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AMI
Third Floor, One Brunswick Square,
Bristol, BS2 8PE, United Kingdom
Tel:+44 (0)117 924 9442
Fax:+44 (0)117 311 1534
www.ami.international
www.twitter.com/plasticsworld
Registered in England No: 2140318

EDITORIAL

Editor-in-Chief: Chris Smith
chris.smith@ami.international

Editor: Lou Reade
lou@filmandsheet.com

Events and magazines director:
Andy Beevers
andy.beevers@ami.international

ADVERTISING

Advertisement manager: Claire Bishop
claire.bishop@ami.international +44 (0)1732 682948

Sales & commercial manager: Levent Tounjer
levent.tounjer@ami.international +44 (0)117 924 9442

Sales manager (China): Jenny Zhou
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US speciality film giants join up

Two leading US film producers – Next Generation and Charter Nex – are to join forces, which they say will form a new platform in speciality films.

The private equity firms that own Charter Nex – Leonard Green & Partners, and Oak Hill Capital – have agreed a deal with Next Generation's owner and CEO, Dave Frecka, to combine the companies.

Frecka will be a major shareholder in the combined company and will continue as CEO of Next Generation, while Kathy Bolhous will remain as CEO of Charter Nex Films. The transaction is expected to close by June.

"By joining these two market leaders together, we will be able to offer customers a broader scope of capabilities and product solutions, while leveraging our combined scale to offer the most technically-engineered speciality films," said Frecka.

The two firms plan to maintain their existing management teams and brand identities, operating as two distinct divisions of the combined company – which will have 11 manufacturing plants and more than 100 extrusion lines across four US states.

"Charter Nex and Next Generation share a dedication to outstanding quality, excellent service and innovation," said Kathy Bolhous, CEO of Charter Nex. "By blending our complementary assets, capabilities and expertise, we will create a powerful value proposition for our customers."

› **www.charternex.com**
› **www.nextgenfilms.com**

Euromap takes aim at Brazil

Euromap, which represents European plastics machinery manufacturers, says exports to Brazil in 2018 reached €169m (US$189m). It says the packaging market there is dominated by smaller players, and investments in injection moulding are more likely than in extrusion – though multi-layer flexible packaging is a future trend.

› **http://vdma.org**

Tekni-Plex buys Amcor sites

US-based Tekni-Plex is to acquire three manufacturing facilities from Amcor's flexible packaging business unit.

The facilities – two in Wisconsin and one in Massachusetts – provide a broad portfolio of sterilisable medical device packaging substrates, including coated and uncoated Tyvek, heat-seal and cold-seal coated paper and films, medical grade laminates and die-cut lids and labels.

"The acquisition expands our complex packaging solution portfolio for medical device manufacturers, many of whom are our customers today," said Paul Young, president and chief executive officer of Tekni-Plex. "The acquisition of these three plants also brings us 150 highly qualified and experienced employees who form the backbone of the business."

The purchase is the eleventh acquisition Tekni-Plex has made in the past five years, supporting its strategy to grow its business through acquisitions and strategic add-ons.

The closing of the acquisition depends on approval by the US Department of Justice, and the closing of the merger between Amcor and Bemis.

› **www.tekni-plex.com**

PTi and Farrel Pomini align in plastic sheet

US firms Processing Technologies International (PTi) and Farrel Pomini have formed a strategic business alliance to supply integrated compounding and extrusion systems for production of plastic sheet under the Direct-to-Sheet (DTS) Compounding name.

The two companies said that DTS Compounding brings together their respective production technologies: PTi will contribute its sheet extrusion machinery, notably the G-Series Rolls Stands; Farrel Pomini its CP Series II compounding system.

The goal of the alliance is to eliminate the need to create pre-compounded resins prior to extrusion processing. Polymers and additives "can be mixed and directly extruded to sheet in one cohesive and uninterrupted process," the companies said in a joint statement.

Claimed benefits include cost savings, process efficiencies and enhanced control of compounded materials where high volumes of mineral fillers are required in extruded sheet. DTS Compounding can be configured in line with a thermoformer or as a roll stock system producing wound rolls of sheet offline.

› **www.ptiextruders.com**
› **www.farrel-pomini.com**

EU's single use plastics plans include oxo ban

The European Parliament adopted the EU's Single Use Plastics (SUP) Directive on 27 March. EU Member States have two years to introduce new legislation, which bans the use of certain products in the EU by 2021, including single-use plastic cutlery and plates, plastic straws, cotton bud sticks made of plastic and plastic balloon sticks as well as EPS food containers and cups and all oxo-degradable plastics.

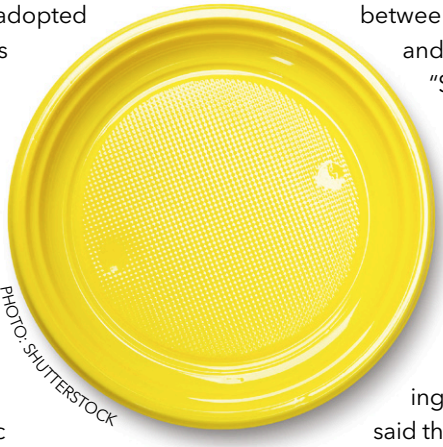

PHOTO: SHUTTERSTOCK

Plastic plates are among the banned single-use products

The last of these is already being challenged by producers of oxo-degradable materials. In a statement, the Oxo-Biodegradable Plastics Association said the introduction of a ban before the completion of ECHA's analysis of the impact of the materials, which was requested by the Commission, breached EU law.

PlasticsEurope said it welcomed the SUP Directive in terms of acknowledging that the fight against litter is a shared responsibility between authorities, producers and consumers. It said: "Setting guidelines on definitions and categories should follow promptly to avoid the risk that different interpretations will prevail among Member States."

The IK plastics packaging association in Germany said there is a danger that the emotionally charged debate around plastics in the environment could lead to hasty decisions. Climate protection should not be about banning plastic products, many of which help to reduce CO_2 emissions, save fuel, energy and water, it said, arguing that an anti-littering directive would have a greater impact on waste management and environmental protection.

- **www.europarl.europa.eu**
- **www.biodeg.org**
- **www.plasticseurope.org**
- **www.kunststoffverpackungen.de**

Blackstock buys Essel Propack

US-based private equity firm Blackstone is to acquire a majority stake in Indian packaging firm Essel Propack.

Blackstone will buy a 51% stake in the business – which makes laminated packaging tubes and other extruded film products – for at least US$310m.

This will trigger an offer to buy a further 26% of the shares, under India's rules on takeovers.

The Ashok Goel Trust is currently the majority owner of Essel Propack.

Ashok Goel, chairman and managing director of Essel Propack, said: "Blackstone brings deep expertise in the packaging space, with a proven track record of creating value."

- **www.blackstone.com**
- **www.esselpropack.com**

DS expands China plant

Davis-Standard's Suzhou facility has been expanded

Davis-Standard's subsidiary in China has expanded its manufacturing capabilities.

The company, based in Suzhou, has added an extra 35,000 sq ft (3,251 sq m) facility near its existing facility – which will house control panel assembly and provide warehousing. This reflects Davis- Standard's growing extrusion coating business and long-term strategy in the region.

"The additional space will allow us to build more extrusion coating lines at our main plant while supporting other machine services – including faster delivery," said Jinsong Lin, general manager at Suzhou. "The increased manufacturing capacity is a positive reflection of our growth over the past few years."

Suzhou also houses an R&D facility, where the company recently added a new DSX Flex-Pack 300S for customer trials. This is a single station extrusion and lamination line built specifically for the Asian flexible packaging market.

- **www.davis-standard.com**

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Simona breaks €400m sales barrier for first time in 2018

German extrusion specialist Simona has announced record sales and profits for 2018.

Last year, the company expanded sales by 6% to €418 million (US$466m), driven mainly by strong growth in North America – where revenue expanded nearly 21% to exceed €114m (US$127m). In Europe, it saw more modest growth of less than 2%, to take sales past €273m (US$304m).

Germany, Switzerland and Austria saw solid growth, but sales in Western Europe were affected by sluggish business in France and Italy, it said. Revenue from Eastern Europe was slightly higher. Business in Asia remained stable despite economic slowdown in China, with sales constant at around €30m (US$33m).

Simona CEO Moyses is to step down later this year

Pre-tax profits at the group rose by 31% to €32m (US$36m).

Its semi-finished products division, which includes plastic sheet, recorded revenue growth of 6.3%, taking the figure to nearly €334m (US$372m). Strong business in aviation applications was offset by a poor performance in the area of construction and advertising applications, said the company. However, Simona's acquisition of US sheet manufacturer PMC last year added to its core competence in extrusion – and contributed more than €9m (US$10m) to revenue growth.

Despite weaker economic conditions, Simona has set a revenue target of €435-450m for 2019 – a growth of at least 9%. In the first quarter of 2019, it has already grown sales by 12%, to €111m (US$124m), though profitability declined slightly.

The company is also searching for a new leader, as CEO Wolfgang Moyses has announced he will leave Simona by October 2019.

› **www.simona.de**

Trex expands its film recycling scheme

US decking specialist Trex is looking to expand its plastic film collection and recycling programme.

The company has branded the long-standing scheme NexTrex, and is looking to expand the 32,000 stores from which it currently collects waste plastic film.

Through the programme, Trex compensates partners for collecting recycled plastic material.

After collection, the plastic material is sent to local distribution centres, then sorted and shipped to one of Trex's two North American manufacturing facilities.

"NexTrex is an integral component of our sourcing efforts, and we're thrilled by the growing interest and participation by retailers across the country," said Dave Heglas, senior director of material management at Trex.

"Through NexTrex, we collected more than 130m lbs of recycled plastic from retailers in 2018."

