.

Equipment for hire

Not all compounders can justify the capital cost of a dedicated laboratory machine. **B&P Process Equipment** currently has one 30 mm TriVolution reciprocating single screw compounder available for rental, with a second one on its way, says Alan Malott, product manager for continuous mixing systems. The unit fits on its own mobile platform that also houses the temperature control unit, and it has a single screw crosshead and pelletizing system.

The segmented element design allows for a quick change over from low shear to increasingly higher shear mixing based on the formulation being run. The barrel sections are also designed to be modular, which allows for complete re-arrangement of the feed barrels along the length of the shaft. The feed sections are also designed to rotate, allowing a top feed location to easily become a side feed location.

Malott says the 30 mm TriVolution can be used for either small scale production or feasibility testing. "One of the major requirements of a laboratory compounder is the ability to run multiple types of material with minimal switch over," he says. "The goal is to develop the materials and not to have to change your formulation based on the compounder running the materials."

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Right: Prof Christian Bonten (right),director of the IKT, with Frank Lechner, head of processing technology at Coperion, beside its new ZSK 18 MEGAlab compounder

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As supply chains become more global the threat of counterfeit production grows. A range of new additive technologies can provide valuable brand and supply chain security. **Jennifer Markarian** reports

Taking on the counterfeiters

Globalisation and complex supply chains have led to an increase in counterfeit products across a wide range of industries. Counterfeiters are also becoming ever more sophisticated and a counterfeit product may be very difficult to identify, so OEMs and brand owners are employing a variety of solutions – from labels with unique identification numbers to additives that provide unique markers – to provide assurance that a product is authentic (or to prove that it is not).

Layering protection

"Layering of solutions continues to be not only a trend but a necessity as counterfeiters advance in their trade," says James Petrie, marketing director, **PolyOne** Color & Additives in North America. "A single solution is economical, but in many cases leaves a product vulnerable to counterfeiting. There are several examples of brands targeted by counterfeiters who now have up to eight different security and authentication layers including a mix of overt, covert and forensic solutions."

Because counterfeiters continue to get better at recognising and replicating existing authentication technologies, producers must also continue to evolve their anticounterfeiting measures, adds Petrie, who notes that PolyOne continues to expand its Percept solutions and to translate advancements from one region to another. "As an example, we are currently translating a light-sensitive technology that we have had success with in Europe to the United States, while at the same time working with new technologies in Asia to complement our existing offering. The process also works both ways as we continue to develop and translate emerging technologies from North America, such as DNA tagging in polymer substrates, to other regions of the world."

Many companies are being driven to protect their products because they have experienced profit or market-share loss due to counterfeiting, adds Sarah Skidmore, marketing manager at **Plastics Color Corp**. Plastics Color's Mibatch taggant additive is being used as part of a multi-layer solution that may include a taggant embedded in the polymer material and taggant or other anticounterfeiting measures in the package. Plastics Color partners with SICPA, which provides security inks and other product protection solutions, to meet specific customer needs.

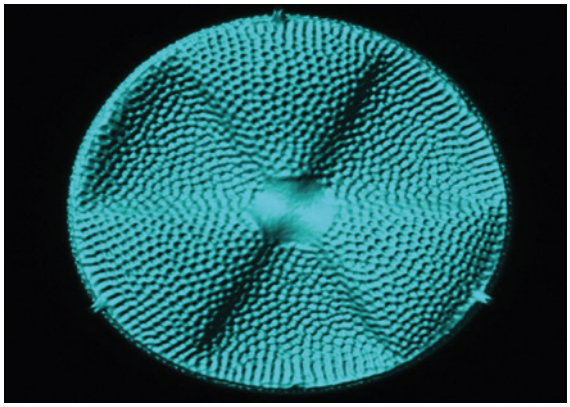
Beyond the brand

Growing areas seeking anticounterfeiting protection include some luxury products as well as pharmaceuticals and medical devices. "The benefits of anticounterfeiting solutions are not limited to brand protection," says Skidmore. "For automotive and medical applications, consumer safety comes into play. Protecting against liability and ensuring that your product meets specific requirements are valuable."

In the pharmaceutical and medical device industries, government

Main image: TruTags' silica-based microtags provide covert and overt protection in anticounterfeiting plastics applications

Below: Multi-layered anticounterfeiting measures will typically be required to provide full product protection, according to PolyOne



Right: Fluorescent dyes are used in this Actinoptycus cell marker from Polysecure as a supplementary security feature

regulators have instituted requirements for systems that assign a serial number to each single-unit package or device to prevent counterfeiting or diversion by tracking the item through the supply chain. In the EU, the Falsified Medicines Directive of 2011 requires barcodes on packages and new responsibilities for the supply chain. In the US, laws to prevent counterfeiting were passed in November 2013 for pharmaceutical drugs and in September 2013 for medical devices. The **US Drug Supply Chain Security Act** will be phased in over ten years and will eventually require item-level traceability. Some classes of medical devices are now required by the US Food and Drug Administration (FDA) to have a Unique Device Identifier (UDI) as a label on the device and the device package, and other classes will be required over the next several years. More information about the FDA's UDI scheme can be found **here.** The UDI data will go into FDA's Global Unique Device Identification Database (GUDID).

Other countries also have UDI requirements, and a Global Harmonisation Task Force led by the European Commission adopted a guidance document, the **Unique Device Identification (UDI) System for Medical Devices** in September 2011 to encourage an internationally coordinated approach.

Innovations designed to meet these regulatory requirements are finding use in other industries. "Demand for our supply chain solutions has exploded as the need for enterprise serialisation, track and trace, authentication and regulatory compliance expands in adjacent markets such as food and beverage, retail and consumer products," says Bob DeJean, CEO of **Systech International**. The key is unique identification that can prove a product is authentic. In September 2015, Systech launched UniSecure, which generates a unique identification signature from an existing print mark or data carrier, such as a barcode. That unique signature is then stored in the Cloud, and the product can be tracked and authenticated at any point using a mobile app.

Below: German electrical equipment producer Obo Bettermann has been using marker technology from Polysecure since 2013

"Counterfeiters are becoming increasingly sophisticated, allowing them to easily defeat current anti-counterfeiting technologies," according to DeJean. "UniSecure capitalises on unique characteristics that occur with all printers. No two labels or printed data carriers are identical. Printing is dynamic and affected by numerous environmental and other factors that combine to produce small-scale variations or 'noise' in printed marks. These microscopic variations are random, unique and at a scale beyond the controllable resolution of printers – meaning they cannot be intentionally duplicated. It's as unique as a fingerprint or a snowflake. It can't be duplicated, so it can't be counterfeited. You simply cannot reverse-engineer the random vibration of a production line or the humidity in a factory on a given day; it can't be done."

UniSecure captures these microscopic variations, detecting specific measurable patterns, and generates an inherent, covert security feature from existing print marks. Anywhere in the supply chain, a product can be scanned and matched to its "UniSignature" to prove its authenticity. Today, the technology is being used to identify labels (for example bar codes and QR codes), but it can also be used on packages such as blister packs, and possibly with an identifying mark directly on plastic or other parts such as medical devices or electronic headphones, says Darryl Brown, vice-president of global strategic marketing at Systech. He adds that advantages of the technology include immediate authentication at the inspection point using an inexpensive software application tool.

Additive identifiers

Several types of additives can be used as covert anticounterfeiting technologies and *Compounding World* discussed these in some detail in its **November 2014 edition**. Covert technologies that can be identified in the field with inexpensive light-based devices include pigments that fluoresce under ultraviolet light and additives that convert infrared to visible light. Some

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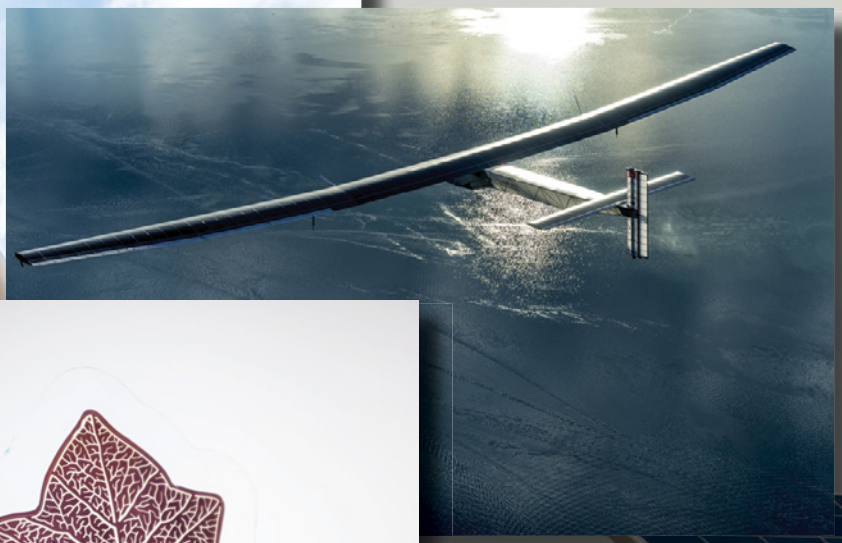

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Right: TruTag's proprietary manufacturing technology etches unique 'spectral barcodes' into porous silicon wafers to create microtags

additives also serve as unique identifiers; covert taggant particles carry unique identification codes and can be identified with field readers or with laboratory techniques, depending on the technology and application.

Taggants used in polymers are typically inorganic materials, such as ceramic particles. An exception is **Applied DNA Sciences**' SigNature DNA, which makes use of the complex code inherent in botanical DNA and of its sensitivity down to the molecular level. "The most significant advantage of DNA is that it is the forensic gold standard in the court of law," says Jim Hayward, CEO of Applied DNA Sciences. He notes that the company's technology has seen a strong uptake over the past year with penetration into multiple industry verticals and ongoing projects with five different US government agencies.

