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DEAK PERFORMANCE IN POLYOLEFINS INNOVATIONS IN AGRICULTURAL FILM THE SECRETS OF COST MANAGEMENT RAISING THE BAR IN FLAT DIE DESIGN

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Indian state bans plastic packaging for 'junk' food

Himachal Pradesh (HP), a state in northern India, has banned the use of plastic packaging for a range of 'non-essential' foods.

The ban comes into force on 26 January 2014.

In late December 2013, the state's High Court upheld a ban on polyethylene packaging for 25 'junk' foods including crisps, snacks, biscuits and sweets. These and other foods must now be packed in biodegradable plastics.

At the same time, the court ordered that edible oils and fats must be packed in tin containers, rather than plastic bottles or pouches.

However, a number of 'essential' foods including bread, milk and drinking water – as well as medicines – may still be supplied in plastic packaging until 31 March 2014.

HP's government originally announced the ban in June 2013, but this was delayed



Himachal Pradesh has banned conventional plastic packaging for foods such as crisps

after appeals from organisations including the Indian Biscuit Manufacturers Association.

According to local business magazine *Down to Earth*, the IBMA is now planning to file an appeal with the court. KP Mohandas, secretary general of IBMA, told the magazine that the court order was against the interest of consumers, industry and trade.

"We have been consulting the Indian Institute of Packaging (IIP) about introducing biodegradable packaging," he said. "The director told us clearly that no such technology is available in the country for biodegradable packaging of mass food products such as biscuits. We are very disappointed with the order."

DuPont sets March award deadline

The deadline for this year's DuPont awards is 1 March.

Any form of packaging, which does not have to feature DuPont materials, is eligible for entry, as long as it has been commercialised since 1 January 2012.

"The packaging industry is experiencing a transition from disruptive packaging innovation to solutionsbased innovation," said David Luttenberger, this year's chief judge.

New judging categories for the 26th awards include technological advancement, responsible packaging and enhanced user experience.

Yasmin Siddiqi, awards programme leader, said: "The awards honour packaging innovations that use science, inspiration, and creativity to shift the paradigms and change the way we live."

www.packaging.dupont.com

UK investment for plastic banknotes



Beeby: "This recognises the benefits of polymer notes"

UK-based Innovia expects to invest more than £20 million (\$33m) to build a plant to supply plastic banknotes.

The investment is needed following the Bank of England's decision to start using plastic notes. Innovia says it has been identified as the preferred supplier because its Guardian polymer substrate is already used by more than 20 other countries.

The company will build an

opacification plant at its Wigton site, which is expected to be operational in early 2016. It will produce the polymer substrate for the new Winston Churchill £5 note (launched in 2016) and Jane Austen £10 note, which will follow around a year later.

The investment is expected to create up to 80 jobs. It is in addition to the recent £20m investment to install extra biaxially oriented polypropylene (BOPP) film capacity, and a gas turbine, on the Wigton site.

David Beeby, CEO of Innovia, said: "We are proud to have been selected as the preferred supplier of the polymer substrate for the new £5 and £10 bank notes. This recognises the benefits that polymer notes have to offer, and Innovia's expertise in this field."

I www.innoviafilms.com

Compostables have "negligible effect" on plastic waste stream

Biodegradable plastics producers have hit back at claims that their products affect the quality of recycled polyethylene (PE).

Industry association European Bioplastics cites a number of studies that say a level of 10% compostable plastic in the waste stream has a "negligible" effect on the physical properties of the resultant recycled PE. European Plastics Converters (EuPC) had earlier published a study claiming that just 2% of compostable plastics is enough to affect the mechanical and visual properties.

"Studies and field trials have demonstrated that a small fraction of compostable plastics do not negatively impact the quality of the recycling stream," said François de Bie, chairman of



European Bioplastics.

He added that compostable materials in the PE stream were easier to handle than others, such as polystyrene, or polypropylene.

The studies cited by European Bioplastics were carried out at the Institute for Bioplastics and Biocomposites at the University of Hanover, the Italian National Packaging Consortium (Conai) and bioplastics company Biotec. The Hanover research examined the influence of different compostable plastics on LDPE, with a contamination level up to 10%. The researchers found no reduction in viscosity, elasticity or tensile strength, in comparison with pure LDPE. There was no noticeable optical change, and a slight decrease in melt flow rate at a level of 10%.

The compostable plastics used in the study included a

PLA/PBAT blend (BASF's Ecovio); pure PBAT; and a starch blend.

The Biotec study concluded that its Bioplast material (a starch/PBAT blend) had a similar effect to contamination by PS or PP. At the same time, it found that a 2% contamination by PET led to material that was impossible to process by blown film extrusion.

The Conai study found that 10% inclusion of Novamont's Mater-Bi starch-based resin had no effect on recycled PE.

The earlier study, which claimed that 2% of compostable plastics was enough to affect PE performance, was commissioned by EuPC and carried out by the Transfer Centre for Polymer Technology (TCKT) in Austria.

I www.european-bioplastics.org I www.eupc.org

Simona makes acquisition in US

Simona has extended its reach in North America by acquiring a leading US sheet producer.

Laminations Inc, which makes high-density polyethylene (HDPE) and fluoropolymer sheet products and lining laminates, is based in Archbald, Pennsylvania.

Michael Schmitz, president of Simona America, said the acquisition gives the company a broader range of products and production methods, as well as greater production capacity to supply the growing North American market.

Laminations' capabilities in HDPE include a number of colour technologies and a broad product range developed for applications in outdoor recreational structures, signage, furniture and the marine industry. Its products, marketed under the Lamcorr brand, include flame-inhibiting PP, PVDF, PFA, E-CTFE and a proprietary grade of PVC. They are used widely in applications for semiconductor and chemical processing equipment.

"This acquisition is part of

our global strategy to penetrate growth industries and establish significant positions for our plastics in all international regions," said Wolfgang Moyses, Simona's CEO.

Michael Lynch, formerly president and CEO of Laminations, becomes CEO of Simona America.

"The combination of products, market expertise and technologies strengthens our position in the semiconductor and chemical processing industries," he said. I www.simona.de



Moyses: "This acquisition is a significant part of Simona's global strategy"

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Treofan plans expansion at main BOPP plant

German BOPP film manufacturer Treofan is to boost production at its main site in Neunkirchen, with a €30m investment.

A five-layer extrusion line, housed in its own building, will produce a broad range of packaging and label films in a variety of thicknesses and densities. The 8.7m wide line was designed by Andritz.

Construction begins in the spring, and equipment will be installed towards the end of the year. Because the new line will occupy its own building, production will continue without interruption, says the company.

From mid-2015, Treofan expects the plant to produce around 1 billion square metres of film per year.