Trex provides participants with recycling bins and a list of qualifying recyclable materials, which include everyday items such as grocery bags, overwraps, newspaper sleeves and bubble wrap.

› **www.trex.com**

Covestro grows in polycarbonate films

Covestro of Germany has started building extra production lines at its Dormagen site, to make polycarbonate films. The new coextrusion lines are scheduled for completion by the end of 2020. The expansion will create around 50 new jobs, says the company.

The new lines will make multi-layer flat films, which are commonly used in applications such as identity documents – allowing security features to be embedded. They are also used in car interiors.

› **www.covestro.com**

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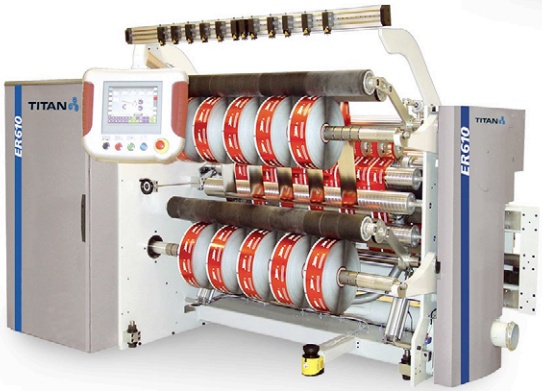

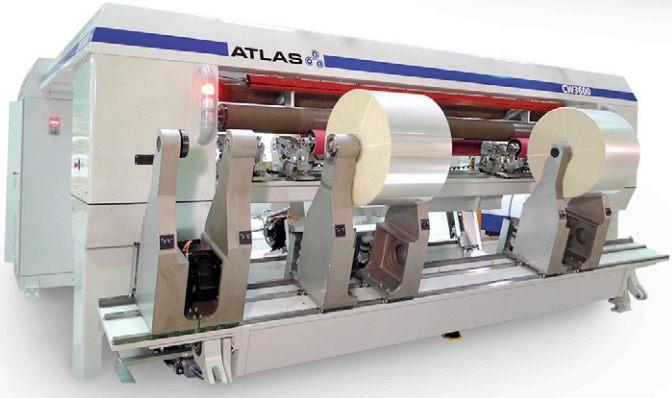

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www.atlasconverting.co.uk

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European Court backs use of DEHP in recycled PVC

The European Commission has won a court case at the European Court of Justice, regarding the use of 'legacy additives' in recycled PVC.

Many phthalates – including DEHP – have been restricted by the European Chemicals Agency (ECHA). In 2016, the Commission backed a recommendation by ECHA to grant a four-year authorisation for uses of DEHP in recycled PVC by three PVC recycling companies – VinyLoop Ferrera, Stena Recycling and Plastic Planet.

ClientEarth, an environmental NGO, challenged this decision at the European Court of Justice. However, in a decision on 4 April 2019, the court backed the Commission's stance.

ClientEarth says that it may appeal the ruling, saying that the court's decision was contrary to Reach's main objective of ensuring high level of protection for health and the environment.

"We regret that the EU makes it so hard for NGOs to go to court to protect people and the environment," ClientEarth lawyer Alice Bernard told *Chemical Watch*.

The Commission originally gave the three companies permission to use recycled PVC – which contained DEHP – in two ways: to formulate recycled PVC and dry-blends; and in industrial use of recycled soft PVC in various processes, including extrusion.

Brigitte Dero, general manager of VinylPlus, said of legacy additives: "The committees of ECHA concluded in favour of allowing – for 15 years – the recycling of PVC waste containing lead up to concentrations which should allow most recycling to go on – because the conditions applied ensure that the risk is controlled."

› **www.echa.europa.eu**

› **www.clientearth.org**

Chinaplas 2019 is held in Guangzhou this year, and organiser Adsale expects it to host around 180,000 visitors. The show, which runs from 21-24 May, is held at the China Import and Export Complex in Pazhou, Guangzhou. Around 3,500 exhibitors are expected to fill more than 250,000 sq m of exhibition space. Visitors from more than 150 countries and regions are expected to attend, said Adsale. Our Chinaplas **preview** begins on page 13.

› **www.chinaplasonline.com**

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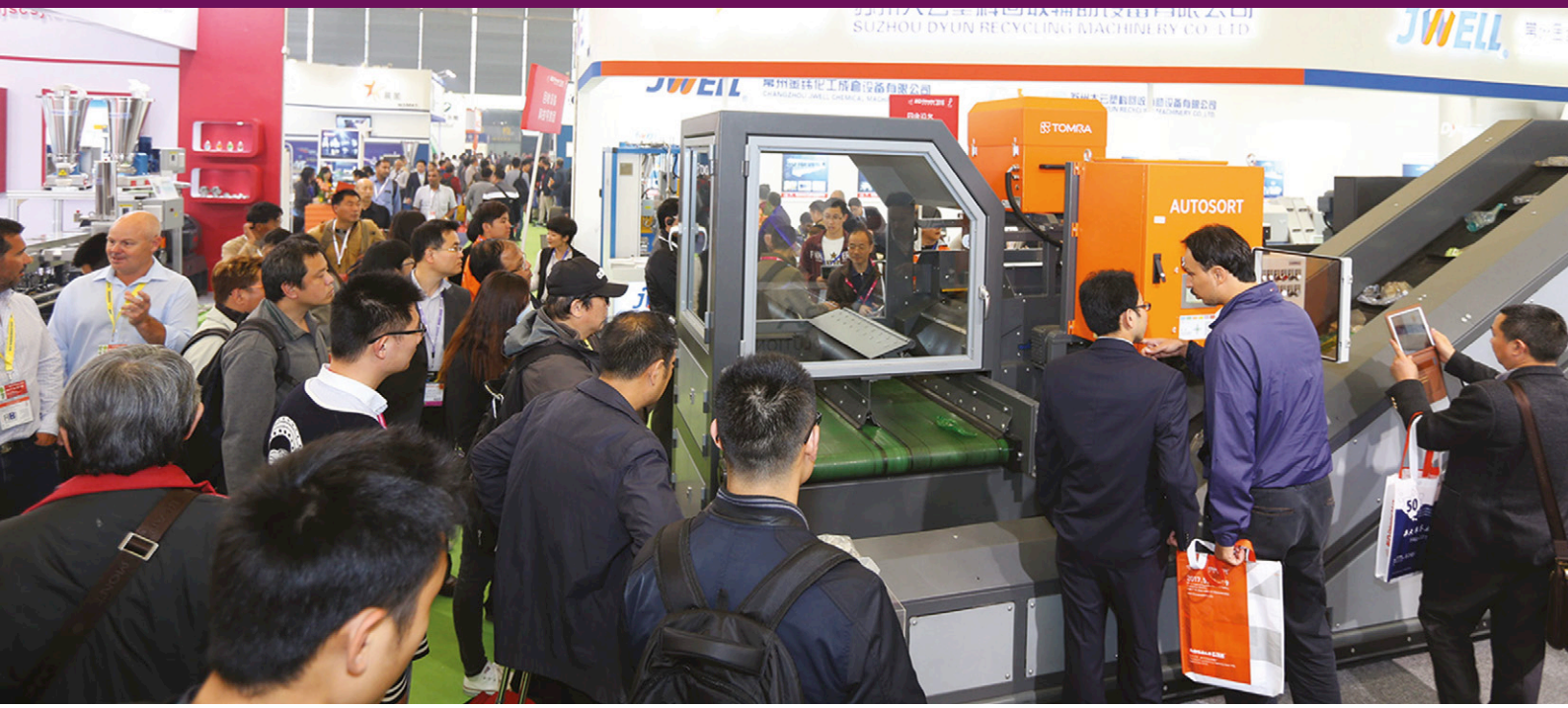


Chinaplas returns to Guangzhou

Chinaplas returns to Guangzhou this year, and here we preview the show with a focus on features of interest to film and sheet extruders

Chinaplas returns to Guangzhou this year and is expected to host around 180,000 visitors. The show, which runs from 21-24 May, is held at the China Import and Export Complex in Pazhou, Guangzhou. Around 3,500 exhibitors are expected to fill more than 250,000 sq m of exhibition space.

Many of its traditional features will return. One is an increasing focus on sustainability – and in this respect it will upgrade its Recycling Technology Zone and promote it to "a prime position" at this year's event.

The show's organiser, Adsale, says that the local market has changed since China banned the import of waste plastics in 2017.

"In the past, the waste processing and recycling industry relied heavily on imports – lacking a complete recycling chain – while recycling rate and proportion of large-scale recycling are both low," it said. "With the implementation of the ban, it is bound to intensify the shortage of raw materials, and the recycling system of renewable resources is in urgent need of change."

And China's ongoing productivity – and growth in plastics production – will mean a necessary improvement in recycling.

"It is predicted that by 2025, China will produce nearly a quarter of the world's total urban solid waste," it said. "And we know that by improving the recycling rate of waste plastics, the development of a circular economy can be greatly promoted."