The company has completed pilot programs to incorporate DNA into a variety of polymers and in different formats (fibres and pellets), and is currently in the process of commercialising these technologies. "The sensitivity of DNA detection is the highest of any marker, so the required level is in the region of parts per trillion. There are no interactions with the material, and DNA is completely stable in the plastic matrix," says Hayward. The company also develops devices for authenticating SigNature DNA in plastics in the field. One device is optimised for large scale authentication for quality control, and the other is optimised for speed, such as needed for customs or border control.

Another naturally based taggant is **Polysecure**'s diatom-shell marker particles, which, while still in development, can incorporate certain phosphors. Due to their edibility and biocompatibility, initial targeted applications include food products. Polysecure's

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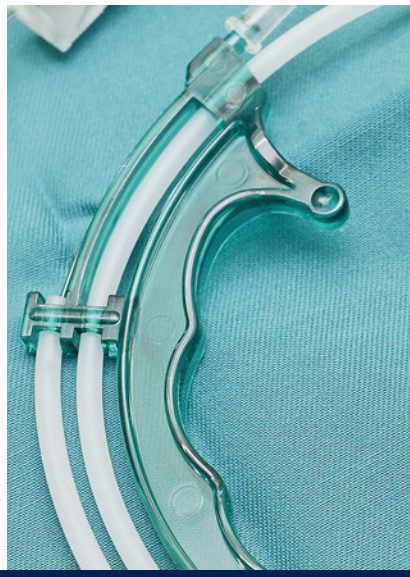

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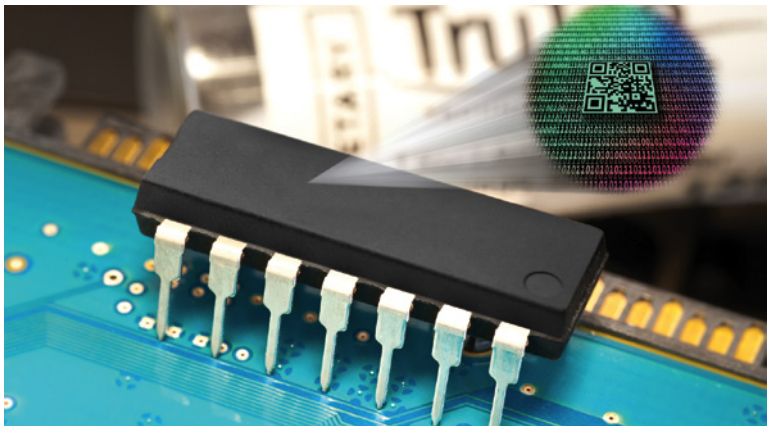

Above: Electronics is a key market for TruTags's microtag anticounterfeiting technology

commercial products include markers made from crystalline and/or ceramic particles that can combine security features including colour change and fluorescence for fast, mobile detection; a product code that can be read with a handheld XRF device; and a structural fingerprint based on the random details of each production batch that can be analysed in the laboratory. The security features offer a legally valid authentication of a product marker, comparable to a forensic procedure, says Peter Hensle, head of marketing and key account manager at Polysecure.

TruTag's microtags can withstand temperatures well above 1,000°C, and can be used in various plastics forming processes. The company is developing methods to integrate the taggant directly into plastic pellets, and is also working with additive companies and packaging manufacturers on unique food packaging concepts, says Kent Mansfield, President of TruTag. "We are still seeking channel partners in the plastics business who have technical expertise and wish to co-develop solutions for their particular markets," he says.

Securing supply chains

Right: Sennheiser's Sport headphones use an antimicrobial additive from SteriTouch that incorporporates taggants to provide supply chain verification and authentication

A recent example of a product that makes use of an anticounterfeiting additive is the Sports range of performance headphones made by Sennheiser, which incorporate an ionic silver antimicrobial from **SteriTouch**. A taggant that can be detected using an inexpensive, handheld laser is integrated with the SteriTouch antimicrobial additive and is available either as a masterbatch or a compound. The taggant serves a dual purpose of authenticating the end product and of verifying the presence of the antimicrobial additive.

"Overseas third-party manufacturing is on the increase, so Western brands must find ways of ensuring their specified additives are not being replaced by cheaper, illegal alternatives; this technology also offers a simple method of determining whether the antimicrobial is being included at all, without being prohibitively expensive," says Joanna Wilson, marketing manager at SteriTouch. She adds that, with increasing regulations surrounding biocides, manufacturers want to be sure they are compliant and that their products are performing as they should. Selection of the appropriate taggant is important to be sure there are no adverse reactions, such as discoloration, between the taggant and antimicrobial or matrix.

The increasing desire to better control the supply chain is leading to plenty of discussion about using taggants to authenticate polymers or the presence of specific additives, says Dave Witt, R&D manager at **Plastics Color Corp**. "Complex finished parts may have moulded parts coming from many different locations, and it is important to ensure that their suppliers are using the specified materials," he explains.

In addition to protecting against liability and protecting brand identity, companies are also beginning to look at anticounterfeiting measures as a means of differentiating their product. "On a business-to-business level, anticounterfeiting features can be a value-added product capability that parts producers can provide to brandowners," says Plastic Color's Skidmore.

An ongoing trend in consumer products is to connect with the purchaser using technologies such as QR codes to give information to the customer as well as to capture feedback. This can include information on sourcing and verification. "Sophisticated consumers are more aware of counterfeiting and want to know what they are buying. Millennials want to know the origins of their food and other products," says **Applied DNA**'s Hayward.

"The ultimate goal for many brands is to not only protect their product but also to tap into the consumer experience," says **PolyOne**'s Petrie. "A security feature that is robust enough to be overtly advertised to the consumer (and counterfeiter) but also secure enough that it still offers brand protection is a growing request. PolyOne is developing solutions to fit this need in specific markets and we continue to expand the applications scope."

Systech also sees its technology evolving for use at the consumer level. Scanning by consumers "opens the door to engagement programs," says the company's COO Lou Arace. "In an age of social media, companies are looking for innovative ways to engage directly with consumers at the time or purchase. Clearly, the first step is to ensure the

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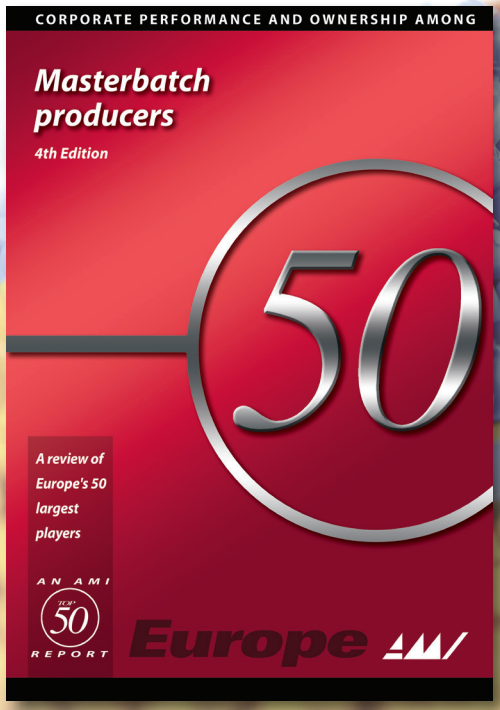

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Simplifying sorting

Polysecure's robust marker particles, in addition to being used in anticounterfeiting and authentication, can be used to improve the efficiency of material sorting in recycling processes. Separation of plastic waste is key to optimising its re-use, but separation at the consumer level is not practical; sorting must occur after collection, says Dr Martin Fahr, research and development and product manager at Polysecure. It is difficult, however, to separate chemically similar materials (for example food-grade versus non-food grade PET, or plastics with and without different inorganic additives) using existing commercial sorting technology.

Fluorescent marker additives, at levels under 100ppm, create an economically viable solution by allowing separation of recycled plastic flakes in a high-throughput process using specially designed sorting machines. Polysecure can provide variations of the markers that can be distinguished from each other, and the sorting technology for this is uner development. The markers "survive fires, extensive heat, aggressive chemicals, mechanical strain and more without any loss of efficiency," says Fahr.

The technology can be used to separate fractions in a waste stream, such as bio-based polymers from synthetic polymers or glass-fibre reinforced PVC from other PVC streams. It would be possible, with strong support by industry, to standardise markers for certain compound types to allow widespread sorting with this method and improved re-use, says Fahr. The technology can also be used to uniquely identify and sort a specific company's material – some major brands are interested in getting back their packaging materials after use to close the recycling loop, he says.

Click on the links for more information:

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Tuesday, January 26, 2016

8:00 Golf tournament sponsored by:
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1:00 Registration and welcome coffee
2:30 Opening announcements

SESSION 1 - MARKET OVERVIEW: WHAT SHAPES THE INDUSTRY

2:40 **Resin trends driving the demand for concentrates in North America**
Mr. Andrew Reynolds, Research Director,
AMI CONSULTING, United States

3:10 **Consumer color trends and influences 2016**
Mr. George Iannuzzi, Key Account Manager,
SUDARSHAN NORTH AMERICA, United States

3:40 - 4:10 Coffee break sponsored by:

4:10 **The evolving market for titanium dioxide**
Mr. Carlos Verdejo, Global Account Manager,
THE CHEMOURS COMPANY, United States

4:40 **Innovations in carbon blacks for the polymer market**
Dr. Bhuvanesh Yerigeri, Technical Market Manager,
ORION ENGINEERED CARBONS, United States

5:10 - 6:40 Cocktail reception sponsored by:

Wednesday, January 27, 2016

8:30 Welcome coffee
9:00 Opening announcements

SESSION 2 - PIGMENTS, ADDITIVES & MATERIAL TRENDS

9:10 **Implications of globally harmonized systems (GHS) for pigments, additives and resins**
Ms. Jennifer Kirkman, Product Regulatory Specialist,
BASF CHEMICAL COMPANY, United States

9:40 **Energy management for specialty plastics**
Mr. Mike Yockel, Regional Sales Manager,
ECKART AMERICA, United States

10:10 - 10:40 Coffee break sponsored by:

10:40 **New innovation in polyethylene morphology modification**
Mr. Reed Walker, Global Marketing and Business Development Manager,
MILLIKEN & CO., United States

11:10 **New antimony oxide developments for the compounding industry**
Mr. Glade E. Squires, Product Manager – Flame Retardants,
OMYA, INC., United States

11:40 **Progressions in carrier resins for enhanced processibility**
Mr. Randal Kerstetter, Sales Developer,
EXXONMOBIL CHEMICAL, United States

12:10 - 1:40 Lunch

1:40 **Strategies for product development in an era of global regulatory change**
Mr. Tom Vetterly, Technology Manager,
MAYZO, United States

2:10 **The impact of raw material choice on the color fastness of compounds during warehouse storage**
Mr. Marty Paisner, Senior Scientist – Polymer Additive Applications,
VANDERBILT CHEMICALS, LLC, United States

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PROGRAM

SESSION 3 - EQUIPMENT/TECHNOLOGY

2:40 **Thermoplastic concentrate compounding: Scale-up pitfalls and how to avoid them**
Dr. Paul Andersen, Director, Process Technology,
COPERION CORP., United States

3:10 - 3:40 Coffee break

3:40 **Past, present and future of pelletization**
Dr. Philip S. Shoemaker, Executive Director,
POLYMERS CENTER OF EXCELLENCE, United States

4:10 **Optimizing the performance of loss in weight feeders**
Mr. Walter Folkl, Sales Manager,
BRABENDER TECHNOLOGIE, INC., Canada

4:40 **Five things NOT to do when purchasing capital equipment**
Mr. Stan Broadhead, Senior Field Sales Engineer,
FARREL POMINI, United States

5:00 Afternoon wrap up and questions

Thursday, January 28, 2016

8:30 Welcome coffee
9:00 Opening announcements

9:10 **Twin screw extrusion for concentrates: Advances, tips and test results**
Mr. Charlie Martin, President/General Manager,
LEISTRITZ, United States

SESSION 4 - BUSINESS FORUM

9:40 **Discussion of thermoplastic concentrates/additives and automotive interior applications**
Dr. Sam He, Technical Fellow & EGM of Advanced Materials and Materials Engineering,
INTEVA PRODUCTS, LLC, United States

10:10 **A 40 year perspective on the future of the thermoplastics concentrate industry**
Mr. John Manuck, CEO and Chairman,
TECHMER PM, LLC, United States

10:40 - 11:10 Coffee break

11:10 **Suppliers and customers: What really matters**
Mr. Mark Bruner, Industry Consultant,
United States

11:40 **Change is the only constant for sustainable growth in a dynamic moulding business**
Mr. Kent Houser, President,
COBRA PLASTICS INC., United States

12:10 **The concentrate market in North America – what drives opportunity and growth**
Mr. Andrew Reynolds, Research Director,
AMI CONSULTING, United States

12:40 - 12:50 Afternoon wrap up and questions

1:00 - 2:00 Lunch and conference ends

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Image courtesy of:
Ft. Lauderdale Marriott Coral Springs

DATE AND LOCATION:
January 26-28, 2016
Ft. Lauderdale Marriott Coral Springs
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Ms. Stephanie Berchem, Conference Coordinator

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Europe's distributors rise to the challenge

Europe's polymer distributors have had to accommodate significant economic and structural challenges in recent years but the sector continues to grow, writes AMI consultant **Karla Vittova**

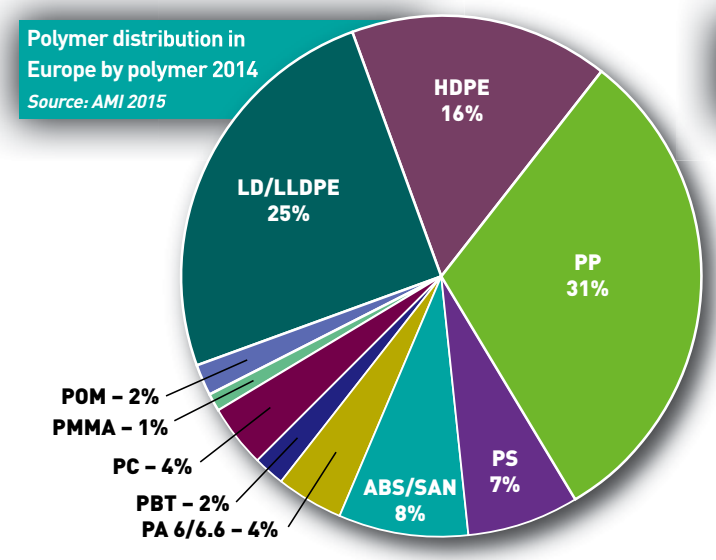
Polymer distributors play an increasingly strategic role within the polymer industry value chain, providing opportunities for polymer producers to cut cost and improve efficiencies while delivering better service and support to plastics processors. However, in an industry notorious for its slim margins operating in a low growth economy, the successful distributor needs to be rigorous in understanding the cost-to-serve and the value gained from its customers in order to ensure future survival and growth.

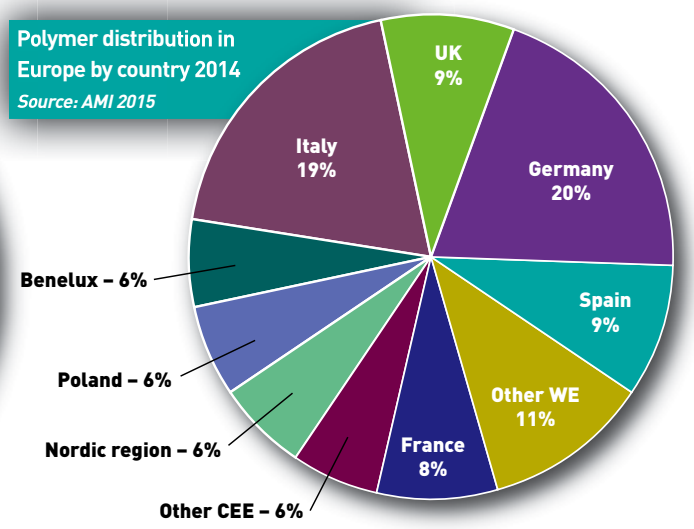
The newly published sixth edition of **AMI's Polymer Distribution in Europe** report estimates overall official distribution channels in Europe accounted for nearly 3.4m tonnes of resin sales in 2014, equivalent to 12% of the total market (this includes PE, PP, PS, ABS/SAN, PA 6 & 66, PBT, PC, PMMA and POM but excludes PET, PVC and EPS are these are not considered typically distributed polymers). The AMI analysis shows that distributors account for a high share of the engineering resin market (up to 40% for PBT, for example) but a much lower share in the commodity markets (typically around 10%) due to strong competition with traders, as well as the fact that polymer processors with larger accounts are often served by suppliers direct.

Although engineering polymers bring higher margin to distributors, due to the technical aspect of the processing and services needed it is commodities that drive the sale volumes, accounting for nearly 80% of sales by distributors in 2014. However, engineering plastics will undoubtedly drive the future value of polymer distribution and will record much stronger growth than standard polymers.

In 2014, AMI estimates that European polymer distribution accounted for revenues of approximately €7bn with the largest contributors to added-value being polyolefins and polyamide.

The overall growth in polymer demand has been running at less than 1% a year over the period from 2009-2014. However, volumes sold through official distribution channels have grown well ahead of this at 3.4%/year over the same period. Polymer distributors have benefited from the slower growth in the underlying





polymer market as resin producers have continued to rationalise their customer base and bottom slice smaller and less profitable accounts, a trend driven by the desire to reduce credit exposure and to cut sales and marketing costs.

The pattern of distribution sales reflects underlying polymer demand, which means that the largest markets are found in Germany and Italy, closely followed by France and the UK. However, distribution is proportionately more important in countries that do not have a strong local polymer production industry or that are located on the periphery of Europe (for example, Portugal, Ireland and the Nordic region). Processors in these countries often have to rely on distributors importing from neighbouring countries.

The availability of materials from outside of Europe, particularly from the Middle East and Asia, continues to offer opportunities for distributors, although most of these volumes tend to enter the European market either on a spot or traded basis. The trader market last year was affected by the 6.5% increase in import duties on Middle East-sourced material that came into effect on 1st January 2014 and reduced the region's price advantage. At the same time, European distributors are looking for opportunities beyond their home territories. Turkey, Russia and Africa's Maghreb countries are being targeted by a number of players, including Albis, Biesterfeld, Snetor and AMP. Latin America is also an area of key interest, with examples of active players including Biesterfeld in Brazil and SM Resinas in several locations across Mexico and South America.

Shifting dynamics

While distributor volumes have grown, the market still remains challenging. Distributors supplying Middle Eastern material, for instance, were impacted by last year's import duty rise although some tried to mitigate this by bringing in extra volumes in the final quarter of 2013. The effect of this strategy was largely dissipated by the second quarter of 2014, after which the fall in oil prices and the weakening of the euro against the dollar brought other strains to the market. Shortages began to appear, particularly for certain grades of PE, as Middle Eastern producers diverted material to Asia where they could earn better netbacks. European producers also took advantage of the euro's weakness to be more competitive in deep sea markets that offered better margins, resulting in reduced material availability locally.

A string of unexpected force majeure calls by leading polymer producers just at the time when spring buying was kicking in added to these availability problems, creating an extremely tight market. Such was the impact on the market that processors were having to shut down lines and industry trade associations were lobbying hard for producers to invest in new European production (although the latter could only ease the situation in the long term). Distributors with guaranteed supply agreements were better placed than traders to ride out this storm, but market conditions were very difficult for all concerned.