"Together with Andritz, we have developed a sophisticated overall concept spanning everything from raw material supply to a differentiated film portfolio," said Peter Vanacker, Treofan CEO.

Neunkirchen was chosen for the investment partly because its central European location allows for rapid Vanacker: "New line helps us manufacture sophisticated, complex film"

continent-wide delivery. The plant's design allows for potential future expansion, and the addition of extra products.

Specific energy consumption, measured in kWh per kg of manufactured film, is expected to be at least 20% below that of the company's existing lines.

"The new line is another step in implementing our growth strategy of manufacturing sophisticated, complex film characterised by innovation, quality and efficiency," said Vanacker.

EFSA wants BPA levels cut

The European Food Safety Agency (EFSA) is proposing to cut the exposure limit of bisphenol A (BPA) to one-tenth of its current level.

It is recommending that the tolerable daily intake of BPA – which is used in the production of polycarbonate – be cut to 5 microgrammes per kg of body weight per day.

EFSA has reviewed over 450 studies relating to potential health hazards associated with BPA and identified likely adverse effects on the liver and kidney, and effects on the mammary gland, as being linked to exposure to the chemical.

It recommended that the reduced TDI should be set on a temporary basis, pending the outcome of research from the US National Toxicology Program (NTP) which will address many of the current uncertainties about the potential health effects of BPA.

However, it concludes that BPA poses a low health risk to consumers as exposure to the chemical is still well below the temporary TDI.

Iona Pratt, chair of EFSA's panel on food contact materials, enzymes, flavourings and processing aids (CEF), said: "The risk assessment of BPA has been hugely complex. EFSA concludes there is an estimated safe level of exposure to BPA but has reduced this and set it on a temporary basis."

EFSA is launching a public consultation on this draft assessment, which runs until 13 March 2014.

www.efsa.europa.eu





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Vicent Martínez of Aimplas explains how supercritical carbon dioxide can help to recover valuable materials from packaging film

Recovery position

Plastics account for more than one-third of all materials used in packaging applications, and it's easy to see why: they offer important advantages including mechanical strength, low weight, high barrier, design flexibility and recyclability.

The packaging sector is under pressure from stringent legislation regarding plastic materials for food contact applications. Furthermore plastics processors are largely responsible for reducing the generation of packaging waste. Many of them use in-plant recovery systems to reuse out-of-specification film, off-cuts, process scrap, over makes, or old redundant stock. The amount of scrap generated can reach more than 10% depending on the converting process.

The scrap is usually mixed with virgin resin to obtain new products. There are currently several state-of-theart recycling technologies for shredding and agglomerating this type of scrap, making it possible to continuously and homogeneously feed extrusion film lines.

Ink removal

But when it comes to recovering printed and laminated film waste, the inks used in conventional flexographic or rotogravure printing lead to colouring of the reprocessed thermoplastic material, limiting its reuse in applications where clarity and transparency are important. Therefore, the waste is used to manufacture low value products such as rubbish bags, plant pots or irrigation pipes – or diverted to landfill as a mixed plastic fraction. This is because the recycled compound has a dark brown coloration as a result of the inks. Furthermore printing inks are based on organic components that decompose during reprocessing generating gases, volatiles and an unpleasant smell. This recyclate can also be difficult to process as blown film.

The presence of a multitude of gels affects the mechanical properties of films.

The amount of printed films for flexible packaging applications is increasing considerably. A number of recycling technologies have been proposed in order to remove the inks, adhesives and other contaminants, from the films, so they can be reused for added value applications.

Many of these approaches are based on removing the layer of ink on the film surface, by physical or chemical means.

Plastic films used in flexible packaging applications can be as thin as 15 microns and are difficult to handle due to very low apparent density. So, the first step in these de-inking methods consists of shredding the films into homogeneous, small-sized particles. Physical methods rely on rotating chambers where ceramic beads remove the ink layer by eroding the film surface. Chemical processes use organic solvents or solutions Reels of waste printed film often end up in landfill because they are difficult to recycle



Film made from Clipprecovered material is more transparent than that recycled using conventional methods with surfactant cationic agents. These processes include several stages (grinding, pre-washing, counterflow extraction) requiring high levels of energy consumption and generating waste streams, such as sludge. In the case of organic solvents, there are volatile organic component (VOC) emissions to contend with. Because of these issues, the economic feasibility of these de-inking methods has limited their implementation at industrial level.

Supercritial recovery

A pan-European project, called Clipp, has studied the use of supercritical carbon dioxide technologies as a way of recycling printed or laminated plastic packaging films.

Coordinated by Aimplas, it aims to demonstrate and promote alternative technologies for increasing the recycling of printed films and lightweight packages in a cost-effective way.

This EU-funded project has nine partners from four countries: there are three technological centers (Aimplas, Fraunhofer-ICT, Plasttechnics Cluster of Slovenia - PCS); four SMEs (Extruder Experts, Gneuss, Skymark, Aligoplast); and two large companies (Grefusa, Emsur-Saymopack).

The partners cover the whole value chain of the product, including thermoplastic materials processors, manufacturers of equipment for plastic extrusion, film lamination and printing companies, packaging manufacturers, recycling companies, and packaging companies from the food sector.

The recycling system proposed by Clipp would reuse scrap from post-industrial, out-of-specification printed films, off-cuts, process scrap, over makes and old redundant stock in a closed-loop management system. It would allow companies that generate such waste to reuse the recycled thermoplastic compound in comparable (but not food contact) applications.

Continuous extrusion

The technology for removal and compatibilisation of the ink fraction in the printed films relies on a continuous extrusion process by means of synergetic combination of carbon dioxide in supercritical conditions $(sc-CO_2)$ with microfilters and vacuum degassing in a fully integrated process.

The injection of sc- CO_2 gas into the molten polymer matrix acts as a stripping agent for removal of organic components and also contributes to reduce melt viscosity – allowing fine filtration. This approach differs from previous attempts, which use conventional de-inking processes – multi-stage operations that use organic solvents or aqueous solutions with surfactants, which have environmental drawbacks and limited economic feasibility.

Different machine configurations such as twin screw extruder, tandem single screw extruder and multi rotation system (MRS) developed by partner Gneuss, were studied in order to optimise the removal of organic components and other contaminants from inks and varnishes, while enhancing degassing capacity for volatiles.

Injection port

Two extruders are used in the operation. Extruder 1 incorporates an injection port for $sc-CO_2$. A rotating screw melts and compresses the thermoplastic material in order to build up high enough pressure at the end of the extruder or compression zone, which helps to assure supercritical conditions for CO_2 addition in the melt flow for volatiles solubilisation and reduce melt viscosity.

A filtering system is placed between the two extruders in order to remove contaminant particles. A venting port, which is situated at the end of the extruder, allows for degassing.