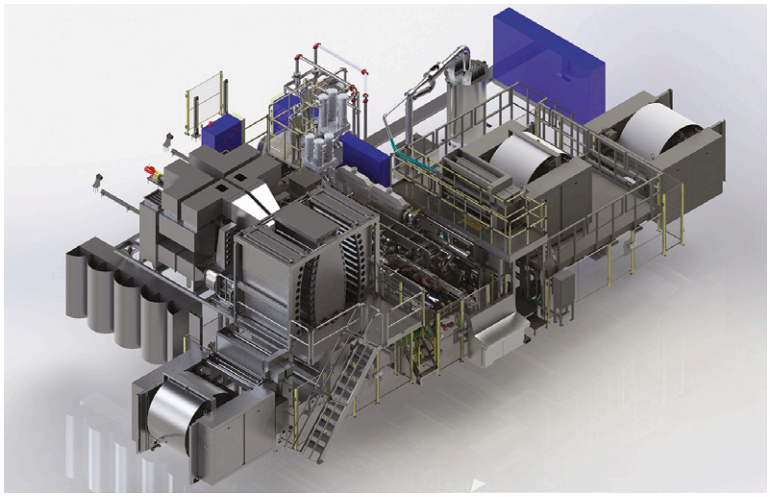
Other areas of interest to film and sheet extruders include: Medical Plastics Connect, which promotes medical-grade chemical raw materials and equipment; Tech Talk, which covers 11 major themes including precision extrusion; Design X Innovation; and, Industry 4.0 Factory of the Future. In this final feature, there will be two themed areas – 'Manufacturing Intelligence Control Room' and 'Smart Factory' – to demonstrate implementable intelligent solutions. Visitors can view 15 simulation scenarios – from production, management and supply chain, including shift handover, KPI monitoring at multiple production sites and material traceability.

For all these extra features, the main reason for visiting the show will always be the exhibition space – and many external exhibitors will again be at Chinaplas. ›

Main image: The Recycling Technology Zone will be promoted to a prime position at this year's event

Chinaplas 2019 – Key Information

Dates: May 21-24, 2019 **Opening Hours:** 09:30-17:30 (until 16:00 on final day)
Venue: China Import & Export Fair Complex, Pazhou, Guangzhou, China
Free registration online **www.chinaplasonline.com**



Above: Davis-Standard's DSX Flex-Pack 300S was designed specifically for the Asian flexible packaging market

Suzhou expansion

Davis-Standard will promote several aspects of its equipment innovation at Chinaplas – along with its regional growth.

The company is expanding its Suzhou location this year. An additional 35,000 sq ft (3,251 sq m) facility near its existing shop in Suzhou will house control panel assembly and provide extra warehousing. Suzhou is also home to an R&D laboratory that supports Asia's medical market. It has helped support development of new resins and biodegradable products.

In addition – in response to increased demand for 'smart' technology – Davis-Standard introduced the DS Activ-Check system for continuous extruder monitoring. It enables processors to take advantage of real-time preventative maintenance by providing early notifications of potential extruder failures. Machine operators are alerted to issues before they happen, preventing unnecessary downtime while also collecting valuable data. Key parameters monitored include extruder reducer, lubrication system, motor characteristics, the drive power unit, barrel heating and cooling.

Its latest DSX Flex-Pack model being promoted is the 300S. This single station extrusion and laminating line is designed specifically for the Asian flexible packaging market. It is a collaboration between Davis-Standard's teams in the USA, Germany and China, addressing the pricing, machine footprint, speeds and output, and shorter runs demanded by converters. Davis-Standard is also engineering a tandem configuration of this machine called the DSX Flex-Pack 300T.

The DSX Flex-Pack 300S will be available for demonstration in Suzhou later this year.

For stretch film, the company offers a stretch film line equipped with a DS S3 winder. This offers a compact machine arrangement, ease of servicing, good profile control, consistent roll quality and an intuitive control package. It is engineered for producing thin films from 31- to 51-gauge (7.8 to 13 microns) at high speeds. The side-by-side DS S3 overlapping winder is essential to this capability, enabling maximum slit widths for hand-wrap, machine-wrap and jumbo rolls. This winder also makes it possible for converters to support multiple market segments on one winder.

Flexible innovation

Windmöller & Hölscher (W&H) will present innovations for manufacturing flexible packaging. In film manufacturing, the company will present its the complete machine range.

"The need for new innovative quality forms for special fields of application is increasing and we take these into account," said Michael Fischer, CEO of W&H Asia Pacific.

This applies to market trends such as PET replacement film in lamination applications with more easily recyclable PE/PE. The company's MDO technology and process know-how helps these PE/PE films achieve outstanding flatness, high modulus and transparency and high stiffness – plus a temperature resistant outer layer for making stand-up pouches.

For breathable diaper film, the company says its Varex line – with inline MDO stretching unit – produces a thin, downgauged breathable diaper back sheet film. This product is usually made using cast film extrusion and with a higher basis weight, says the company.

W&H will also focus on surface protection films,

Right: W&H's Varex line can be used to make breathable diaper film

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Stretching and sheet

SML of Austria will focus on a number of technologies at Chinaplas, including its MDO units and PET sheet lines.

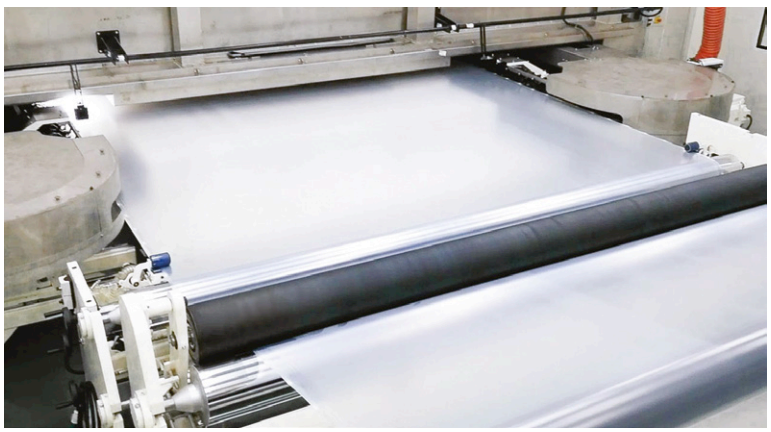
Based on decades of experience, it has designed a new mono-axial direction orientation unit that offers great flexibility in processing many different film types and structures – in large widths. Its main advantage is its ability to control film properties – through the inline variation of the stretching gap between 70 and 350mm – using a servomotor. This is significant because the best PP and PE film characteristics result with a shorter gap, while a longer gap is required when stretching PET film. Good results are guaranteed in terms of improved visual qualities, achieved tenacity, increased barrier properties and reduced film thickness.

At the same time, it will show its extrusion concepts for PET/rPET sheet production. It can help its customers choose the best extrusion system for their application and available feedstock: single-screw extrusion with pre-drying, recycling extruder or conical twin-screw extruder. No matter which solution is used, they mean moderate capital expenditure, high output, reduced energy consumption, ease of operation and minimised need for maintenance, says the company.

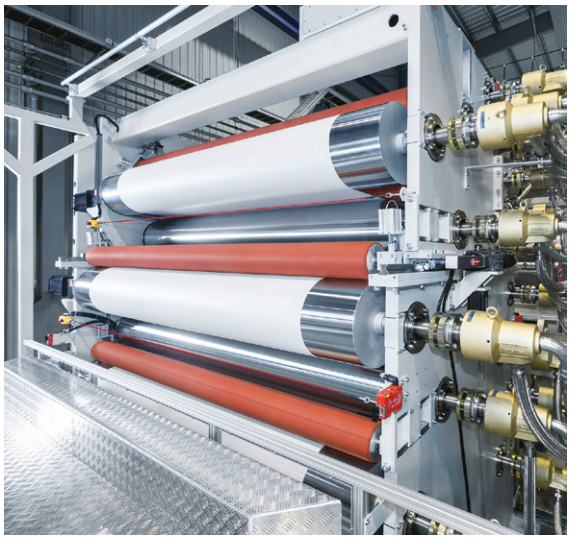
Hot stuff

Brückner Maschinenbau of Germany will present its latest stretching lines for technical and speciality films – plus a selection of other technologies.

For instance, it has developed a high temperature oven, for use in the production of oriented speciality films for high-value technical and optical applications. These include BOPI films for base film and cover glass in flexible displays, or PTFE membranes – which are used in clothing.



Below: Marchante says its BSF line can produce battery film as thin as 5 microns



Right: SML's MDO unit can accurately control film properties using a servomotor

The newly developed ovens provide temperature uniformity and tight tolerances in air velocity – which are both necessary to produce high quality film with a low yield. Additionally, the special chain track systems ensure a smooth film guiding in order to reach the dedicated mechanical properties.

Combined with Brückner's automation system – and a low energy consumption – the production costs for highly special films can be cut to a minimum.

Stretching performance

Marchante of France will exhibit details of a battery separator film line that it developed last year, and which relies on its Masim simultaneous stretching system.

The company says it works at maximum speed of 350m/min, which ensures homogeneous stretching of the film. The system was designed to reach higher stretching ratios (1:7 at that time), improving the properties of the film with minimised risks of breaking. Thanks to this process, Marchante says its BSF line can produce one of the thinnest films on the market, starting from 5 microns. This significantly reduces production costs and waste creation during production, it says.

The new generation of Masim gives stretching ratios up to 1:10 (MD and TD). It can be used for a range of films, including BOPP, BOPET, BOPA and BOPS.

Clips in the stretching zone are specially designed for a secure clipping and minimised waste at the edges. Because the clips are very thin, the bowing effect is reduced – so there is no need to cut the film twice during production. This means the effective width of the final roll is highly optimised (only 100mm waste on each side).