In a tighter market, all players in the supply chain look to reduce cost through JIT production and maintenance of minimal stock levels. This makes planning difficult as plastics processors only buy material to order. Distributors who did not get their forecasts right got caught out, either by ordering too little or too much from their suppliers. As suppliers are equally trying to produce only what is going to be sold, sudden changes in market demand lead to unexpected material shortages or surpluses. This trend, in combination with the sudden material shortage in the market, made it challenging for the distributors. However, this is where the top players can be seen to win out over traders, resellers and agents through their ability to respond to

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Right: The tight credit restrictions imposed during the downturn have eased slightly but more frequent, smaller orders remain the norm

sudden polymer demand or price changes with excellent inventory management and solid relationships built with suppliers and customers.

Traders challenged

With the reduced flow of excess polymer volumes in Europe, the traditionally strong position in the market of traders has been challenged. A number of smaller traders have disappeared, while larger traders have aimed to become even larger through consolidation or by stepping into distribution. As a consequence, the dividing line between distributors and traders has become increasingly blurred. Some distributors are getting involved more in trading to secure revenue, while traders increasingly seek to establish regular contractual relationships with suppliers to secure guaranteed volumes in times of material shortage.

The tight credit situation seen during the years of the recent economic downturn has since eased slightly, but the credit risk continues to be considerable and the financial health of a significant number of plastics processors that have remained in the market may be considered questionable. During the toughest years of 2008 and 2009 insurance companies dramatically reduced the scope of their services. For many distributors the credit limit became the major indicator of how much material a customer could order and this, together with the steep price increases, meant many customers were able to purchase at considerably lower volumes than a few months earlier. The market has still not returned to its pre-crisis level of confidence and it remains much harder to secure funding and loans from financial institutions. Even here, however, distributors have managed to turn challenge into opportunity and for many their margins and overall profitability have improved despite the trend to larger numbers of smaller orders.

Most European suppliers seem to have favoured – or aspired to – a pan-European distribution model.

Below: Further moves towards JIT and minimal inventories throughout the supply chain makes planning a challenge

However, in recent years they have been more inclined to pursue a combined model consisting of a pan-European distributor complemented with local champions. Suppliers will continue to reduce the number of local players per country to reach a maximum of two. In this respect, Italy with its fragmented regional structure continues to be a challenge.

It is not only polymer suppliers that are optimising their networks. Larger-sized distributors are also rationalising their customer networks by targeting specific customer groups (healthcare or automotive sectors, for instance) and even terminating cooperation with customers that are outside this strategic focus, have a poor payment history, or that generate unsatisfying margins. A reduction in exclusivity agreements with suppliers primarily in commodity businesses is another emerging trend, and an increasing number of distributors now establish contracts with two or more suppliers of each polymer type.

A consolidating industry

The polymer distribution industry is generally consolidating and restructuring, with the leading groups expanding their international/pan-European presence. Some of the major M&A events that have taken place since AMI's last review of the market include the acquisition of the Azelis polymer distribution business by Gazechim Plastiques (2012), Spain's Guzmán Group's purchase of Italian distributors Tecno (2012) and Bilco (2014), Biesterfeld taking over the remaining share in its Nordic joint venture with Fred Holmberg (2014), and the rebranding of Resin Trade to Polydist and its acquisition of Merco Polymers in Benelux in April 2015 and a takeover of another target in France finalised later on in the year. In 2014, the largest ten players in terms of turnover included A. Schulman, Albis, Biesterfeld, Febo, Hromatka Group, Interpolimeri, Nexeo Solutions, Resinex, Ter Plastics Polymer Group and Ultrapolymers.

Over the next five years, polymer distribution is expected to grow at double the rate of polymer demand

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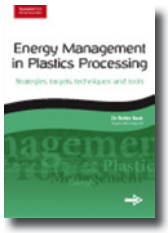

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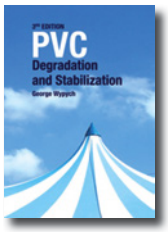

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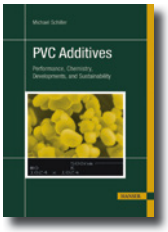

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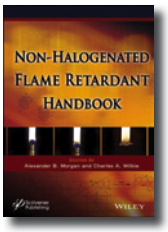

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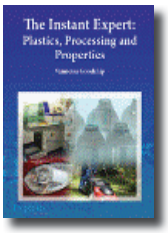

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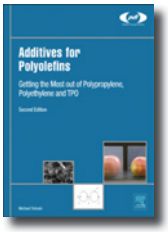

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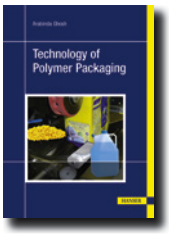

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at around 2%/year. The key driver in this growth will be supplier rationalisation of sales teams and customer base, increasingly focusing on the larger, strategically important customers and passing smaller, financially unsound or non-strategic customers onto distributors. In addition, the industry will continue to be driven by distributors' ability to adapt rapidly to sudden polymer demand or price changes, to optimise inventory management, and to build solid relationships with their suppliers and customers. Distributors will also continue to take market share from traders as foreign suppliers increasingly establish more regular, contractual relationships with European distributors.

Distribution will grow most strongly in value-added and technical applications. High potential exists in polyolefins and engineering polymers used particularly in injection moulding and for industries such as automotive, white goods, electrical and medical/healthcare sectors. The strongest growth will be seen in Poland and other markets of Central and Eastern Europe, where distribution networks are still growing and where there is the opportunity to export to markets further east (including Russia, Ukraine and other CIS states).

For more information:

The sixth edition of AMI's **Polymer Distribution in Europe** report analyses in detail the challenges impacting on Europe's distribution sector, including the effects on polymer producers and distributors in this competitive and fast-changing supply chain. The 270-page report covers all of Europe (EU28 plus Norway and Switzerland) and includes details of sales volumes for around 190 distribution companies and their 300 individual sales offices. For more information, contact report author Karla Vittova. Email: **kv@amiplastics.com**; Tel: +44 117 314 8140.

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US resin distributor M Holland has invested two years of work into its MH2GO custom CRM, which it believes will prove a key differentiator for the firm in the highly competitive North American distribution marketplace

Investing in customer service

To be successful in polymer distribution you must provide your customers with top quality service. For most companies today, that includes implementation and effective use of a Customer Relationship Management (CRM) system. US-based M Holland is no exception, but senior managers at the 65-year old company decided they wanted a system that went beyond standard implementations and would give them – and their customers – real and measurable benefits.

"We recognised we needed a CRM system," says M Holland Company President Ed Holland. "But we wanted something more. We wanted to do something that would significantly enhance the customer experience. We wanted to create a differentiator, something that would remove the obstacles and frustrations customers often experience when sourcing materials."

Work on developing a system that met the company's specific needs began back in 2013 and was driven by the firm's Vice President of Sales and Marketing Marc Fern and then newly appointed Manager of Information Services Neil Goodrich. It was a challenging project, coming close on the heels of the implementation of a new ERP system that Fern described as "somewhat painful" and that had left many in the organisation feeling a little "IT fatigued."

At the outset of the CRM project, Goodrich set out to learn the company's business processes and to identify those that were working and, more importantly, those that were not. He worked alongside account managers and product managers to find out precisely what they needed to make their jobs easier and visited M Holland customers and suppliers to establish their needs and frustrations. He also worked closely with functional departments internally to understand the cross-functional hand-offs that occurred and the causes of occasional problems.

"Neil was refreshing," says Holland. "Other corporate IT managers want to remake the company to fit into a computer system. Neil took the opposite approach – 'tell me what you need, and I'll find the right IT solution.'"

The company had only recently installed a new ERP system, but Goodrich established early on that accessing the database was cumbersome. "The only way for most users to access data was by human proxy – through a phone call or email. We went past 'Let's get a CRM' to 'let's give account managers what they need to create a great customer experience.' Mobile access to CRM was only a piece of that puzzle."

The result of Goodrich's work was the MH2GO system, which was first demonstrated to M Holland's 90-strong commercial team in June of this year. Fern says he was aware that there was a certain amount of wariness on the part of the commercial team – there was some concern that data entry might displace direct interfacing with customers – but following the first

Main image: M Holland's MH2GO CRM system aims to enhance customer experience through the use of mobile IT platforms and real-time data integration

Above: The tablet-based system delivers real-time inventory and pricing data for instant order confirmation

demonstration, he says the feedback was very positive.

"Often, in big software rollouts like this, it's done to meet the company's needs and not a lot of time is paid on user experience. From the beginning, we were focused on providing value to the user and to the person sitting across from them. That focus really changed the way we did everything," says Goodrich. As an example, he points to the entry screen for targets, which was designed over a period of weeks by a cross-functional team from across the organisation. It is engineered to maximise value but minimise data entry, devised by the commercial team for the commercial team. "In real life, conversations evolve in many ways, so MH2GO provides various points of access for particular information and functionality based on how transactions really occur."

M Holland sees the MH2GO product as a real differentiator for it in the market. The system was put together by the company's five-person in-house IT team with the support of some outside consultants and, for the most part, uses off-the-shelf technology. It is built on the company's Epicor ERP system and Microsoft's CRM application. The business intelligence software is off-the-shelf, and it uses spreadsheets to house and manipulate certain data. Only two aspects of the system are proprietary, according to Goodrich. "The hidden magic is the hub of the tool – how we tie our various IT applications together and pull data into a turnkey delivery system," he says.

He says the important element in the MH2GO development was not the technology but the methodology used to build it. "We didn't want to install a tool and then make people use it," says Goodrich. "Our goal was to make something that offered so much value that people were excited to use it. That's not something that IT can do by itself; you need a marriage of business expertise and technology. So, MH2GO really represents the imagination and experience of the company as a whole."