Extruder 2 then provides extended residence time,

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promoting better dispersion and compatibilisation of remnant particles into the polymeric matrix. A venting port situated at the end of the extruder allows degassing.

Analysis of treated thermoplastic compounds using the proposed recycling technology showed that synergetic combination of sc-CO₂, filtering and degassing led to significant VOC reduction (in some cases by a factor of nine).

Extrusion trials

Extrusion blown-film industrial trials were done in Skymark partner facilities in order to assess processability of PE-treated compounds.

No bubble instabilities, die lines, melt fracture, gels or other issues were seen. Although film obtained is not completely transparent, it is translucent enough to read a text through it. In addition films show good aesthetics and mechanical properties similar to those from virgin resins.

As a main outcome the extruded PE film does not emit any unpleasant odour and was suitable for different added-value packaging applications, including film for wrapping tissue packages, pallet top covers and mailing bags.

PCS was in charge of environmental, regulatory and economical analysis. Operating costs for Clipp recycling technology are approximately €0.38/kg. This outcome, added to the fact that Clipp-treated compounds can be reused for added value products, strengthens its commercial viability. At the same time, a thorough health, toxicity and safety analysis found that – although current regulations insist that recycled materials containing pigments or adhesives must not be used for products intended to come in contact with food – Clipp materials can be used for food packaging applications in multilayer structures behind a functional barrier, because migration analysis agreed with Regulation EC 10/2011.

Also, Clipp-recycled material can be used in non food contact applications where odour-free materials with low VOC emissions are needed. I www.aimplas.net

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Recycling is of growing importance. We highlight some of the latest techniques, which were seen at the recent K2013 exhibition



Visitors to K2013 discovered new ways to sort and recycle plastics waste, including a method to remove adhesive labels and another to recycle bioplastics.

Bühler used the show to launch its Optical Sorting Station (OSS), which integrates all the necessary elements – including plant engineering, sorting technology, pneumatic conveyors, pre-conditioners and ancillary equipment.

"This will mean that processors no longer need to source separate elements from multiple suppliers, and manage multiple relationships," said the company.

For flake processing, an optical sorting station features a purifying, refining, sizing and grading stage which can include one or more Sortex optical sorters. These are linked together, convey the product between stages and can re-introduce it into the system for re-sorting. Flakes can be fed into one end of the OSS and collected at the other end – ready for bagging or further processing.

Charith Gunawardena, head of optical sorting at Bühler, said: "We want to help our customers achieve the most efficient sorting methods on plastic flake processing lines. We have already installed the full optical sorting station for several of our plastics customers, including Deceuninck and ITW Poly Recycling. These companies are beginning to see increased efficiency and yield from their processing lines, which leads to higher operating profits."

Label removal

Pallmann of Germany has developed the Hydrofiner, which uses hydro mechanical action to remove sticky cellulose-based laminate from packaging – yielding

Fraunhofer IVV has adapted its Creasolv process to recover PLA from packaging waste

high quality, clean material for further processing. The company says that it can separate large amounts of post-consumer laminated plastic packaging from adhesive labels quickly and efficiently.

Large amounts of packaging waste is relatively clean, but difficult to recycle because it includes paper labels, which are often attached with strong adhesives. The usual method of recycling such waste is to granulate it and reprocess it in an extruder. But this requires a lot of melt filtration and frequent changes of melt filters. It may be possible to remove the labels by washing the packaging, but this requires the use of hot water, which consumes energy. Another alternative – using solvents – also introduces extra cost.

Pallmann decided to develop the industrial equivalent of some basic methods that are used in developing countries – where labels are often removed by vigorous manual brushing them off manually.

In the Hydrofiner, a large amount of waste is intensively rubbed between two surfaces, with a small amount of water. The material rubs mostly against itself, rather than the metal surfaces of the machine. The labels and glue are separated and removed, and the packaging is reduced to flake.

Bühler's integrated optical sorting station (OSS) is an integrated system that includes pneumatic conveyors, pre-conditioners and ancillary equipment The process is based on two discs – a rotor and a stator – with material being fed to the centre via an auger, then moving to the outside through pairs of intermeshing teeth. The time the material spends between the discs can be altered by changing the speed of the rotor and by adjusting the amount of water. The water is injected at three separate locations to provide increased precision, and is recycled back into the system after use. The Hydrofiner has a throughput up to 1800kg/hour of packaging waste. It is modular in construction, and can fit into a 20- or 40-ft container for ease of transport and assembly. The company has already sold two systems.



Dissolving PLA

The Fraunhofer Institute for Process Engineering and Packaging (IVV) has developed three new variants of its Creasolv process – including a method for recycling PLA.

Creasolv is a solvent-based process that selectively recovers a specific plastic from a mixture of materials. IVV says that it has developed a way of separating pure PLA, PLA-containing fractions, PLA composites and blends from packaging waste – and convert it into high quality PLA recyclate. These can be used to make packaging for non-food applications and consumer goods.

The other two Creasolv variants, presented at K2013, were to recycle metal-plastic composites, and expanded polystyrene (EPS).

Recycling innovation

Intarema is the name of the new core recycling technology from **Erema**. It is based on the company's patented counter current technology, which Erema says combines flexibility and higher productivity with lower energy consumption.

Inside a cutter/compactor, the rotation of the rotor disc that is equipped with tools forms a rotating spout so that material circulates the whole time. In the counter current system this spout now moves against the direction of the extruder. As a result, the relative speed of the material in the intake zone – when passing from the cutter/compactor to the extruder – increases to such an extent that the extruder screw acts in the same way as a sharp cutting edge which now cuts the plastic.

This helps the extruder to process more material in a shorter time and is more independent in terms of the pre-compacting level of the material.

The inverse tangential configuration of the counter current system ensures that the extruder screw is filled virtually pressure-free with pre-heated material.

"The screw basically takes what it needs," said Michael Heitzinger, chief technology officer at Erema. "The extruder always has the ideal filling level and is never overfilled, which makes it much better to regulate."

Results from development trials (in cooperation with customers) with in-house waste from 30 micron LLDPE blown film show the effect of the new system on the increased process stability, productivity and flexibility of the Intarema plant.

"Besides extremely easy operation, a stable and sensitive recycling process is essential to ensure recycling rates of 100 % high-quality recyclate in virgin







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material grade, particularly when processing clean in-house waste from production," said Heitzinger.

The new Smart Start concept allows many central process steps to run completely automatically. Staff at the machine can operate it very easily by pressing just a few buttons – without having to think about the operating language, because it is based on a few clear, easy-to-understand symbols.

A further technical innovation is the EcoSave technology (fitted as standard) which enables users to reduce energy consumption by 10%, cut CO_2 emissions and lower production costs. The efficient direct drive on the Intarema extruder screw can boost extruder efficiency by around 3%, while a practical energy display gives a constant overview of energy consumption.