Masim is designed to allow the adjustment of MD and TD ratios during production. Masim has

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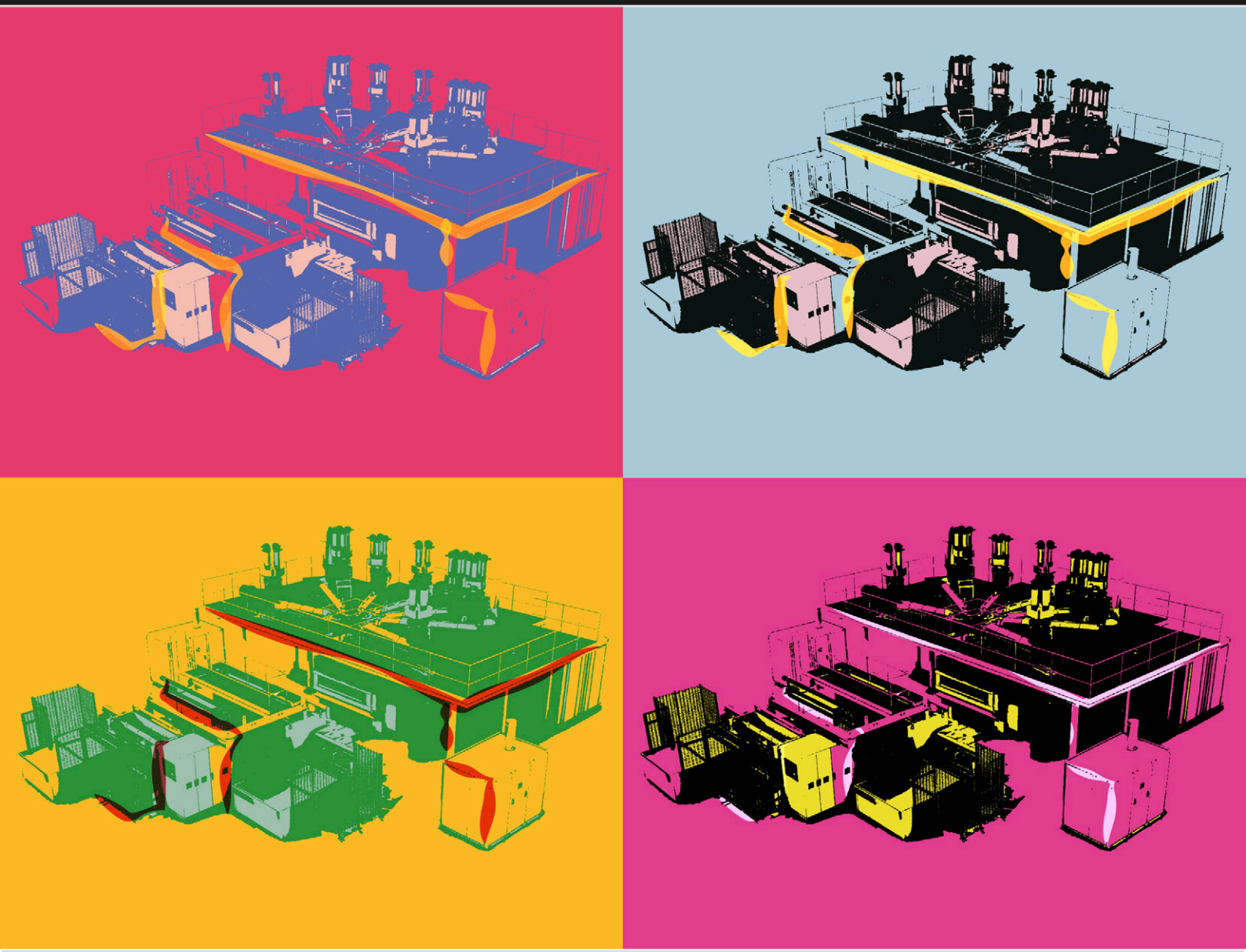

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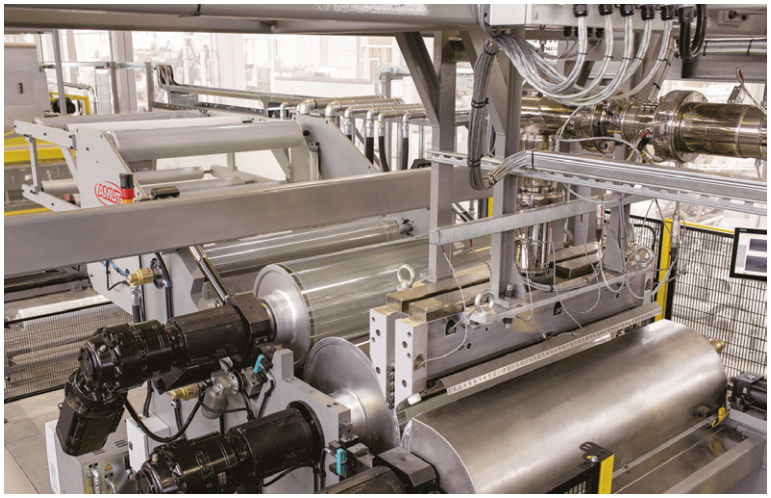


Above: Amut will showcase a range of film technologies at Chinaplas

replaced most motors with mechanical processes, which gives a significant reduction of energy consumption and automation issues, says the company.

Technology selection

Amut of Italy will present technologies from each of its divisions.

In packaging film, it will focus on cast lines for making stretch film. The company has developed an innovative system called Q-Catcher, which can improve film quality by recalling the proper setting when the line is in operation. Another innovation is the ProWind 4.0 super-fast winder, for flexible packaging films.

In its extrusion division, the company has developed (with Erema) a concept for rPET bottle to packaging application. The extrusion line processes 100% post-consumer bottle flakes into food grade single layer foil. The foil is FDA and EFSA approved.

Its thermoforming division will showcase the ACF 820-Plus thermoforming machine, which will be using rPET foil – made on an Amut-Erema extrusion line, using Ingeo foil from NatureWorks. Amut and NatureWorks have recently started collaborating to develop PLA for food contact packaging.

Deep draw

WM Thermoforming Machines of Switzerland will present a range of its technologies, including both the FT and Twist series.

There will be a special focus on the FT series in version D – for deep draw thermoforming. These are pressure forming-punch and die machines with a lower tilting plate with closed cutting tolerance, fully automatic thermoforming lines with extreme easy operator control to increase the machine efficiency and optimise the production, while reducing manufacturing costs (through less energy consumption, higher output rate, lower maintenance costs and low waste/scraps).

WM says the FT is the best solution for making cups up to 220mm deep, and with material thickness tested up to 2.8mm for PP and 2.3mm for PET.

Roll-fed thermoformer

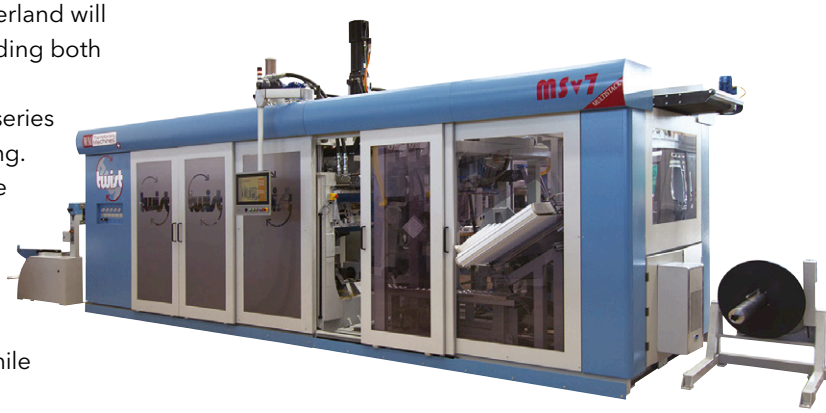
Illig of Germany will be showcasing its new IC-RDM 73K automatic roll-fed thermoforming machine – which has high output and a quick-change system for moulds.

Compared to its earlier 70K machine, the forming area of the new machine has been enlarged by 23%. The improvements add up to a 25% increased production performance, it says. A new, easy to use system for block change of moulds cuts tool installation and removal times in half.

At Chinaplas, it will produce drinking cups on the line using a 32-up mould, at a speed of 50 cycles per minute. The cups are made of A-PET and A-PLA films (0.7mm thick). The machine is combined with an in-line PH 73 stacking machine. This can be variably equipped with different discharge options. When the application changes, the PH 73 can be easily adapted thanks to the modular system.

Machines of the IC-RDM K series are also frequently used as in-line systems with pre-linked extruders, such as for large-volume production of drinking cups in quantities of millions. The Illig IC supports the aspects relevant for large-volume production. It includes modules for general process optimization, high productivity and availability as well as minimisation of operation costs.

In addition, its IC-RDK series offers a forming and punching technology to achieve excellent part quality and reproducibility of trays and hinged packs – used for protection of food during transport and as sales packs. Heated materials are formed by means of pre-stretcher and compressed air. The part is punched out of the material in the same cycle. Using this method, parts can be manufactured without punching mismatch in the rim area, which improves automatic pack process-



Right: WM will show its Twist and FT machines at Chinaplas

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From dreams to reality

Right: Moretto's Moisture Meter Manager analyses the moisture content of polymer granules and manages and controls the drying process

ing. At Chinaplas, Illig will show its IC-RDK 80 automatic roll-fed machine with live production on the line of an oval A-PET tray made of a 0.4mm thick film with A/B stacking using a 10-up mould, at a speed of 50 cycles per minute.

Drying control

Drying will be a key focus for **Moretto** at Chinaplas – where it will display its Moisture Meter Manager. This device gives an in-line reading of the moisture content of polymer granules, and manages and controls the drying process to ensure product certification and energy savings.

It uses an MM Crown sensor to measure the moisture of the granule when it enters the hopper. This allows the system to accurately predict the drying process that the dryer must handle. The dried material exiting the hopper is further analysed by the MM Box sensor, which accurately analyses the water content in the polymer (from 15 to 3000ppm, with a temperature range of 20-180°C).

Using the range between initial and final moisture levels allows the device to manage the dryer's working conditions and maximise process performances within strict energy limitations.

Moretto will also showcase some 'mini dryer' systems. Its X Comb range is frequently used in the medical sector to dry small quantities of material (with hourly production of 1-20kg). It features powerful turbocompressors, zeolite technology, a dew point equalizer (to -60°C) and the OTX hopper. Maximum efficiency and auto calibration are strategic factors for optimal transport of plastic materials, it says.