The MH2GO CRM system is designed to run primarily on iPad tablets (it can also be accessed via regular computers, mobile phones and the M Holland corporate intranet). It incorporates a wide range of features:

- Account managers and product managers gain access to detailed and live information when interfacing with customers and suppliers. From a customer's office, for instance, an M Holland account manager can now access real-time pricing and inventory information, generate quotes and confirm orders.
- For suppliers, the application enables product managers to track up-to-the-minute sales activity and report on the status of target projects, including the capability to drill down to prior communications and information.
- The Dashboard display, which can be customised to the individual user, allows account managers to view schedules, tasks list, messages, sales and profit performance compared with budget, and more. Using GPS positioning technology, the Dashboard can also list customers in the order of proximity, helping to optimise call scheduling.
- Dashboard also provides account managers with one-touch access to vital customer information, including credit history, credit limit, order history, sales versus budget, and the like.
- MH2GO includes a collaboration tool that allows product managers and technical service engineers to communicate with the account manager on open projects, eliminating the need for long email chains.

Ongoing development

The MH2GO development process continues to move ahead. Goodrich says the team spent the first two weeks following the introduction debugging minor glitches and fielding inquiries. Then it was on to further advancing the tool with new features and functionality, mainly based on suggestions and inputs from users. "We have a robust tool in place," he says. "But it's really just the beginning. We designed the architecture to allow for great expansion flexibility. Our only limitation will be the needs and imaginations of our customers, suppliers and users. As a platform MH2GO is here for the long haul, but its features and functions will evolve alongside the commercial team."

Holland expects MH2GO to make a big impact on the company's business going forward. "It was certainly more expensive than buying a CRM system, but the return on investment is immeasurable. At the end of the day, it justifies my belief that if you do the right thing, only good results will follow," he says.

www.mholland.com

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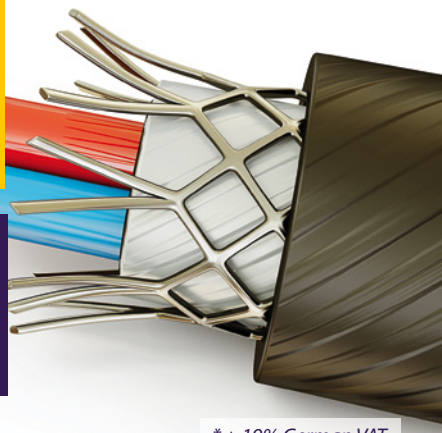

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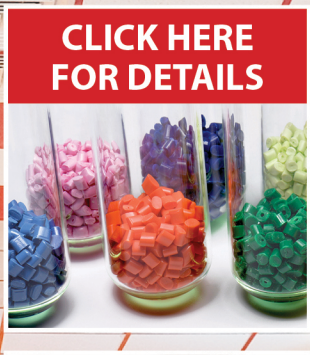


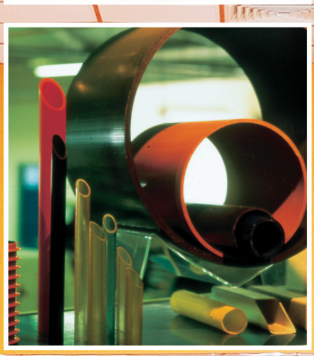

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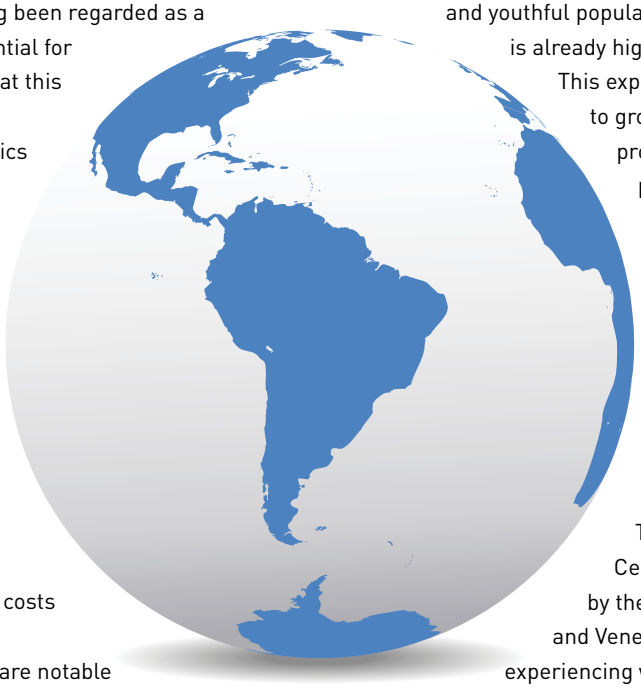
New analysis from AMI identifies the highest growth potential markets in Latin America in terms of polymer demand. Report author **Cristina de Santos** provides some exclusive insight

South and Central America: Polymer opportunities still to be found

South and Central America has long been regarded as a region of considerable growth potential for polymers. However, the reality is that this growth has proved erratic as the necessary development of the plastics processing industry has often been undermined by the economic fragility and political instability of many countries in the region. Many factors contribute to this erratic growth performance but key factors include a high debt burden, a dependency on globally-traded commodities that leave national economies vulnerable to external economic shocks, often burdensome import tariffs and regulations, high energy costs and infrastructure bottlenecks.



South and Central America continues to see significant investment in plastics processing operations

Despite these challenges, there are notable opportunities for plastics companies in a number of countries across Latin America where the pace of growth is accelerating on the back of economic expansion, foreign investment and rising incomes. And the plastics industry in the region can, in general, be positive about the contribution it makes to the development of local communities.

AMI Consulting's latest global polymer demand report, *Polymer Demand in South and Central America*, details the size, nature and future prospects for both commodity and engineering plastics, and identifies the winners and losers in terms of polymer demand growth. The report describes the Latin American region as representing a varied market of more than 20 countries, each of which has quite differing prospects for polymer demand.

Regional economic growth is fuelled by natural resources, minerals and commodities, as well as an increasing consumer market. Latin America has a large and youthful population of nearly 500m people and this is already highly concentrated in urban areas. This expanding consumer class is giving rise to growing demand for a wide range of products, many of which require plastics.

The region also continues to see significant investment in plastics processing operations aimed at replacing imported product and this is driving strong growth in polymer demand for certain applications and markets.

The big three

The economic output of South and Central America is largely determined by the larger nations of Brazil, Argentina and Venezuela, all of which have been experiencing weak economic fundamentals during 2014 and 2015. As a consequence, this year the region is expected to see its worse economic performance since the global financial crisis of 2009. The general consensus is that the overall regional economy will expand by less than 1% for 2015, with a more robust economic performance expected for 2016 of around 2% GDP growth.

Demand for polymer in South and Central America in 2014 recorded a drop of nearly 2% compared with 2013 and the market is expected to continue flagging through 2015 – and AMI anticipates a further drop in polymer consumption of up to 3%.

It is the weak state of polymer demand in the big three countries – which together account for almost 70% of total polymer consumption in the region – that explains this flagging performance. Outside these countries, polymer consumption is growing at about 5%/year, albeit on much smaller volumes. Colombia, Chile and Peru are identified as having the best prospects.

Colombia continues to be the most stable market in the region, with growth in polymer demand increasingly driven by infrastructure projects announced by the Columbian government.

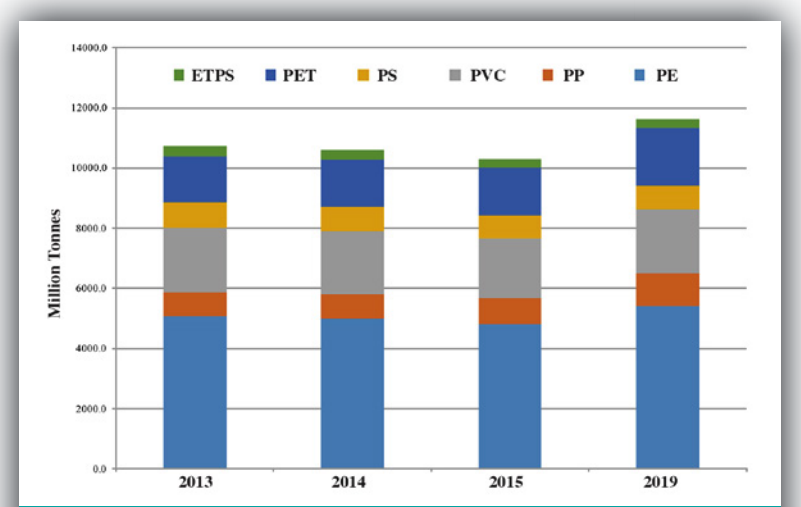
Growth in Peru

Peru has also recently emerged as one of the more stable economies in South America. Its natural resource abundance, improved political stability and economic governance and industrial modernisation have been the main factors behind this success. Polymer demand in Peru grew by over 5% in 2014 with the main driver for growth being domestic demand (exports of plastic products from the country have significantly declined in recent years).

Packaging is the most important demand driver for polymer in Peru, accounting for 60% of all resin used in plastics processing. Demand for PET for production of PET preforms is one of the fastest growth markets in Peru and the region - the country is a net exporter of preforms. Peru is also the location for the largest BOPP film producer in South & Central America - OPP Film SA, which is owned by the Oben Group and has a capacity of around 120,000 tonnes/year.

Oben Group is also now active in Chile, having acquired the Chilean BOPP film producer Sigdopack in 2013. Again packaging is the main driver for plastics processing in Chile, with a particularly large demand for PET bottles as the country has one of the largest per capita consumption rates of soda (soft drinks) in the world after the USA and Mexico. However, there was some slowdown in growth in 2014 due to rising energy costs and an increase in imports of finished product.

The markets of Central America are also proving to be particularly robust, driven by growing investment in manufacturing aimed at servicing both the North and South American markets. The largest of these markets can be found in Guatemala, which has one of the most important export-oriented plastics processing industries in the region and one which has seen considerable growth in recent years. Plastic exports are mainly generated by packaging products, including closures, crates/boxes, flexible packaging, PET preforms and sacks targeted at other markets in Central America as well as the US and Mexico.