The controlled material intake alleviates the risk of sticking, which can be a problem for very light materials with low energy content (such as thin packaging films) or materials with a very low softening point (such as PLA).

Temperature changes in the cutter/compactor due to fluctuations in feeding have hardly any effect on plant performance or the quality of the recyclate, says Erema.

The new system also offers high flexibility when



processing materials with high input moisture and contamination, such as washed agricultural films, post-consumer film flakes, or films with solid content.

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Breakthroughs in bioplastics continue, as the sustainably derived materials find their way into new applications. **Lou Reade** reports

Fresh crop of plastics hit the market

Research into bioplastics is continuing to help the industry's fastest-growing material to find new applications.

Basic research, and pan-European research project are uncovering potential new uses for materials, as well as suggesting new ways to make them. Closer to the market, a number of leading players are showcasing their latest developments.

One of the longest established producers, **Novamont** of Italy, has extended its range of Mater-Bi biodegradable films, developing a grade for agricultural mulch film for the first time. The material was showcased at the recent K2013 exhibition.

The transparent film will biodegrade in the soil. Novamont has previously decided against marketing such a product, because it did not have any natural, biodegradable UV stabilisers – until now.

The UV stabilisers are needed to ensure that the product has a long enough lifespan in the field.

"We did not consider it sustainable to use the same additives as non-biodegradable mulching film because this would have left deposits in the soil after the film had biodegraded, presenting a risk of accumulation," said the company.

After intensive research, Novamont has developed a UV stabiliser derived from natural substances, which biodegrades completely in the soil.

At the same time, **Biotec** launched its Bioplast 500 film grade. The material has a bio-based carbon share



of more than 50%.

"The challenges to tackle were significant," said Harald Schmidt, CEO of Biotec. "Processability and mechanical properties were key factors."

Bioplast 500 can also be used to make film as thin as 18 microns, he added.

The material, which took three years to develop, is designed for blown film extrusion for applications including short life packaging, multi-use bags (such as carrier bags and loop-handle bags), single-use bags (such as biowaste bags or bin liners) and agricultural film.

According to Biotec, films made from its material consist mainly of renewable raw materials, are biodegradable and can be composted at home – as well as being recyclable.

Plastic from sugar

FKuR of Germany has launched two new grades of material for packaging and household film.

For packaging, it offers its range of tailor-made compounds under the brand name Terralene, which is based on Braskem's Green PE (sugarcane-derived polyethylene).

Barrier packaging made from Terralene can be manufactured on existing production equipment and is fully recyclable in existing PE recycling streams, says the company.

At the same time, it has developed two new com-

Corbion and Innovia have teamed up to develop a transparent, high heat PLA Novamont has launched its first agricultural mulch film postable materials for household films. Bio-Flex F1137 and F1138 are both certified compostable (according to EN 13432) and meet the high demands placed on household films.

Bio-waste bags made from F1137 allows organic waste in the home to be collected in a hygienic way. The high moisture resistance helps to keep the water from kitchen waste inside the bag, keeping the waste bin clean and dry.

Carrier bags made from F1138 are already used in Italy. They can be reused as carrier bags multiple times, then serve as waste bags for the collection of organic waste.

Recently, the company started operating an extra compounding line – supplied by KraussMaffei Berstorff – for the production of biopolymers. FKuR now has three lines from KM Berstorff.

The latest line is equipped with a ZE 75 R UTXi and designed for output rates of up to 1,000 kg/h.

"The main benefits of these lines are minimum downtime combined with unparalleled flexibility, which enables us to process a wide range of biopolymers without any retooling", said Carmen Michels, FKuR's CEO.

Mvera B5011 from **Metabolix** is a new film grade resin that is designed to meet international industrial standards for compostability, while enabling customers to produce films for compostable bags and packaging applications with high transparency.

It is certified for compostability by Vincotte to meet the EN13432 standard and by the Biodegradable Products Institute (BPI) to meet ASTM D6400. The resin processes well on existing blown film equipment and has a good balance of puncture toughness, tear propagation resistance, seal strength, printability and durability, says the company

Aimplas and its Ecobionet partners have developed biodegradable nets for food use

"It pairs robust bag durability with superior clarity, touch and feel," said Bob Engle, vice president of biopolymers at Metabolix.





Metabolix earlier launched Mvera B5010, which balances physical properties with the toughness and load-bearing capability needed for translucent shopping and food waste bags.

High heat PLA

Innovia Films and **Corbion Purac** are teaming up to develop polylactic acid (PLA) film that is transparent and resistant to higher temperatures.

Many biopolymers, including PLA, have limited heat resistance – which can limit their application. Corbion and Innovia say that the new films have lower shrinkage at high temperatures than existing PLA films, and offer properties much closer to traditional PET. Potential opportunities for the new film include food and non-food packaging and many industrial applica-

and non-food packaging and many industrial applications. Juice and soup pouches made from the film could withstand the temperatures required for sterilisation, for example. Non-food applications might include release liners for pressure sensitive products, window films, and protective films for smartphone screens. Many of these applications require thermal stability during processing or use.

Steve Langstaff, product development manager at Innovia, said: "Dimensional stability, particularly at high temperatures, is a real weakness in biofilms. This development will fill a performance gap in the market." Corbion Purac's lactide monomers are sourced from GMO-free, renewable feedstocks such as sugarcane, and form the basis for PLA. The resulting homopolymers can withstand boiling water, and now boast performance characteristics to rival their oil-based counterparts, says the company.

Jeroen Jonker, senior vice president for bioplastics

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FKuR benefits from minimum downtime and high flexibility of KraussMaffei Berstorff lines



Carmen Michels, FKuR's CEO

at Corbion Purac, said of the partnership: "By pooling our expertise and combining our research strengths, we can develop a bio-based performance film to rival traditional, oil-based standards."

Net benefits

Spanish research organisation **Aimplas** has developed biodegradable nets as packaging for citrus fruits, potatoes, onions and shellfish products. They do not need to be separated from the organic waste in order to be recycled, as everything can be composted together.

It is the result of research carried out by Aimplas and partners in the Ecobionet project: these include Ecoplas and Cristóbal Meseguer of Spainn, Tecnaro from Germany and OWS of Belgium.

The net is fractionally more expansive than a conven-

Green alliance

Eight leading consumer brands – in collaboration with conservation group World Wildlife Fund (WWF) – have formed the **Bioplastic Feed-stock Alliance** (BFA), to support the development of plastics made from plant material.

Its main focus will be to guide the selection and harvesting of feedstocks – such as sugar cane, corn, bulrush, and switch grass – that is used to make bio-derived plastics. As the development of these renewable materials has grown, so has the need to address their impact on land use, food security, and biodiversity, says WWF.