It will also show its Exa, a flexible conveying system that can manage up to six Kasko receivers, including powerful suction units with side channels, and a cyclone filter suitable for the transport of large quantities of granules or dusty regrinds. The system is connected with Moretto's Mowis super-

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Bioplastics underpin focus on packaging

There will be a large packaging presence at Chinaplas – as well a focus on bioplastics.

Hubei Guanghe Biotechnology, for instance, will display a fully biodegradable material – GH7-1-360 – and a bio-based material with a biogenic carbon content of almost 20% (JH330-D16A0). Both were developed in collaboration with the Changchun Institute of Applied Chemistry at the Chinese Academy of Sciences. The materials, designed for courier bags and bubble courier bags, have passed the European DIN Certco's certification for fully biodegradable and bio-based products.

NatureWorks will showcase a new generation of tea and coffee bags made of Ingeo PLA-based biopolymer, which is not only compostable but also helps improve consumer experience in terms of flavour and aroma – with better organoleptic properties.

And **Jandi's Industrial** will showcase its manufacturing line for biodegradable T-shirt bags, where the steps of processing raw materials, film blowing, printing, bag manufacturing, recycling of residual materials and automatic packing all take place in a single production line. As hot films are immediately processed, it makes for high sealing quality. The residual materials are also recycled immediately.

At the same time, bio-based and compostable material from **Suzhou Hanfeng New Material** offers new ways of making traditional products. Its technology for blending PLA with PBAT creates a material that can used to make products including green courier bags, supermarket shopping bags, bags on a roll and flat-top bags.

- **www.ghbt.com.cn (Hubei Guanghe)**
- **www.natureworksllc.com**
- **www.inflationmachine.com (Jandi's)**
- **www.biohf.com (Suzhou Hangfeng)**

Below: Coperion K-Tron's Bulk Solids Pump (BSP) feeder allows gentle feeding of free-flowing granular materials

vising system and is manageable by portable devices, Master K key pad and Master 300 touch view. The Exa system can guarantee high control, performance and flexibility in case of expansion of the system, says Moretto.

Pump quality

Maag will present a broad range of its products that help compounders and recyclers combine high productivity with high product quality.

From its range of gear pumps, Maag will present the Extrex in X6 class design. As with all X6 versions, Maag has re-engineered and redesigned all the components, from the shafts through to the bearings and seals, and optimised the interaction of the components. Specially developed gear teeth with low compression allow high pressures to be achieved with low shear rates. The result is a further increase in achievable product quality, volumetric efficiency, as well as production consistency and safety.

In addition, it will show an ERF350 melt filter from its subsidiary Ettlinger. The ERF350 reliably filters plastic melts with impurities and separates out foreign materials. It can handle impurity levels up to 18 % with very low melt losses. Designed for high efficiency, it achieves a maximum throughput of 3,800 kg/h, depending on the type of melt and degree of impurities as well as the selected filtration rating. It is suitable for typical polyolefins and polystyrenes, as well as technical plastics such as styrene copolymers, TPEs and TPUs.

Feeding solutions

Coperion K-Tron will showcase a variety of equipment at Chinaplas, including a number of feeding solutions.

Its K2-ML-D5-T35/S60 Quick Change (QC) feeder features the ActiFlow bulk solids activator and Electronic Pressure Compensation (EPC) in combination with a 2400 Series vacuum receiver for refill. The T35/S60 QC is designed for applications requiring quick changeover of materials and convenience of fast cleaning. It allows for the removal of the entire feeding module with screws in place for replacement with a second unit. The removed feeding module can then be transported to a cleaning facility for further disassembly, cleaning and preparation for another material. Twin and single screw feeding modules are available. Single screw feeding units handle free flowing powders, granules, pellets and other non-flooding materials, while twin screw units are ideal for floodable powders and more difficult, sticky or hard-to-flow materials.

The ActiFlow smart bulk solids activator offers an innovative way to prevent bridging and rat-holing of cohesive bulk materials in stainless steel hop-

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Right: Seebach uses flow simulation to develop filtration solutions for custom applications

pers without internal hopper agitation. It is a non-product contact device, consisting of a vibratory drive and intelligent control unit, designed to work with Coperion K-Tron's line of gravimetric loss-in-weight feeders. Together with a control unit, it continuously activates the material inside the hopper with an optimised frequency and amplitude, without exerting any mechanical force on the bulk material.

Also on display will be the company's K-ML-BSP-150-S Bulk Solids Pump (BSP) feeder, for gentle feeding of free flowing granular materials. The BSP feeder does not use the usual screws/augers, belts or vibratory trays to convey the material. Instead it uses positive displacement action to feed free flowing materials with high accuracy, offering uniform discharge, consistent volume and gentle handling. Material moves smoothly from storage hopper to discharge outlet through a 'product lock-up zone', achieving true linear mass flow. With no pockets or screws and only one moving part, the compact feeder is cleaned in seconds, making it ideal for applications with frequent material changes.

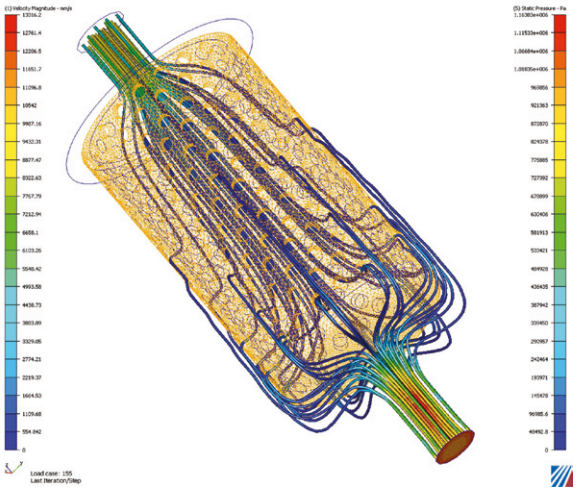
Filter simulation

Seebach of Germany will exhibit its flow simulation capability for non-Newtonian fluids – such as plastic melts.

Flow simulation is increasingly used to identify the root cause of filtration problems, and to develop filtration solutions for custom applications. Seebach's approach relies on its extensive experience in the filtration of non-Newtonian fluids – which change their viscosity with applied shear. Using simulation, it can optimise existing systems or design new systems for specific applications.

It can provide the following data – expressed in graphic form:

- Expected start pressure loss;
- Velocity profile within the filter;



- Shear stress and viscosity profiles; and,
- Temperature gradient (for temperature-dependent simulation).

To perform a simulation, Seebach requires the following data: drawings (preferred 3D models) of the existing filtration system; information on flow rate, temperature conditions and desired filtration rating; and fluid data (including density, viscosity curves and temperature transition coefficient).

Depending on the quality of the existing data, a simulation can be completed in 1-3 days.

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Demand for film that controls the transmission of moisture and oxygen is growing, despite the higher complexity involved in its manufacture. Lou Reade reports

Oxygen mask: the rise of barrier film

Barrier packaging is becoming increasingly important across a range of industries – from food to pharmaceuticals – as end users demand longer shelf life for their products.

Aptar CSP Technologies is combining its Activ-Blister technology – which protects moisture- and oxygen-sensitive tablets and capsules – with FreeThink Technologies' ASAPprime technology for fast shelf-life determination.

The combination is a 'right first time' approach to stability challenges and blister package design, and "virtually eliminates protracted testing and costly reformulations", according to the company.

Activ-Blister technology controls the internal atmosphere of individual blister cavities, allowing for improved product performance and enhanced shelf-life. Using proprietary three-phase polymer technology, engineered materials can absorb customised amounts of water vapour, oxygen, and/or volatile compounds – and produced in shapes and sizes to accommodate any tablet and capsule size. The technology can be applied via heat-staking, without the use of adhesives, and added to existing packaging lines.

ASAPprime can determine a drug's moisture and oxygen sensitivity, using accelerated stability studies that account for specified environmental conditions – such as temperature, relative humidity and oxygen level. Modelling then creates a theoretical blister design with Activ-Blister to achieve desired shelf life.

Once the optimised blister and sorbent are determined, laboratory, clinical and stability study packaged product can be manufactured. The combination of technologies comes in response to the increased complexity of matching moisture- and oxygen-sensitive oral dose products to ideal packaging solutions – and the need to speed time to market.

Medical barrier

Klöckner Pentaplast has introduced an ultra-high barrier PVdC film for medical packaging. The company says that Pentapharm Alfoil ET SG extends its portfolio of pharmaceutical blister films for the growing high barrier market.

Alfoil ET SG films can be used in applications including OTC, generics, veterinary and nutraceutical. The triplex structure is designed with Super Glide (SG) finish allowing for high line speed with low friction, smooth surface and improved product feeding.

"Alfoil ET SG delivers outstanding value to performance ratio with a specially formulated colour package to guarantee a consistent visual appearance while protecting your brand," said Michael Vollgold, senior vice president of sales. "The unique benefit of the SG finish will help reduce stickiness while improving package integrity. This leads to higher line productivity and yields."

Food focus

Despite its importance in the medical market, most barrier film is aimed at the food sector. Global demand for high barrier film for food packaging is growing faster than it is for regular packaging film,

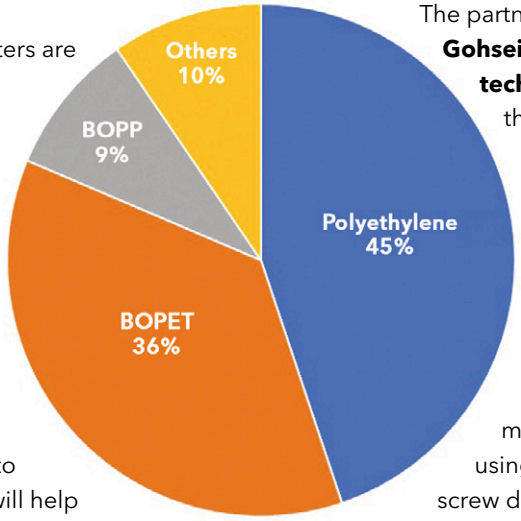
Main image: Aptar's Activ-Blister technology controls the internal atmosphere of individual blister cavities

says a report from consultancy **AMI**.