Polymer demand in South & Central America 2013-2019
Source: AMI Consulting 2015

Commodity markets

As might be expected polymer demand across the South and Central American region is characterised by a high volume of commodity resin, which accounted for over 97% of all plastics processed in 2014. The largest volume is for polypropylene resins, which account for more than 22% of the market. The polymer is widely used for raffia production for bags and sacks, production of BOPP and cast film for food packaging, and for injection moulding of a wide variety of consumer goods and packaging.

HDPE demand stood at just under 2m tonnes for 2014, with the polymer widely used in the manufacture of bottles, drums and jerricans, gas pipe and a variety of injection moulded products, but particularly packaging (such as closures and crates).

PET resin has been the fastest growing market due primarily to the high per capita demand for soda drinks and the replacement of glass, tin and cartons. Recent investments in the first BOPET film lines in the region has also helped keep PET demand on a positive trajectory, whereas all other resins saw falling demand overall in 2014.

The decline in PVC usage is mainly the result of the weak state of the building market in Argentina, Brazil and Venezuela. However, in most other countries in South and Central America PVC usage has been growing strongly thanks to investment in pipe and profiles for infrastructure, agricultural and mining projects.

Of the commodity resins, polystyrene is the smallest market with GP-HIPS accounting for 5% of all plastic processed in 2014 and EPS less than 2%. GP-HI PS is not expected to see its market grow over the study period due to competitive pressures from other polymer materials in packaging markets, particularly PP and PET.

Engineering thermoplastics accounted for just over 320,000 tonnes of demand, with the bulk of this demand occurring in Brazil and Argentina. However, the market for these materials shrunk by over 16% between 2013 and 2015, largely because of the decline in car manufacturing in these countries.

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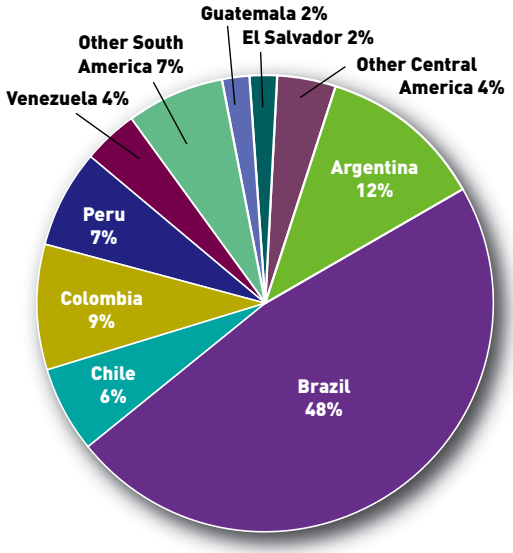
Market structure

AMI estimates there are close to 26,000 plastics processing sites operating across South & Central America. This figure includes both custom and in-house processors, but not converters of semi-finished plastics or thermoforming operations.

Although in general polymer processing is regarded as a fragmented business, in most countries the industry structure is one in which there are a handful of larger groups – often operating multiple processes – which account for a significant proportion of local polymer demand. A large number of much smaller players that may be operating just one or two machines in an intermittent fashion make up the rest of the industry. Their polymer purchasing is typically very small.

This particularly applies to the injection moulding sector, where AMI estimates there to be around 17,000 sites. While more than 3m tonnes of polymer is used in injection moulding across South and Central America, because of the large number of businesses operating the process the average site throughput is only around 350 tonnes.



Polymer Demand in South and Central America in 2015 (%)

Source: Applied Market Information 2015

For more information:

AMI Consulting's *Polymer Demand in South and Central America* data report provides detailed statistical data on the demand and end uses for all major thermoplastic materials on a country by country basis. To find out more, contact Cristina de Santos (cds@amiplastics.com) on +44 (0)117924 9442.

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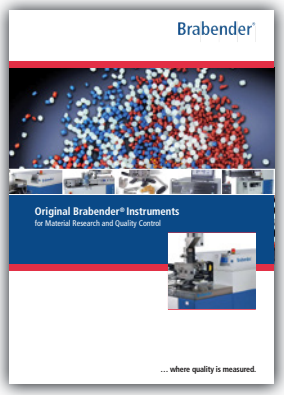
Brabender: Polymer instrumentation



Brabender offers one of the widest ranges of polymer materials characterisation instruments. This 20-page catalogue lists the company's full range of rheometers, extruders, measurement heads and downstream equipment.

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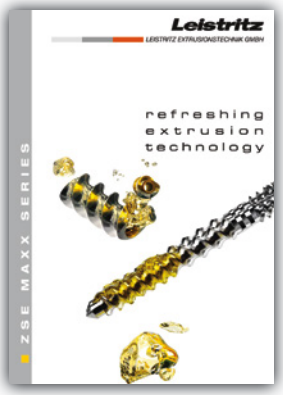
Leistritz: ZSE MAXX extruders



This 12-page brochure covers Leistritz's state-of-the-art ZSE MAXX twin-screw extruders in great detail. These high-torque, high-volume machines have been developed to deliver improvements in productivity, throughput and quality.

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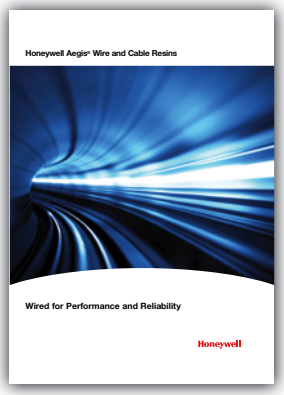
Honeywell: Wire and cable resins



Honeywell's Aegis H55WC and H55WCX performance resins are versatile nylon 6 wire and cable jacket materials offering high level protection in applications from building wires to automotive cables. Find out more in this brochure.

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Maguire: gravimetric blenders

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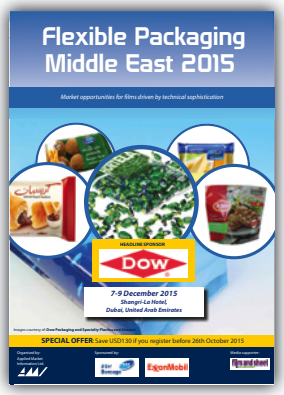
Flexible Packaging Middle East



AMI is holding its seventh Flexible Packaging Middle East conference on 7-9 December in Dubai, UAE. Download the brochure to check out the line-up of expert speakers covering market and technology developments.

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Compounding World Forum

The third Compounding World Forum will be held in Philadelphia on 8-9 December. Its programme boasts experts on additive technologies and process optimisation, plus influential leaders from the international compounding industry.

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Oil & Gas Non-Metallics

AMI's international conference on polymer material selection, qualification and use in oilfield and gas engineering applications will be held in London, UK on 8-10 December. Check out the full programme in this four-page brochure.

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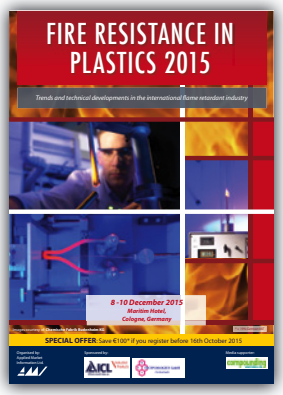

AMI's 10th Fire Resistance in Plastics conference returns to Cologne, Germany on 8-10 December. Download the comprehensive programme that covers changing market demands plus the latest FR additives and compounds.

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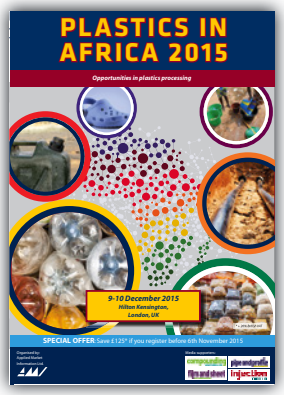

AMI's first international conference on Plastics in Africa is taking place on 9-10 December in London, UK. The programme features leading experts who will provide very valuable insights into this dynamic emerging market.

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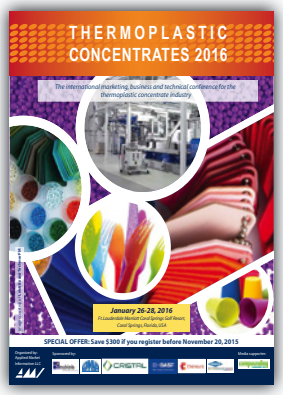

AMI's well-established Thermoplastics Concentrates conference continues to attract an influential audience and an impressive line-up of speakers covering the latest masterbatch trends. Download the brochure to check out this year's programme.

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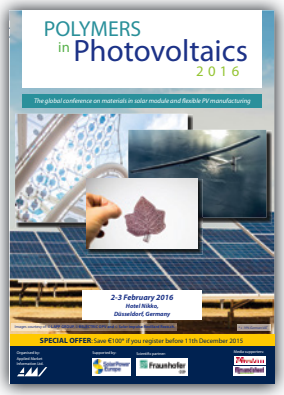

AMI's global conference on materials for solar module and flexible PV manufacturing will next take place on 2-3 February in Dusseldorf, Germany. Download this brochure to see the full line-up of speakers.

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Polyethylene Films

Polyethylene Films 2016 will take place on 2-4 February at Daytona Beach, Florida, USA. The programme for this market leading event covers film production, market strategies, advanced materials, and machinery developments.

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The Grass Yarn & Tufters Forum

The 11th Grass Yarn & Tufters Forum takes place in Berlin, Germany, on 15-17 February 2016, providing an unmatched opportunity to explore the technical and commercial developments taking place in the artificial grass and synthetic turf industry.

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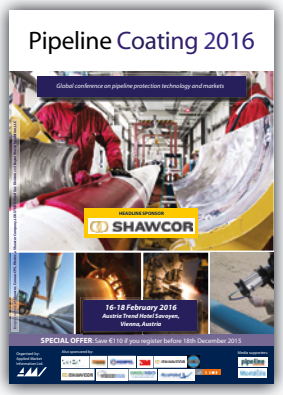

Taking place in Vienna, Austria, on 16-18 February 2016, AMI's Pipeline Coating conference provides a unique forum for the world's leading pipeline experts to discuss the latest pipeline protection technology and industry trends.