With consumers increasingly looking for more sustainable products, responsible sourcing of these materials is critical, it says.

"This alliance will go a long way in ensuring the responsible management of natural resources used to meet the growing demand for bioplastics," said Erin Simon, of WWF. "Ensuring that crops are used responsibly to create bioplastics is a critical conservation goal, especially as the global population is expected to grow rapidly through 2050."

The Alliance's eight founding companies are Coca-Cola, Danone, Ford, Heinz, Nestle, Nike, Procter & Gamble and Unilever.

tional one, and will increase the price of packaged goods by one cent per kilo of product. (So, 5kg of potatoes will cost an extra 5 cents if packaged in this way.)

The biodegradable net can be manufactured in all of the variations currently used on the market: oriented (retain its original shape with the product inside, as is used for garlic and shellfish products); the non-oriented (for citrus fruits, potatoes and many fruit and vegetables); and combined (designed to see the product and to let it breathe, but prevent waste and dust from falling out).

Researchers at the **Masdar Institute of Science and Technology** in Abu Dhabi, United Arab Emirates, have developed a material comprising PLA and nanocrystalline cellulose (NCC), which they say could be used for packaging and other applications.

This could be a way of improving the toughness of PLA – and hence its process ability – but using a renewable substance rather than something like a nanoclay.

The NCC is extracted from cellulose fibres by subjecting them to acid hydrolysis. This separates the amorphous and crystalline parts of the cellulose. The rod-shaped cellulose crystals are then dispersed into the PLA, which is processed by electrospinning.

The research was published in the *Journal of Applied Polymer Science*.

US-based **Sierra Resins** is looking to fishing industry waste as a source for a new type of biodegradable plastic.

In collaboration with Jason Bolton, a food safety specialist at the University of Maine, it will develop biodegradable plastic for products used in the food services and food processing industry, including packaging.

"The fisheries waste stream could very well provide some answers in making materials more biodegradable," said John Tersigni, CEO of Sierra Resins.

Sierra Resins is a formulator of a bioplastics that break down in landfills. Its Enviroable masterbatches promote the breakdown of materials including PVC, PET and HDPE.

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Natural born fillers

Mineral fillers, such as talc, have always been sold on the basis that they cut the cost of the final part – by replacing a certain portion of the (more expensive) resin.

But fillers are also starting to take on a green tinge. Many new types of filler are derived from sustainable sources. This gives rise to a new sales pitch: fillers that can reduce the use of non-renewable content (in the shape of the plastic resin).

An example is Seppa, which is derived largely from sea shell waste. It can be used as a filler in a range of plastics, helping to reduce the amount of polymer used for a variety of applications (especially film and sheet).

"It has no claims to biodegradability, but simply reduces use of a non-renewable source," said Colin Farrant of **CFM Machinery**, the UK agent for Seppa.

Seppa contains three core ingredients: chitin, calcite and aragonite. Chitin is contained in the outer layer of sea shells. Calcite is calcium carbonate – as is found in rocks like chalk and limestone. It is already widely used as a filler for plastics, but this version is from a renewable source. Aragonite is a special form of calcium carbonate with a different crystalline structure. Seppa contains more aragonite than calcite.

The three ingredients are processed into a microfine powder and compounded into a pellet of LLDPE, ready to add to batches of synthetic resin.

Each element has a different role to play. The aragonite promotes even distribution of in flexible and

Fillers from renewable resources – including sea shells, grain and paper – are becoming more commonplace. Lou Reade reports

rigid plastics. Product performance can be retained at far higher loading levels than ordinary calcium carbonate. Chitin provides strength and durability. The benefits of using calcite as a filler are already well known.

Seppa does not contain any oxo-degradable technology such as metal salts – and, unlike bioplastics based on corn-starch, does not contain a food stock.

Seppa distributes evenly in HDPE and LDPE films. A loading level of 27.5% can easily be run in 13-15 micron films, to give around 25% bio-renewable content. In thicker films, a loading of 40% or more is possible. It can be used in products ranging from lightweight carrier bags and reusable shopping bags, to plastic sacks and sheeting.

For thermoformed products, it can replace up to 45% of the synthetic polymer normally required to make the item – without affecting product performance. Finished goods are recyclable using standard processes.

"It comes from a renewable and sustainable source

Waste paper can be ground to a fine powder and used as a filler for PP and other resins

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– that does not use agricultural land or resources – and is cost neutral," said Farrant.

Preferred supplier

US-based **Laurel Biocomposite** has opened a new 2,000 sq m facility in Laurel, Nebraska, and completed the first 3,200 tonnes/year line for its Bio-Res PE compounds.

Bio-Res compounds are produced using the by-products of distillers' grain and are blended with traditional polymers as a filler, in order to replace non-renewable content.

BioRes blends easily with PE, PP, PLA and PHA polymers, to produce a range of products. A renewable content of up to 40% can be attained, says the company.

A second expansion phase is also planned, including a second production line and bulk material handling, which should raise capacity to nearly 22,000 tonnes/year

Meanwhile, US compounder **RheTech** has established an alliance with Eco Bio Plastics Midland (EBPM) allowing it to use the latter's patented technology for incorporating ground paper as a polymer reinforcement.

The EBPM technology, developed by its Japanese parent Eco Research Institute, involves dry grinding

paper and pulp to form a micro-sized powder (30-50 microns) that is suitable for use in polypropylene and other types of thermoplastic resin.

"All of our customers are looking for ways to meet stricter environmental standards in the products they make, and RheTech continues to provide a broad range of compsoite solutions that meet those needs," said Jim Preston, vice president of strategic growth for RheTech.

Production of the new compounds, which will be marketed under RheTech's Rhevision bio-composite and EBPM's Mapka brands, will be located at the company's Whitmore Lake plant in Michigan.

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Seppa is a filler derived from seashells that is compounded into LLDPE



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Polyolefin film was very much in evidence at K2013. Here, we round up some of the highlights, from medical film to extrusion coating

Making the grade

Polyolefins are adaptable materials, finding applications everywhere from blown film to coatings, and in industries from food packaging to medical products. With K2013 not yet a distant memory, it's not surprising that many of the most recent advances were first seen at the show.

LyondellBasell added to its Toppyl family of polyolefin resins for food packaging, with a grade that provides extra convenience to ready-to-eat products – while maintaining protection.

Toppyl RC3000 is formulated to stick directly to traditional polyethylene (PE) food containers, providing a strong seal to keep foods fresh, but it still easy to open and close. It eliminates the need for food packaging made with hot melt adhesive, which can make opening packages difficult.

"Today's packaging must be practical, effective, safe and easy to open without the need for a cutting instrument," said Stefano Pasquali, marketing manager for PB-1 specialities at the company. "Toppyl RC3000 provides a strong seal to keep foods fresh for easy storage and handling of delicate food, including meat, fruit, vegetable and cheese."