It estimates that – of more than 20 million tonnes of flexible films used for food packaging in 2018 – around 8% was high barrier. Polyethylene accounts for the largest volume, thanks to its use in multilayer coextrusions with EVOH. It is followed by PET, which is mainly metallised for high barrier – though the use of vacuum deposition of aluminium oxide or silicon oxide coatings is accelerating. For BOPP, PVdC coatings are the main method for improving oxygen barrier performance. However, producers are looking at coextruded and metallised grades, to compete with PE and BOPET.

Film extruders and converters are investing in high barrier film technologies to capitalise on value-added options in an otherwise steady market for regular films – where some categories are suffering from overcapacity.

"The costs of capital investment in high barrier films are coming down, making the market more accessible for those seeking to enter," said the report. "This will help to drive demand but will also drive down the cost of films."



Global polymer film demand for high barrier food packaging, 2018
Source: AMI, 2018

New production

Packaging manufacturer RPC Bebo Plastik has used **Reifenhäuser** cast sheet coating (CSC) line concepts and process expertise to set up a new production line – a multi-layer extrusion line for making barrier films, at its site in Bremervörde, Germany.

RPC uses the new line to make packaging items with aroma protection, such as coffee capsules, which act as an excellent barrier, protecting the packaging contents from oxygen, light, and humidity thanks to precise multi-layer technology.

The line relies on Reifenhäuser's MT technology – its patented mechatronic polishing stacks – for high standards of reproducibility. All line settings are saved using a recipe management system, meaning that time- consuming reconfigurations due to frequent product or colour changes are unnecessary.

"As well as the great tolerances and fast colour changes, reproducible composite films were pivotal to our decision," said Niklas Rad, project head at RPC Bebo Plastik. "The opportunity to test composite films on a 9-layer barrier line in the Reifenhäuser technology centre assured us that we were using the right technology."

The line also saves on material by incorporating a REIcofeed 2.2 coextrusion feedblock. An internal encapsulation device replaces barrier raw materials and tie resin at the edges with inexpensive ground stock without an extra extruder being required – which saves space.

Bio-based barrier

Four bioplastics specialists have teamed up to develop a range of transparent, multi-layer bio-based films.

The partners – **Sukano**, **Nippon Gohsei**, **NatureWorks** and **Eurotech Extrusion Machinery** – say the project will allow packaging manufacturers to produce easily recyclable co-extruded film for applications such as dry food packaging.

The coex film, processed at Eurotech, used a K5A five-layer blown film lab machine in a configuration using two extruders (each 25mm screw diameter), and three extruders of 20mm diameter – plus a die lip of 100mm diameter and die gap of 1.4mm.

The film, which is 45 microns thick and 280mm wide, uses Ingeo PLA 4043D from NatureWorks for the inner A layer, with an outer bubble layer E including Sukano masterbatches with processing aids. The PLA-based masterbatches were specifically designed for this application. The tie layers use BTR8002P and the barrier layer uses G-polymer – both from Nippon Gohsei. This combination of formulation and process conditions yielded a stable bubble, excellent film transparency, and good roll quality, said the partners.

The barrier layer is made of Nichigo G-Polymer, which Nippon Gohsei describes as the first extrudable high barrier amorphous vinyl alcohol resin. It offers high gas and aroma barrier and transparency, while supporting compostability and recyclability properties of the final film. G-Polymer can replace Alu-foil in many packaging applications, and is still transparent even when 4mm thick.

The partners said that the bio-based barrier film could be used in applications such as dry food packaging – including lidding films for coffee capsules or for cups and trays, flow packs, trays for snacks, and biscuit packages. With refined design, it could also be used for 'wet' foods.

Fresher soup

Verstraete IML has developed an in-mould label with oxygen barrier to extend the shelf life of soup.

The company, in collaboration with injection moulder ITC Packaging, developed the packaging for Spanish food producer Dulcesol – for its Naturcrem range of single-serve soups. As well as boosting shelf life, the packaging had to be distinctive on the shelf. The barrier in the IML ensures that the soups have a shelf life of up to one year without refrigeration.

Benedict Adins, regional sales manager for Southern Europe at Verstraete IML, said: "By using an EVOH layer, the IML label reduces the oxygen permeability of the packaging. This means that the OTR value – the extent of the oxygen permeability – is up to 100 times less compared to packaging with a standard IML label."

Added gas barrier

Mondi has added a barrier layer to its BarrierPack Recyclable multilayer film. This adds a gas barrier to its existing moisture barrier, which extends the laminate's breadth of potential applications.

"Constructed using two layers of polyethylene film, BarrierPack Recyclable is a highly functional, flexible, packaging material that's easy to open and reclose for added consumer convenience," said Carl Stonley, technical account manager at Mondi Consumer Goods Packaging.

Mondi says the material is stiffer, stronger and lighter than a conventional PET/PE laminate of the same thickness and can be formed directly on form/fill/seal machines, as well as used for pre-made packaging.

"This is a leap forward for sustainable packaging," said Stonley. ›

Above: Verstraete's in-mould label with oxygen barrier has extended the shelf life of soup

Above: Innovia Films has refocused its research on high barrier materials, and has developed a range of BOPP films

BOPP development

Innovia Films has developed a range of Biaxially Oriented Polypropylene (BOPP) products with optimum barrier performance.

The company is refocusing its research and development efforts on high barrier materials, following investment in new assets. These have allowed the company to produce the BOPP barrier products.

The first products to market will be high barrier metallised films, followed by AlOx clear high barrier films and then co-extruded oxygen barrier films, said the company.

Stephen Langstaff, global business manager for packaging, said: "We have been developing new films that extend the shelf life of a range of products, to reduce food waste. We will be developing options that allow pack simplification, by removing or replacing layers within lamination materials that restrict recycling."

Innovia will also develop mono layer materials for different applications, which can be recycled more easily.

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Anywhere that water collects – from a huge reservoir to a flat roof – is a prime candidate for a protective membrane

Protect and serve: latest in waterproof membranes

Waterproof membranes – whether for lining reservoirs or protecting a roof from leaking – takes many forms. Delegates at the recent *Waterproof Membranes* conference – organised by **AMI** and held in Dusseldorf, Germany – learnt about the range of solutions available – and an impression of the size of the market.

Industry consultant **Boyd Ramsey** told delegates that the global market for geomembranes was a shade over 1m tonnes per year.

These range from sophisticated 'A' and 'B' systems – which include double composite liners with leak detection and geomembranes with protective facbric. The consequences of these failing in service range from bad to severe, he said. Simpler systems (so-called 'C' and 'D' classes) will consist of the geomembrane only – of varying thickness. It these fail, the ramifications would be less (and in some cases, nothing at all).

The total accounts for anything up to 5.5% of global annual plastics production, he said.

Colour changes

Geomembranes – whether of traditional bitumen-based design, or more modern plastic-based types – are generally black in colour. For the plastic geomembranes, this creates no problem if they are lining a lake, for instance. However, the issue of 'green buildings' means that many builders – and regulations – are now looking to make roofing lighter in colour so that it can reflect more light.

With this in mind, many developers of roofing membranes are addressing the problem with roofing membranes in lighter shades.

Lucobit of Germany, for instance, has developed a range of thermochromic roofing membranes – which change colour depending on temperature, thanks to the use of special additives.

"The main driver is the view that a roofing membrane should not only be based on its sealing performance," said Harald Lehmann, head of R&D at the company. "Developers should also consider interactions with the environment."

The formulations use leuco dyes, which change colour between the colourless and coloured forms. For instance, leucoindigo changes fro colourless to indigo at the correct temperature.

"They are commercially available – usually in the form of microcapsules with the mixture sealed inside," he said.

Main image: Waterproof membranes are thought to account for up to 5% of global plastics production

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AMI is pleased to announce the launch of Housewrap 2019, taking place September 17-18, 2019 in Coral Springs, Ft. Lauderdale, Florida.

Housewrap 2019 covers the latest technical developments and market trends in this dynamic sector and focuses on the most commonly used types of housewrap. The program looks at developments in raw material characteristics, machinery, testing techniques, material formulation, extrusion & processing technologies continuing to facilitate cost reduction without compromising performance and safety criteria.

The conference sessions are complemented by a focused table-top exhibition and plenty of networking opportunities, including an evening drinks reception.

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The idea is that a roofing membrane is light in summer – in order to reflect sunlight – and dark in winter, when it needs to absorb it. This has a positive effect on climate control within the building. In summer, it keeps the temperature of the membrane cooler – meaning that less heat stabiliser is needed in the formulation.

The concept can be applied to many different designs of waterproof sheet. In roofing, for instance, it could make a single change from grey to white at 25°C – or from dark grey to light grey at 10°C, then light grey to white at 25°C. Membranes for swimming pools could change from dark blue to light blue to white in a similar way.

Compounding thermochromic formulations is possible without a negative impact on processing parameters: at processing temperatures, the pigments are colourless and slowly become dark during cooling.

Organic pigments failed after less than 1000 hours of QUV exposure. Therefore, these membranes were equipped with a separate layer containing a defined ratio of UV absorbers.

"The effect on the number of colour changes was minimal," he said.

Inorganic pigments have better light stability behaviour, and their limits are being investigated.

Green roof

Other producers are looking at similar areas. Udo Wagner, of **FDT** in Germany, told delegates that single-ply membranes can improve climate protection in cities.