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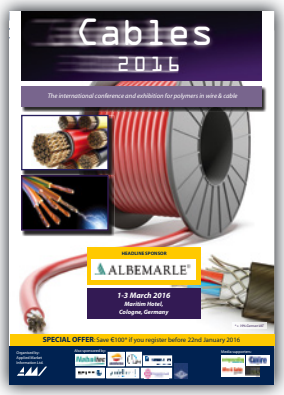

AMI's 16th international conference and exhibition for polymers in wire and cable applications is being held in Cologne, Germany, on 1-3 March 2016. This prestigious event regularly attracts over 250 attendees.

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Sustainable Plastics

This conference on developing a sustainable plastics industry is on 1-2 March 2016 in Cologne, Germany. Critical issues from eco-design through to end-of-life recovery will be covered by expert speakers, including representatives from Philips, Renault and Marks & Spencer Foods.

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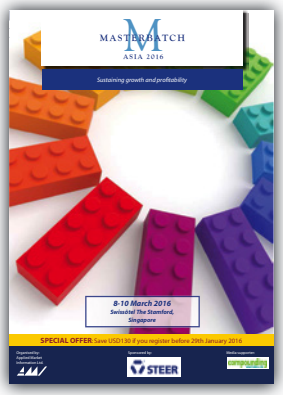
Masterbatch Asia 2016



Now in its 12th year, Masterbatch Asia takes place from 8-10 March in Singapore and provides an international forum for all in the Asian masterbatch production sector and its supply chain to learn about the trends that will influence the industry across the region.

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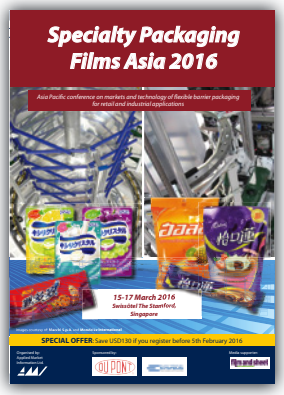
Specialty Plastics Films Asia



AMI's third Specialty Packaging Films Asia conference takes place in Singapore on 15-17 March. This high level event will bring together an international audience of speakers from across the supply chain to detail new technical and commercial developments.

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Polymer Foam 2016

Taking place in Newark, NJ, USA, on 5-6 April 2016, Polymer Foam will give attendees an opportunity to network and discuss the latest foam production technologies and markets and to explore new and emerging applications of cellular polymer materials.

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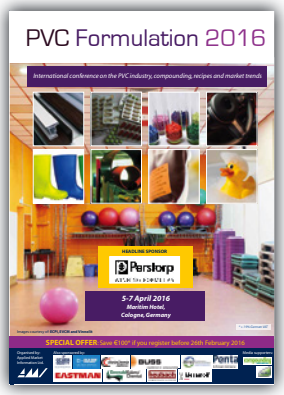

The eighth PVC Formulation conference takes place in Cologne in Germany on 5-7 April 2016. This leading international event provides a place for PVC compounders to keep pace with the latest technical, market, additive and recipe developments.

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Polymer Testing & Analysis

This brand new conference will be held in Cologne, Germany, on 12-14 April and will provide a valuable meeting place for scientists, researchers and R&D professionals developing, testing and analysing new polymer materials and products.

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Compounding World Congress

Taking place in Cologne, Germany, on 18-20 April, AMI's second Compounding World Congress will provide a vibrant meeting place for compounders from across Europe and further afield to discuss some of the market trends and technical innovations shaping this industry.

➤ **Click here to download**

Plastic Pipes in Infrastructure

Held in London on 19-21 April 2016, Plastic Pipes in Infrastructure presents an international forum in which to discuss and learn about the latest developments in plastic pipes for water and gas supply and distribution, drainage and cable protection.

➤ **Click here to download**

Plastic Pouches

AMI's second Plastic Pouches conference will be held in Vienna, Austria, on 26-28 April 2016. This international event brings together brand owners, converters and suppliers to explore the latest market trends and technical innovations in the pouch marketplace.

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Stretch and Shrink Film

AMI's 13th Stretch and Shrink Film conference takes place in Cologne, Germany, on 26-28 April 2016. This high level event provides an unrivalled opportunity to explore business and market trends in the 2.5m tpa European market.

➤ **Click here to download**

Polymer Sourcing & Distribution

AMI's Polymer Sourcing & Distribution conference, which takes place in Hamburg in Germany on 9-11 of May 2016, is the ideal place to learn about key trends impacting on the resin distribution sector and its supply chain in Europe.

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Advertise in this magazine

You can use Compounding World magazine to promote your products and services to the global compounding industry. Download this media pack to find out about our extensive readership, forthcoming features, and highly competitive advertising rates.

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To see our full line-up of more than 30 plastics industry events over the next 12 months, please visit www.amiconferences.com

Polyalloy

Head office location:	Taipei, Taiwan
Date founded:	1986
Managing Director:	Mike Chen
Ownership:	Privately owned
No. of employees:	55
Sales 2014:	US$18 million
Plant locations:	Taoyuan, Taiwan; Hebei, China
Production 2014:	12,000 tonnes
Profile:	Polyalloy specialises in production of thermoplastic compounds predominantly for the automotive component sector. It also offers toll compounding services. The company entered the engineering plastics sector in 2003 and installed some high purity lines in 2007 to supply food industry product. Polyalloy recently set up a joint venture in Hebei, China, operating under the name Baoding Life Automotive Lighting Group. This new compounding plant is expected to start operation in Q2 of 2016 with a capacity of 15,000 tonnes/year. It has a design capacity of 60,000 tonnes.
Product line:	Key product lines include: PoLinker functional compounds for polymer performance and bonding modification (including impact modifiers, coupling agents, tie layers and adhesives); Etoma electrically conductive compounds; Koolymer thermally conductive compounds; XuanWu long fibre reinforced compounds; and VeryGreen PLA-based compounds.
Product strengths:	Polyalloy has a subsidiary company, Sinoalloy, which manufactures twin-screw extrusion machinery.

To be considered for 'Compounder of the Month' contact Karla Vittova at kv@amiplastics.com

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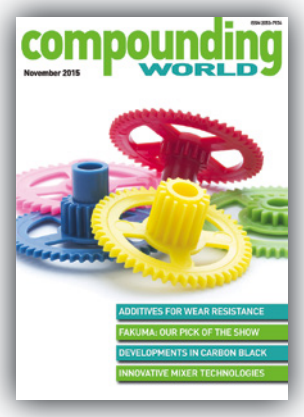
Simply click on the cover to see the full magazine, or download the issue in the relevant Apple or Android app

Compounding World – Nov
The November edition of Compounding World looks at options for cutting polymer wear and friction, the latest innovations in mixer technology and new developments in carbon black. Plus, a review of Fakuma 2015.

➤ Click here to view



Compounding World – Oct
The October edition of Compounding World looks at market developments in the global TiO_2 industry. It also reviews the latest innovations in reinforcing fibres and in-line pellet inspection technology. Plus, it includes a detailed preview of Germany's Fakuma show.

➤ Click here to view

Injection World – Nov/Dec
Injection World's November/ December edition reviews the Fakuma fair and examines the latest automotive plastics and hot runner developments. Plus, we take an in depth look at the newest engineering plastics and compound introductions.

➤ Click here to view

Injection World – Oct
The October edition looks at polymer and processing developments in the Electrical & Electronics markets, innovations in additive manufacturing, and the latest materials handling equipment. Plus, a 15-page preview of Germany's Fakuma show.

➤ Click here to view

Pipe and Profile – Nov/Dec
The November/December edition of Pipe and Profile Extrusion reviews the latest developments in WPC processing and PEX pipe production. It also looks at solutions for minimising screw and barrel wear.

➤ Click here to view

Film and Sheet – Nov
Film and Sheet Extrusion magazine's November edition looks at polymer demand in Latin America, reviews the latest developments in sheet extrusion technology, and reports on new applications in the construction sector.

➤ Click here to view

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

Global exhibition guide

2015		
27-30 November	Indplas, Kolkata, India	www.indplas.in
3-6 December	Plast Eurasia, Istanbul, Turkey	www.plasteurasia.com
2016		
18-21 January	Saudi Plastics & Petrochem, Riyadh	www.saudipp.com
26-29 January	Interplastica, Moscow, Russia	www.interplastica.de
22-25 February	Plastivision Arabia, Sharjah, UAE	www.plastivision.ae
1-3 March	Plastics & Rubber Vietnam, Ho Chi Minh	www.plasticsvietnam.com
8-10 March	JEC World, Paris, France	www.jeccomposites.com
8-11 March	Plastimagen, Mexico City, Mexico	www.plastimagen.com.mx
13-14 April	Plastteknik Nordic, Malmö, Sweden	www.easyfairs.com
13-17 April	Iran Plast, Tehran, Iran	www.iranplast.ir
18-20 April	Plast Alger, Algiers, Algeria	www.plastalger.com
25-28 April	Chinaplas, Shanghai, China	www.chinaplasonline.com
4-7 May	Plastech Izmir, Izmir, Turkey	plastech.izfas.com.tr
13-16 June	Argenplas, Buenos Aires, Argentina	www.argenplas.com.ar
14-15 June	PDM, Telford, UK	www.pdmevent.com
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

AMI conferences

26-28 January	Thermoplastic Concentrates, Coral Springs, FL, USA
1-3 March	Cables, Cologne, Germany
1-2 March	Sustainable Plastics, Cologne, Germany
7-9 March	Wood-Plastic Composites, Vienna, Austria
8-10 March	Masterbatch Asia, Singapore
5-7 April	PVC Formulation 2016, Cologne, Germany
12-14 April	Polymer Testing & Analysis, Cologne, Germany
18-20 April	Compounding World Congress, 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 more details ➤

Polymer Testing & Analysis 2016

The international conference on the testing, characterisation and analysis of polymer materials and products

12-14 April 2016
Maritim Hotel,
Cologne, Germany

** + 19% German VAT*

SPECIAL OFFER: Save €100* if you register before 19th February 2016

Organised by:
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Polymer Testing & Analysis 2016

12-14 April 2016, Maritim Hotel, Cologne, Germany

AMI's first international conference on Polymer Testing & Analysis will provide an important new meeting place for scientists, laboratory staff, researchers and R&D professionals who develop, test and analyse new polymer materials, formulations and products.