Packaging made with the material recloses easily and remains sealed. Product testing by a large film producer showed that food packaging successfully opened and closed with the same success after 10 uses, as compared to its first usage.

The material also satisfies all food contact requirements in Europe, says LyondellBasell.

Also in food packaging, **Topas** introduced a new grade of its cyclic olefin copolymer (COC), which has a combination of high heat stability and robust extrusion performance.

Topas 7010F-600 has a glass transition temperature

of 110°C, putting it between Topas 8007 (80°C) and 6013 (140°C). It is aimed at multilayer food packaging.

The material does not require pre-drying and can run on blown film systems with or without grooved feed extruders at process temperatures of 230°C or above. It can also be processed on cast film lines with low haze over a wide temperature range.

The material is typically used in multilayer structures with polyolefins and barrier resins such as polyamide (PA) and ethylene vinyl alcohol (EVOH). It is used to produce a range of multilayer packaging film applications including metallised film, twist film, hot fill, and shrink labels in thicknesses up to 100 microns.

It can be processed on conventional extrusion equipment, providing transparent, defect-free film. The material complies with US Food & Drug Administration (FDA) food contact regulations. CT7200, an LDPE from Borealis, is for extrusion coating

Lumicene Supertough 32ST05 could make films 25% thinner and stronger

"This fills a gap in our portfolio by offering the



Medalist TPE from Teknor Apex can replace PVC in products like blood bags

processing," said Wilfried Hatke, European marketing and sales manager for Topas.

combination of higher heat stability and strong

Medical advance

Teknor Apex, in a collaboration with **O'Sullivan Films** and **Genesis Plastics Welding**, has developed a way to make products like blood bags from TPE rather than PVC.

Calendered films made from its Medalist MD-500 series of elastomers can overcome the traditional disadvantages of TPEs in applications such as fluid drainage and storage bags, cushioning bladders and surgical pouches, it says.

Calendered PVC film is widely used in medical applications but TPEs have not performed well in in this process – which typically provides better thickness uniformity, more consistent physical properties and greater thermal stability than film extrusion, says Teknor.

Teknor and O'Sullivan have shown that Medalist MD-500 Series medical elastomers can be formulated for successful calendering.

"We attempted to calender a wide range of plastics besides PVC and concluded that most are simply not calenderable," said Chuck Stronach, commercial manager for healthcare products at O'Sullivan Films. "We were intrigued to discover that Medalist 500 Series compounds can be adapted for this process."

Elliott Pritikin, global medical market manager for the TPE division at Teknor Apex, said that new material offered property improvements over PVC, along with weight and cost savings: film made from the material was half the thickness of PVC, for the same strength; and its density is around 30% lower, allowing weight savings of up to 70%.

Natpet's new thermoforming grade of PP boasts high clarity and aesthetics

Medalist elastomers are also available at lower hardness ranges than flexible PVC, provide a broader processing window, and have greater elasticity and tear strength. They also exhibit 25% less colour change on





exposure to gamma irradiation than standard grades of flexible PVC.

The third partner, Genesis Plastics Welding, was able to use its proprietary radio frequency (RF) welding technology, EcoGenesis, to form strong permanent bonds in complex geometric patterns – including sealing two mono-layered films to tubing, to make traditional infusion bags.

Coating performance

There were also advances in polymers for coating. **Sabic** says it has optimised production of its extrusion coating grade LDPE NexCoat 5. The material is produced by Sabic's CTR tubular process to create a resin that outperforms traditional autoclave grades, says the company. Customers have the chance to reduce inventory costs and simplify processes, because the material can replace grades with melt indices ranging from 4 to 8.

At the same time, Sabic says that NexCoat 5 has a 15-20% lower carbon footprint than standard market grades.

Other than food and liquid packaging, it can be used in a variety of other extrusion coating applications, including imaging, release liners and building and construction. It can also be used in lamination applications.

Rob Balk, international account manager at Sabic, said: "NexCoat 5 is a drop-in solution and customers can replace multiple grades with this one product."

The grade has a low neck-in, which produces a stable web. Other properties include: the ability to process at higher line speeds; high adhesion to various substrates; and excellent sealing properties.

Borealis has been working in a similar area,

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ExxonMobil showcased a range of technologies at K2013, though was not even an official exhibitor. Several major machine suppliers ran demonstrations at the show using grades of the company's material, to make products ranging from rubbish bags to shrink film.

An example was Windmoeller & Hoelscher, which teamed up with flat die supplier Cloeren to exhibit cast stretch films made using NanoLayer technology. This allows the production of films with up to 33 layers, that can be as thin as 8 microns. ExxonMobil supplied its Exceed and Enable PE resins, and Vistamaxx elastomer.

"Four customers in Europe have already ordered new nano-technology cast stretch equipment that will double their individual installed capacity," said Peter Cloeren, president and CEO of Cloeren.

At the same time, ExxonMobil has extended the availability of its Exceed 1012 metallocene-catalysed VLDPE into the EMEA region. The material, used as the sealant layer in lamination films, has a seal initiation temperature 10°C lower than Exceed 1018 mPE resin. This requires around 20% less sealing time to achieve maximum seal strength, which can boost packaging line speed by up to 7%.

> launching a low density polyethylene (LDPE) homopolymer for extrusion coating.

> The company says that the material, CT7200, will help the industry address the issue of end-of-life autoclave plants – many of which are expected to close in the future. CT7200 is an LDPE produced on a high-pressure tubular reactor, and boasts high-quality organoleptics and a number of other advantages, including: high zero shear viscosity, which contributes to improved sealing performance; improved flowability to enhance adhesion to various substrates, even at lower processing temperatures; and reduced energy consumption at the same output rates, enabled by high shear thinning.

Good optical properties and low gel level broadens the possibilities to use this product in various flexible packaging applications. It is suited for applications involving high-volume extrusion coating of boards and papers, liquid packaging, extrusion coating and lamination of different substrates and co-extrusion in multi-structures.

Metallocene materials

Total added two metallocene-based resins to its Lumicene Supertough range of materials for multilayer film. One is for flexible packaging, while the other is aimed at industrial film.

Lumicene Supertough 32ST05 can help flexible packaging converters make films up to 25% thinner and stronger, it says. The material allows downgauging of multilayer film structures, helping converters to create stronger films using less material. Several multilayer applications have already used the material: compression packaging (for applications such as for heavy mattresses and lightweight diapers); deep-freeze and lamination films; and shrink applications such as for glass bottle unitisation.

Carl Van Camp, senior vice president of the polymers division, said: "When the limits of downgauging are reached, Supertough 32ST05 steps in to give the necessary boost in toughness to overcome the thickness barrier."