He said that more than 260m sq m of synthetic roofing membranes are applied across Europe.

Above: Light-coloured roof membranes can help to keep the interior of building cool

Most of this is in cities – where temperatures are typically 5°C higher than surrounding areas, he said.

Five cities in Germany are part of a pilot scheme called 'Green City Masterplan' to try and improve environmental performance. Early results from Mannheim show that roofing is an important factor in controlling temperature.

Single-ply membranes can help to reduce the Albedo ratio – and make a dark roof surface more reflective.

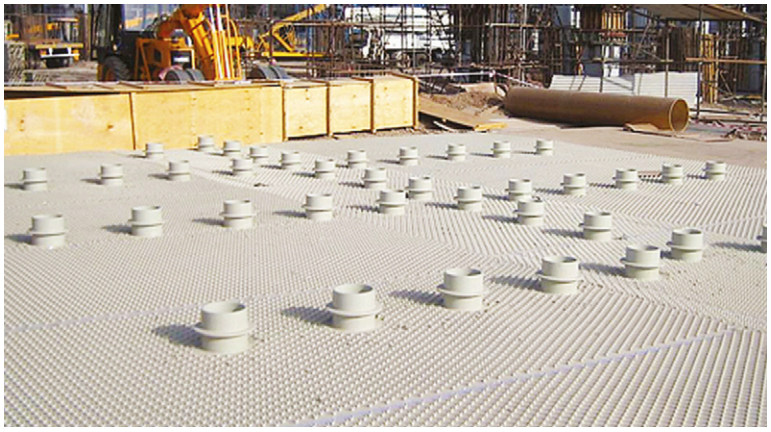
"Ideally, the roof should be white," he said.

As well as reflecting away more light, it can also boost the effectiveness of solar panel system, he said.

White stuff

The most widely used white pigment in plastics is titanium dioxide – and forms a key part of energy-efficient 'cool roofing' membranes.

Chemours, a leading producers of titanium



Above: Agru offers a series of concrete protection products

dioxide, says the 'cool roof' concept works be reflecting the majority of sunlight back into the sky. While a typical black asphalt roof absorbs 80% of sunlight and reflects 5% (and reaches around 80°C), a white roof reflects 85% – and remains at around 40°C.

Part of its success is down to its ability to reflect near infrared light – which constitutes around half of sunlight. The material is ideal for roofing for several reasons according to Melis Arin, business development consultant at the company.

These include: longer service life of membranes (due to inherent UV absorption that protects polymers); ease of processability; and superior optical properties. In addition, it can be used in different membranes, including both PVC and TPO.

The company's Ti-Pure has a particle size of around 25 microns. One particular grade, Ti-Pure R-105 has silica/alumina shells to prevent interaction between the titanium dioxide and UV energy. At the same time, the silica encapsulates' the particles, physically separating them from water and oxygen.

In PVC formulations, it exhibited higher gloss retention than a typical titanium dioxide grade, he said, while retaining other physical properties.

In terms of processability, Arin claimed a 17% increase in throughput rate compared with standard grades, as well as a 7-14% decrease in torque. A roof coating formulation containing 7% of Ti-Pure R-105 had a total reflectance of 89%.

In terms of optics, he said R-105 had a more 'neutral' undertone – making the roof appear whiter – and the highest opacity of durable titanium dioxide grades.

"It gives the best value-in-use available from a durable titanium dioxide," he said.

Concrete benefits

Despite concrete's longevity, it is remarkably prone to damage – through corrosion, spalling and abrasion, for instance.

"They can also be affected by leaking – cause by root penetration or cracks from soil movement," said Rudolf Hummel of **Agru**.

For this reason, many geomembrane liners are designed specifically to protect concrete structures – ranging from sewage treatment plants to pipelines.

Agru offers a number of systems for this – including Sure Grip and Ultra Grip. These are produced on specialist equipment, and incorporate studs along their length – which anchor the system in place.

The products are made from HDPE, PP, PVDF and ECTFE, and have a wall thickness of 2-12mm. Various systems are available, in widths from 1500 to 5000mm. The material chosen will determine the temperature range: PE works from -40°C to +60°C, for instance, while ECTFE operates from -30°C to +140°C.

Some recent applications of the liners include: a biogas tank in Sweden; a sewage treatment plant in the Netherlands; precase pipes and manholes in New Zealand; and chemical storage tanks in Japan.

Adopting polymers

Bitumen systems will continue to co-exist with newer polymer-based systems. One manufacturer in Saudi Arabia – which has traditionally made bitumen systems – recently began producing single-ply membranes in PVC and TPO.

Bitumat, based in Dammam, first began making bitumen membranes in 1985. In 2015, it installed a new PVC/TPO membrane line – and last year began commercial production of a new XPS2 production line.

The new line required a very different approach to that of its traditional business – mixing and rolling bitumen membranes. Now, using an Amut extrusion line, the company is making PVC/TPO membranes.

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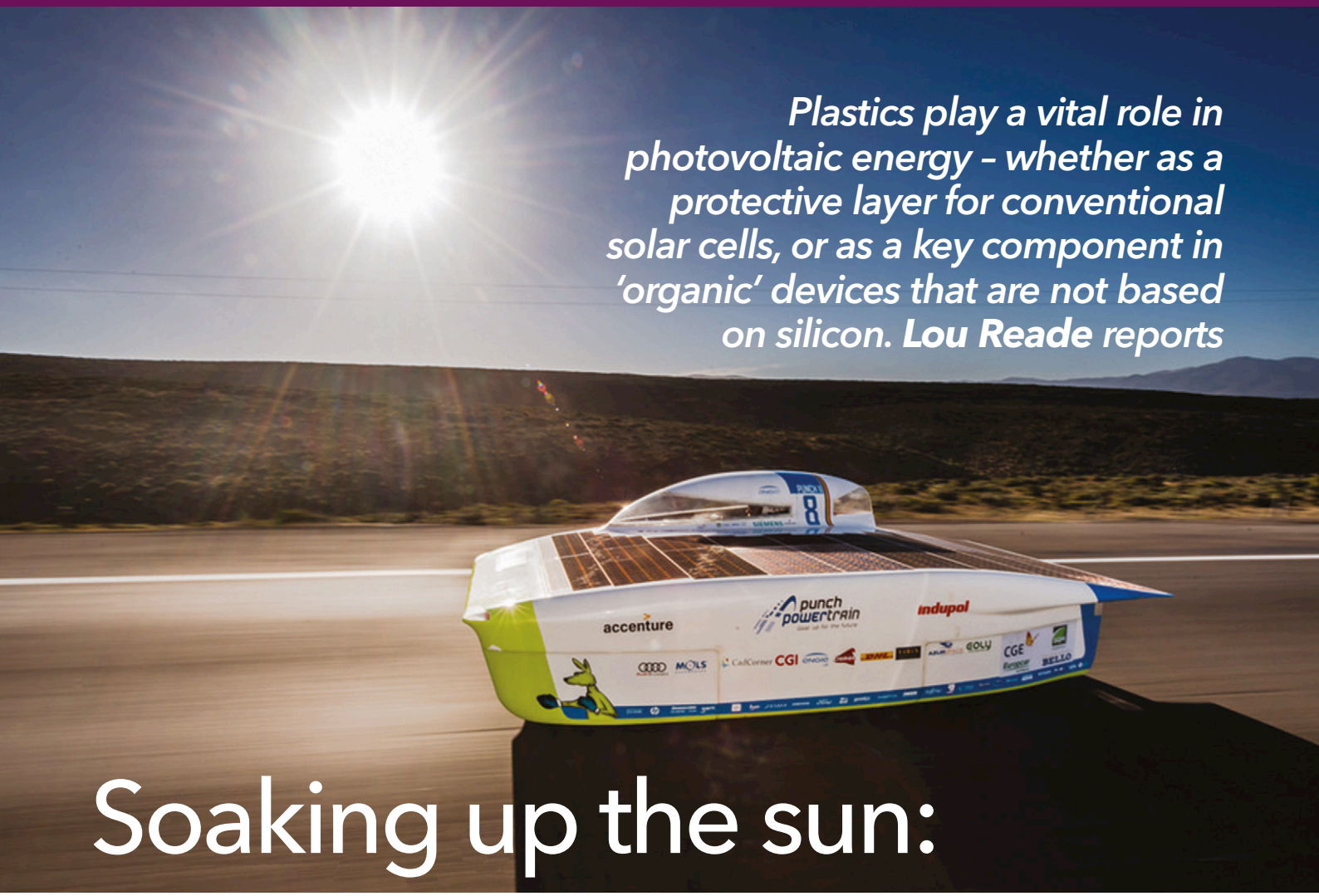

Plastics play a vital role in photovoltaic energy – whether as a protective layer for conventional solar cells, or as a key component in 'organic' devices that are not based on silicon. ***Lou Reade*** *reports*

Soaking up the sun: innovations in solar

Solar power is on the rise: according to the International Energy Agency's Renewables 2017 report, new solar photovoltaic (PV) capacity around the world grew by 50% that year – reaching over 74 Gigawatts. And, the use of solar power is not restricted to generating power for homes.

At this year's Bridgestone World Solar Challenge in Australia, a Belgium-based racing team has used solar encapsulant film from **Borealis** to protect the solar cells in its racing car.

The Agoria Solar Team – comprised of students from KU Leuven university in Belgium – has designed and built its car with Quentys encapsulant film for the roof-mounted solar panels.

"Our testing of the Quentys front and back encapsulant confirmed its stability and ease of use," said Nelis Geurts, the Agoria team member responsible for producing the car's solar module. "Its great optical properties mean that losses will be kept to a minimum. It will enable us to exploit every last bit of energy from the sun."