The conference will provide a unique opportunity to discover and debate the latest innovations in testing, characterisation and analysis techniques specifically for plastics materials and products.

End-users are demanding products that are smaller, smarter, stronger and safer. These requirements are creating tough challenges for materials suppliers, designers, specifiers and processors. It is increasingly important to understand how materials will behave during processing and how a product will perform when it's put to use. The latest testing and analysis techniques for determining such characteristics and properties will be covered in depth at this new conference by an international selection of speakers, including representatives from leading test organisations, academic institutions, equipment suppliers, plastics compounders, and end-users.

They will deliver detailed presentations on a wide range of topics, including the assessment of mechanical properties, weatherability performance, fire retardancy, corrosion resistance, heat stability, permeability, and flow properties. There will also be talks on the latest polymer analysis techniques, quality control methods, non-destructive testing technologies, and failure analysis.

In addition to the busy programme of presentations from leading players in the market, Polymer Testing & Analysis will offer high-level networking opportunities in a focused exhibition area featuring displays from a range of suppliers.

FIVE GOOD REASONS WHY YOU SHOULD ATTEND:

1. **Learn about the latest testing and analysis technologies**
2. **Benchmark your laboratory practices against leading players**
3. **Network with researchers from throughout the plastics supply chain**
4. **Discover new ways to make polymer testing more efficient and reliable**
5. **Take away ideas for improving product quality and performance**

CONFERENCE HOTLINE

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

Save €100*

Register before 19th February 2016

EARLY BIRD REGISTRATION OFFER

Register before 19th February 2016 and pay €990* saving €100* on the full price of €1090*. 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.

POLYMER TESTING & ANALYSIS 2016: 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 outside the main meeting room.

The exhibition package includes a 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 room rate of €159.00 for a single room and €197.00 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 Polymer Testing & Analysis 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.

*+19% German VAT

Turn page for booking details ➤

CONFERENCE PROGRAMME

Tuesday 12th April 2016

18.00-19.30 Registration and Welcome Cocktail Reception

There are no conference sessions on this day

Wednesday 13th April 2016

08.00 Registration and welcome coffee
09.00 Opening announcements

SESSION 1 - RAISING THE BAR FOR POLYMER TESTING

09.15 **Materials testing guidance for end product developers**
Dr. Thomas Fabian, Research Manager,
UL LLC, United States

09.45 **SMART & non destructive testing of polymers**
Mr. Steven Burns, Development Manager,
IMPACT SOLUTIONS, United Kingdom

10.15-10.55 Morning coffee

SESSION 2 - ANALYSING AND IMPROVING QUALITY LEVELS

10.55 **Going beyond colour - how to properly measure total appearance on polymer based surfaces**
Mr. Felix Schmollgruber, Application Engineering Manager EMEA,
X-RITE EUROPE GmbH, Switzerland

11.25 **Automated quality control of thermoplastic compounds using Differential Scanning Calorimetry (DSC)**
Dr. Tobias Pflock, Business Segment Manager Polymer,
NETZSCH-GERÄTEBAU GmbH, Germany

11.55 **Online quality control of polymers based on the "closed loop"- concept**
Mr. Frank Fuchs, Sales Manager,
OPTICAL CONTROL SYSTEMS GmbH, Germany

12.25-13.55 Lunch

SESSION 3 - PREDICTING PERFORMANCE IN THE FIELD

13.55 **Development of the fundamental understanding of leading edge erosion**
Dr. Kirsten Dyer, Senior Materials Research Engineer,
OFFSHORE RENEWABLE ENERGY CATAPULT, United Kingdom

14.25 **Testing of polymers for use in corrosive environments**
Dr. Karin Jacobson, Research Leader
SWEREA KIMAB AB, Sweden

14.55 **How can we measure the flame retardancy of polymer compounds and cables?**
Dr. Günter Beyer, Lab-Manager,
KABELWERK EUPEN AG, Belgium

15.25-16.05 Afternoon tea

SESSION 4 - ASSESSING THE PROCESSABILITY OF PLASTICS

16.05 **A novel approach to quantitative analysis of the generation and subsequent distribution of thermal energy in polymer objects through exposure to radiated I.R. energy**
Mr. Phil Brannon, Lead Research and Development Engineer,
COLORMATRIX GROUP, United Kingdom

16.35 **High pressure capillary rheometer, a simple way to measure viscosity?**
Mr. Timo Gebauer, Executive Manager,
SIGMA ENGINEERING GmbH, Germany

17.15 End of Wednesday's conference sessions

20.00 Conference Dinner

Thursday 14th April 2016

08.30 Registration and welcome coffee
09.00 Opening announcements

SESSION 5 - MEASURING KEY PROPERTIES FOR DEMANDING APPLICATIONS

09.15 **Measurement and evaluation of the specimen surface temperature in artificial weathering**
Dr. Florian Feil, Senior Consultant Global Manager Client Education,
ATLAS MATERIALS TESTING TECHNOLOGY, Germany

09.45 **A comprehensive system for evaluating the heat stability of PVC and other polymers**
Ms. Cassandre Stapfer, Owner President,
METRASTAT S.A., Switzerland

10.15 **Novel cost efficient oxygen permeability measurements – state of the art and new results**
Mr. Sven Sängerlaub, Scientist / Business Field Manager,
FRAUNHOFER IVV, Germany

10.45-11.25 Morning coffee

SESSION 6 - IMPROVING POLYMER ANALYSIS TECHNIQUES

11.25 **Selected analytical methods for proving of recycled polymer in plastic samples**
Ing. Ph.D Jiří Samsonek, Director of Testing Division,
INSTITUT PRO TESTOVÁNÍ A CERTIFIKACI, A.S., Czech Republic

11.55 **Analysis of additives in polymers: from simple to complex chemistries**
Mr. Vincent Jeanguyot, Manager Analytical Laboratories,
INTERTEK (SCHWEIZ) AG, Switzerland

12.25 **Pyrolysis-GCMS – Examining a powerful technology and latest polymer analysis applications**
Dr. Ute Potyka, Product Specialist GCMS / LCMS,
SHIMADZU EUROPA GmbH, Germany

12.55-14.25 Lunch

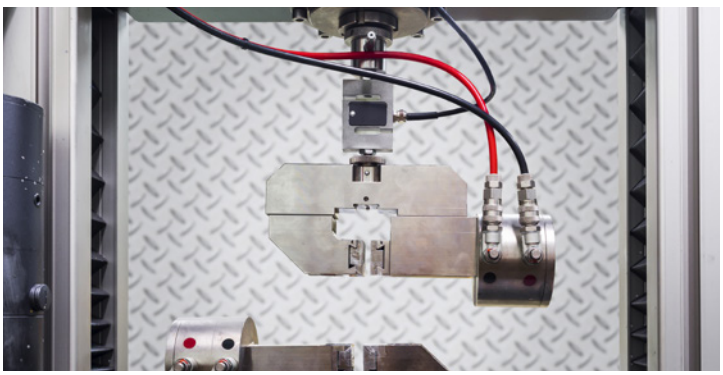
SESSION 7 - UNDERSTANDING MECHANICAL PROPERTIES AND WHY PLASTICS FAIL

14.25 **Novel analytical techniques for polymer and product analysis**
Dr. Carole Raymond, Research Fellow,
MATERIALS DEPARTMENT, LOUGHBOROUGH UNIVERSITY, United Kingdom
Co Authors: Mr. Barry Haworth and Mr. Scott Doak

14.55 **Spherulitic deformation at necking during tensile tests on thermoplastic polymers**
Dr. Lucien Laiarinandrasana, Senior Researcher,
MINES PARISTECH, France

15.25 **Hysteresis-measurements to monitor the non-linear mechanical deformation behaviour of polymers during fatigue loading**
Prof. Dr.-Ing., Volker Altstädt, Head of the Department of Polymer Engineering,
UNIVERSITY OF BAYREUTH, Germany

15.55 Afternoon tea and conference ends



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

REGISTRATION FORM

Company: _____

Address: _____

_____

Country: _____

Tel: _____ Fax: _____

Email: _____

VAT No.: _____

(Must be completed by all EU Companies)

Company activity: _____

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

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

_____

_____

DELEGATE DETAILS

If more than one delegate please photocopy form

Title: _____ First name: _____

Surname: _____

Position: _____

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 19th February 2016)*	€990 + €188.10* = €1178.10	_____
❑ Admission fee thereafter:	€1090 + €207.10* = €1297.10	_____
❑ 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 (***Only admission fee part of package is VAT chargeable at 19%*)	€1750 + €188.10** = €1938.10	_____

** 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. - 'Polymer Testing & Analysis 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: _____

Email: _____

POLYMER TESTING & ANALYSIS 2016
CONFERENCE INFORMATION

Date and location
12-14 April 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 19th February 2016 for only €990*. Thereafter the cost is €1090*.
- ***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).

Polyymer testing & Analysis 2016 table top exhibition
A limited number of table top exhibition spaces are available in the spacious lobby area outside the main meeting 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 Polymer Testing & Analysis 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 to19.30 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 13th April 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 Polymer Testing & Analysis 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 11th March 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.

*+19% German VAT

CONFERENCE HOTLINE

Laura Richardt, Conference Organiser
Applied Market Information Ltd.
6 Pritchard Street, Bristol, BS2 8RH, United Kingdom
Tel: +44 (0) 117 314 8111 Fax: +44 (0) 117 311 1534
Email: lr@amiplastics.com
Twitter: @AMIconferences #attendAMI

The latest programme, including any new speakers or changes to the schedule can be viewed on our website: **www.amiconferences.com**