Total's Lumicene grades, of which Supertough 32ST05 is the newest member, boast easy processing plus high mechanical properties and a good balance between stiffness and optics. Lumicene grades cover the full range of low, medium and high densities.

The second grade, Supertough 22ST05, is aimed at the industrial film sector. Its combination of bubble stability, mechanical properties and potential to downgauge by 25% creates new opportunities for wide width films, which are ideal for agriculture, transportation and protection applications.

Its enhanced properties can help customers to improve the performance and cost of their films. Sonia De Greef, business manager for flexible packaging & personal care at Total, said: "By boosting product properties, we can generate added value for customers and consumers. This innovation allows converters to combine one layer of Supertough with the most standard of prime materials – and even regrind from post consumer waste in the other layers – such that the final film has improved performance with the benefit of cost savings."

And **Natpet**, the PP producer from Saudi Arabia, showcased its new H03TF thermoforming grade at K2013. The material combines high clarity and aesthetics with high dimensional stability for thermoformed cups, trays and containers, both in shallow and deep drawn parts and covering a variety of thicknesses. Using Milliken's Hyperform HPN-600ei, the material allows converters to run shorter cycle times compared to conventional nucleated PP and increase the number of finished articles by minimising waste.

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CONSTRUCTION



Interlayer helps glazing get tough

A recent refurbishment of Vienna's Ares Tower replaced all single-pane toughened glass with laminated glass, which incorporates DuPont's SentryGlas interlayer.

Thanks to its high strength and stiffness, the interlayer helps comparatively thin and light glazing units to withstand elevated loads. This meant that the replacement required neither reinforcement nor other costly changes to the load-bearing sub-frame.

The laminated glass units – supplied and installed by MGT Mayer Glastechnik – consist of two 6mm-thick sheets of single pane toughened glass. The two sheets are bonded together with a 1.52mm thick SentryGlas interlayer.

The resultant panel thickness of 13.52mm is comparable to that of the previously used 12mm single pane toughened glass panels, while the weight is almost unchanged at 125kg.

Walter Mayer, chief executive of MGT, said: "Using conventional PVB interlayers would have meant using a thicker laminated glass structure in order to meet regulatory requirements. The refurbishment could then not have been carried out within



the specified time and cost constraints. The SentryGlas interlayer helped us make direct use of the existing load-bearing structure while meeting all requirements."

The combination of low thickness and high loading capacity is possible because SentryGlas interlayers can transfer elevated shear forces thanks to their high strength and rigidity. In practice, under identical loading, laminates with SentryGlas undergo less than half the deflection of a laminate with PVB, says DuPont.

www.dupont.com

POLYCARBONATE

Window on the world

Polycarbonate glazing is helping schools to boost energy efficiency and classroom comfort.

The Versatile window, from Winco Windows, uses polycarbonate sheet from Bayer MaterialScience. The system was recently installed at Reno High School in Reno, Nevada, where it reduced heating load by up to 25%.

"In addition to the reduction in heating costs, the system provided superior light transmission along with an integral blind attachment – enabling us to remove shading devices such as awnings," said Tony McMillen, construction and project manager director for the school district.

The inherent visual quality of the Makrolon multi UV sheet provided a finished look that matched the original glass block architectural aesthetic that was replaced.

www.bayer.com

ETPs

Taking a Peek at high performance loudspeaker

US-based Wisdom Audio has used Peek film from Ajedium Films to create a laminated diaphragm for a new design of loudspeaker.

The company incorporates the laminate – which combines Ajedium's KetaSpire Peek film, aluminium foil and a proprietary adhesive – into its L8i model in-wall loudspeaker system. Ajedium Films is a division of Solvay Specialty Polymers.

Wisdom says it is investigating whether KetaSpire Peek could replace traditional materials such as polyimide across its range of loudspeakers.

"Solvay and Ajedium met the cost/performance challenge because KetaSpire Peek satisfies our strength and thermal requirements and provides cost benefit and improved productivity compared to polyimides," said David Graebener, senior vice president of research and development at Wisdom.

Ajedium supplies Peek film in thicknesses of 12 microns to 40 mil for speaker diaphragms, which range in size from 6 sq in to 300 sq in (0.56m² to 27.87m²). The Peek film is laminated to the aluminium foil with a proprietary high-heat adhesive, then etched. The three-mil-thick lamination (aluminium foil/adhesive/ Peek film) is stretched and bonded to the frame so it can then move back and forth to create sound.

COEXTRUSION

Coextrusion line makes sausage casings at top speed

Macro Engineering & Technology of Canada has developed a high speed coextrusion line for making biaxially-oriented (biax) sausage casings.

The line can be configured to produce casing structures of up to 11 layers using nylon, PE and EVOH. It can also be extended to allow processing of structures with PVdC. It produces casings with width calibres of 80-120mm and thickness of 40-50 microns. The line operates at speeds up to 170m/min, and can be readily converted to produce films for barrier shrink bag production.

The line includes a primary bubble forming section with vacuum calibrator, orientation section

8.m

with infrared (IR) sectional heaters and an IR annealing oven. The bubble diameter in each section is precisely measured and controlled to ensure consistent production quality.

An advanced control system helps operators to operate the complex line. The control system contains recipes for automatic ramping up (and down) of the line speed with simultaneous adjustment up to 30 process parameters.

Macro intends to add automatic gauge control to the system by 2015. I www.macroeng.com



SENSORS

Keeping the weight off

Thermo Fisher Scientific says that its new weight transmission sensor can help manufacturers of thin film to reduce waste.

Its Beta Plus sensor uses either a Kr-85 or Sr-90 source of beta radiation, to offer accurate, high-resolution basis weight readings for webs and films between six and 7,000 grammes per square metre. The sensor with the Kr-85 source is designed to measure basis weight of very thin film.

"The Beta Plus sensor enhances web gauging performance by incorporating improved optics and advanced digital electronics," said Tam Nguyen, product marketing manager for web gauging at Thermo Fisher Scientific.

www.thermoscientific.com

BARRIER FILM

Oxygen transmission sensor improves sensitivity

Mocon says that its latest oxygen transmission rate test instrument is 10 times more sensitive than previous models.

> The Ox-Tran Model 2/21 10x system can measure barriers to 5x10⁻⁴ cc/(m² x day), at precise temperature and relative humidity conditions. It is aimed at applications that require a high oxygen barrier. Potential users include film and resin manufacturers, converters and packagers in industries such as electronics (OLED and thin film), solar, vacuum panel, food, pharmaceutical and medical devices.

> > Improved material barrier systems have created a demand for increased testing sensitivity,

says the company.

"The improved proprietary Coulox coulometric sensor counts every oxygen molecule permeating through the film," said Doug Lindemann, vice president of Mocon. "This is why Mocon has the only system that complies with ASTM D3985."

Additional improvements include: improved electronics to reduce system 'noise'; a TruSeal film cell, designed to eliminate edge-leakage and assure a perfect seal every time; and, improved temperature stability.

Each module contains two test cells and is available in master and satellite configuration. The 10x module connects with all other modules in the 0x-Tran 2/21 family of transmission rate test systems.

www.mocon.com

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This 32-page magazine celebrates Erema's 30th anniversary, and covers the launch of its new Intarema plastics recycling technology at K 2013. It also features interesting case studies from around the world.

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Gloucester: die rebuilds



This brochure from Gloucester Engineering covers its blown film die rebuild service, which increases line performance and limits downtime. The company's specialists can refurbish various components, including those from other manufacturers.

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This interactive product guide covers Maguire's full range of WSB gravimetric blenders. It explains how the blenders operate and includes technical specifications, key benefits, plus options and accessories.

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Polymag: process roll cleaning



This new five-page guide from Polymag Tek provides a detailed overview of the company's engineered contact cleaning solutions including its wide range of process roll cleaning products.

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Macro: extrusion systems



This 20-page brochure from Macro provides an overview of the company, which manufactures film and sheet extrusion systems plus web handling systems. It also offers process development and optimisation services.

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Macchi: barrier film production



This brochure from Macchi covers the company's COEX flex coextrusion systems for the production of five-, seven- and nine-layer barrier films. The modular blown film lines offer high levels of flexibility and efficiency.

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AMI's PVC Formulation conference has become the essential European meeting place for the vinyl compounding industry. The 2014 event takes place on 24-26 February in Düsseldorf, Germany.

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The Masterbatch Asia conference will be celebrating its 10th anniversary in style on 18-20 March 2014 in Bangkok, Thailand. Download the brochure for full details of the programme and booking information.

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Specialty Packaging Films Asia



The Asia Pacific conference on markets and technology for flexible barrier packaging is being held by AMI on 24-26 March 2014 in Bangkok, Thailand. Download the brochure to see the full programme and booking details.

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Polymer Sourcing & Distribution



AMI's ninth conference on polymer sourcing and distribution returns to Hamburg, Germany, on 12-14 May 2014. Download the high-level programme that examines "a new era for the polymer supply chain".

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Fire Retardants in Plastics



The American version of AMI's conference on fire retardants for plastics is now well established. This will be the fourth annual event in Denver, Colorado, and it boasts another strong programme.

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Folienwerk Wolfen

Head office:	Bitterfeld-Wolfen, Germany
Date founded:	1991
Managing director:	Günther Burkardt
Ownership:	Private
Employees:	Around 150
Turnover 2013:	Around €43m
Profile:	Folienwerk Wolfen was the first spin-off of the former Wolfen Photochemical Combine, where polyester films had been produced. It has now expanded far beyond polyester, processing a range of materials including EVA, PET and PLA, in both mono-layer and multi-layer products. This includes customised products for specific applications.
Product lines:	Applications of the company's films include smart cards and passports, as well as packaging for medical products. At the recent K2013 exhibition, it showcased its EVA films for the glass industry. Thanks to their resistance to heat and ageing, the films are suitable for laminated glass. They are also used to protect solar cells from external influences, such as moisture. Around 70% of the company's production output is exported.
Plant locations:	The company has a 60,000 sq m site (with an 8,000 sq m production facility) on an industrial estate in the district of Thalheim, Saxony-Anhalt. The production facility has reached the limit of its capacity so is likely to be expanded in future, says managing director Günther Burkardt.

To be considered for 'Extruder of the Month', contact the editor on lou@filmandsheet.com

film and sheet

Forthcoming features

The next issues of Film and Sheet Extrusion magazine will have special reports on the following topics:

March 2014

Thermoforming applications Materials testing & quality control Medical materials & applications Chinaplas preview

April 2014

Flat die developments Agricultural films R-PET sheet extrusion Interpack 2014 preview

Editorial submissions should be sent to Lou Reade: lou@filmandsheet.com

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Film and Sheet – October The October issue of Film and Extrusion includes articles on polycarbonate sheet developments, recycling technologies, the latest in BOPP, and market opportunities in India. Plus it has 14 pages of K show highlights.

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Compounding World – January Compounding World's January issue boasts special features on technologies for foaming plastics, the latest pelletizing systems, new developments in polymer additives, and a review of the Compounding World Forum.

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Compounding World – December The December edition of Compounding World has a special focus on the latest regulatory and technical developments for flame retardants. Plus there are reports on lab compounders, electronics applications and European market trends.

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Pipe and Profile – Nov/Dec The November/December edition of Pipe and Profile Extrusion looks at the latest innovations in mixing technology, explores new developments in WPCs, and reviews the latest applications for PEX pipe. It also reviews some of the new launches and introductions at K2013.

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injection pipe and profile film and sheet

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Global exhibition guide

28-31 January	Interplastica, Moscow, Russia	www.interplastica.de
29 Jan - 1 Feb	Samuplast, Pordenone, Italy	www.samuplast.it
11-13 February	Plastec West, Anaheim, CA, USA	www.plastecwest.com
17-20 February	Saudi Plastics & Petrochem, Riyadh	www.saudipp.com
4-6 March	Plastics & Rubber Vietnam, Ho Chi Minh	www.plasticsvietnam.com
7-10 April	Plastivision Arabia, Sharjah, UAE	www.plastivision.ae
23-26 April	Chinaplas, Shanghai, China	www.chinaplasonline.com
8-14 May	Interpack, Düsseldorf, Germany	www.interpack.com
27-30 May	Plastpol, Kielce, Poland	www.targikielce.pl
16-22 June	Argenplas, Buenos Aires, Argentina	www.argenplas.com.ar
18-19 June	PDM & PRE, Telford, UK	www.pdmevent.com
17-19 July	Plastic Technology Expo, Bangkok, Thailand	www.technobiz-asia.com/PIEC2014
3-6 September	Indoplas, Jakarta, Indonesia	www.indoplas.com
29 Sept-3 Oct	Plastex, Brno, Czech Republic	www.bvv.cz/plastex-gb
30 Sept-2 Oct	Interplas, Birmingham, UK	www.britishplasticsshow.com
30 Sept-3 Oct	Equiplast, Barcelona, Spain	www.equiplast.com
14-18 October	Fakuma, Friedrichshafen, Germany	www.fakuma-messe.de
28 Oct-1 Nov	IPF, Makuhari Messe, Tokyo, Japan	www.ipfjapan.jp/english
18-21 November	Plastimagen, Mexico City, Mexico	www.plastimagen.com.mx

AMI conferences for film & sheet extruders

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24-26 March 2014
1-3 April 2014
8-10 April 2014
12-14 May 2014
20-21 May 2014
24-25 June 2014
23-25 Sept 2014
14-16 October 2014

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