The team is using the two commercial polyolefin grades of Quentys that were launched last year. These are: BPO8828F, for front or back encapsulant film in all types of solar modules; and BPO8828WH, a white reflective back encapsulant film for dual glass or standard modules.

The encapsulant film can help optimise photovoltaic (PV) module production, resulting in lower costs per watts peak (Wp) thanks to a number of factors, including:

- Up to 50% reduction in lamination cycle in PV module production;
- Lower investment costs required for increasing output capacity of module production; and,
- Better spread of fixed costs across more modules, with lower per unit module costs.
- The encapsulant film development followed that of Icosolar CPO 3G, a co-extruded polypropylene (PP) solar backsheet.

Extensive independent testing has confirmed that PO encapsulant film based on Quentys extends the lifetime of solar modules and offers increased power output over the lifespan of the module. It consistently outperforms conventional ethylene vinyl acetate (EVA) on desirable properties by reducing UV-induced module degradation and moisture-induced corrosion, and lowering the

Main image: Solar encapsulant film from Borealis will be used in the Bridgestone World Solar Challenge in Australia

Above: Heliatek's organic photovoltaic films have been installed on the façade of a warehouse of Duisburger Hafen

incidence of electrochemical failures.

"I would be hard pressed to find a better demonstration of the power of solar than this race," said Rudi Peters, Borealis global value chain manager for solar. "Our Quentys encapsulant films will enable this young and ambitious team to power their racing car better and more efficiently than before. What is more, by sponsoring this next generation, we at Borealis are helping foster innovation which will ultimately benefit the entire solar industry."

The 3,000km Bridgestone World Solar Challenge goes across outback landscapes, and is the ultimate test for a solar-powered vehicle, say the race organisers.

Solar honeycomb

As solar energy becomes an increasing part of the energy mix, solar panels are often incorporated directly into the structure of a building as a way of generating power for it.

EconCore says that its thermoplastic honeycomb sandwich panel technology – which is based on thermoforming – has been used in a number of new applications recently, including a new design of solar panel. The panel, from Armageddon Energy, is one-third of the weight of a standard glass equivalent solar panel, due mainly to the design being based on EconCore's ThermHex technology.

"The potential of a lightweight, durable solar panel is huge and this development opens up new markets and application perspectives, including those beyond photovoltaics," said Tomasz Czarnecki, COO of EconCore.

The substrate is Zytel polyamide from **DuPont** that is produced continuously and can be in-line laminated with skin layers – made from DuPont's Vizilon thermoplastic composite – to deliver a cost-effective sandwich product uniquely suited to high volume production.

Port sunlight

At the same time, around 185m² of **Heliatek** organic photovoltaic films have been installed on the façade of a warehouse of Duisburger Hafen – which owns and manages the port of Duisburg.

The trial installation has 192 HeliaSol film panels – each 3m long – making it the largest facade installation to date with organic photovoltaics (OPV), says Heliatek.

HeliaSol is a thin, flexible solar film produced in a roll-to-roll process in Germany. Equipped with a self-adhesive backing, it can be applied directly to many surfaces without further assembly, and without affecting the structure underneath. With the project in Duisburg, the solar films were glued directly onto the metal facade of the warehouse. Ventilation or cooling is not necessary as the films do not lose power or efficiency at high temperatures.

The solar films generate about as much energy as a five-person household would consume annually, says Heliatek. Due to the efficient use of materials and manufacturing process, the solar films produce 80 times more energy over their lifecycle than is needed to make them.

Alexander Garbar, project manager for corporate development at Duisburger Hafen, said: "Heliatek's photovoltaic solution is fascinating, and we are pleased to have brought a German manufacturer on board. We are curious what the outcomes will be in the coming months."

Amorphous blends

Researchers at **Osaka University** in Japan – with the Max Planck Institute for Polymer Research in Germany – have simplified the production of organic solar cells by redesigning one of the polymers used in their construction.

The research was recently published in *Advanced Energy Materials*.

"Conventional organic solar cells have achieved good efficiencies but the polymer films in these devices typically require special processing to ensure correct crystallisation," said lead author Yutaka Ie. "Instead, we have been focusing on amorphous polymer blends to avoid these issues."

Co-author Yoshio Aso said: "Being able to make these cells without paying such close attention to the crystal structure of the polymer films could allow us to mass produce these devices by simple printing methods – which should considerably lower costs of the devices and lead to much wider uptake."

Separate to this, Osaka researchers have used artificial intelligence to automate the search for better solar materials.

"The choice of polymer affects several proper-

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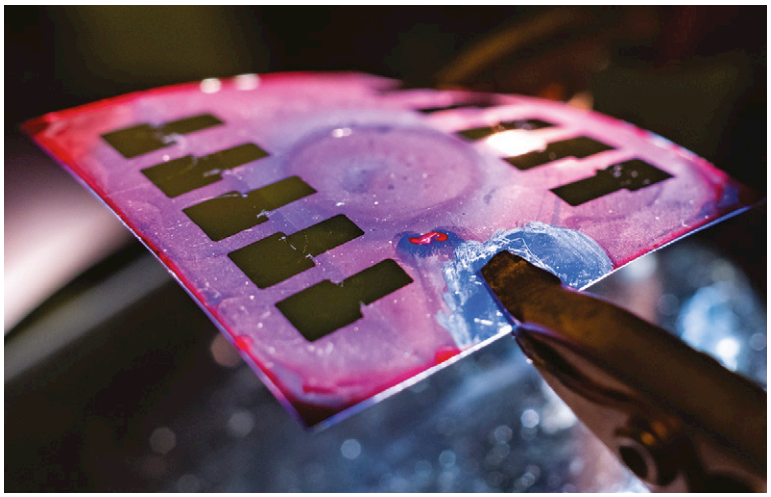


Above: Rice University researchers have used an additive that makes organic solar cells more flexible but does not affect their efficiency

ties like short-circuit current – which directly determine the power conversion efficiency," said researcher Shinji Nagasawa explains. "However, there's no easy way to design polymers with improved properties. Traditional chemical knowledge isn't enough – so we used artificial intelligence to guide the design process."

Informatics can make sense of large, complex datasets by detecting statistical trends that elude human experts.

Flexible friend

Researchers at **Rice University** in the USA have developed flexible organic photovoltaics that could be useful where constant, low-power generation is sufficient.

The team, led by chemical and biomolecular engineer Rafael Verduzco, has incorporated a network of elastic additives into the electrically active materials, making them less brittle – with little to no loss of current flow. The research was published in *Chemistry of Materials*.

Organic solar cells use carbon-based materials such as polymers – rather than hard, inorganic materials like silicon – to capture sunlight and convert it into current. Organics are thin, lightweight, semi-transparent and inexpensive. While typical silicon-based solar cells perform at about 22%, organics have a maximum of around 15 percent.

"The field has been obsessed with the efficiency chart for a long time," said Verduzco. "There's been an increase in efficiency of these devices, but mechanical properties are also really important, and that part's been neglected."

Usually, he says, stretching or bending organic devices leads to cracks in the active layer – and the device fails.

One solution is to find polymers or other organic semiconductors that are naturally flexible, but the team took a different approach.

"Our idea was to stick with the materials that have been carefully developed over 20 years – and that we know work – and find a way to improve their mechanical properties," he said.

Rather than make a mesh and pour in the semiconducting polymers, the Rice researchers mixed in sulphur-based thiol-ene reagents. The molecules blend with the polymers and then crosslink with each other to provide flexibility.

When stretching the materials, strains higher than 30% were achievable – but the material became useless as a solar cell.

"We found there was no loss in our photocurrent up to about 20% – which seems to be the sweet spot," he said.

The researchers say they expect to try different organic photovoltaic materials while working to make them more stretchable with less additive for larger test cells.

CLICK ON THE LINKS FOR MORE INFORMATION:

- **www.borealisgroup.com**
- **www.econcore.com**
- **www.dupont.com**
- **www.heliatek.com**
- **www.osaka-u.ac.jp/en**
- **www.rice.edu**

Material gains: latest in materials handling

Conveying, blending, mixing and other processes ensure that raw materials such as resins and additives are brought together prior to the extrusion process

Main image: Exair says its Line Vacs transport high volumes of material – from coffee beans to plastic granules – through ordinary hose or tube

Materials handling equipment is generally seen as playing a subsidiary role to that of the main extrusion process – fetching and carrying the raw materials that are then converted into finished products. Suppliers are constantly looking to improve the way in which these processes can be carried out.

Motan announced the winners of its biennial innovation awards at Fakuma last year – with the winner scooping €10,000. Reinhard Herro was awarded the top prize for his 'gravimetric suction box' – a new system for throughput detection with batch traceability for pneumatic conveying systems.

It measures all material throughputs directly at the material source and so replaces the usual measuring procedure at the consuming unit – typically a material loader. Using a gravimetric dispenser integrated in the suction box, each batch of material is weighed individually before conveying – then automatically assigned to a designated machine. With only one measuring system, it is now possible to measure and control the material throughputs of many consuming units. In addition, the gravimetric suction box opens up new possibilities for the control and monitoring of pneumatic conveying systems, as many processes are automated. For instance, the optimum filling quantity for material loaders is automatically generated, and overfilling is prevented.

The second prize of €6,000 went to Phillip Mählmeyer, for his app that retrieves status information quickly and accurately. It uses clear, machine-readable codes (QR codes) attached to the aggregates, which visualise the required data on a mobile device. Each operator can then query status information easily, and also control the associated processes: using a mobile device, mechanical adjustments, calibrations and service work can be carried out directly at the machine. A major advantage of the app is that it lowers the installation effort and costs compared to other systems.

The third prize of €4,000 was awarded to Bernd Michael, for his Metro-Lay system – which allows material feedlines to be laid in a very uncomplicated and efficient way.

High volumes

Exair says that its new 2.5in (64mm) and 3in (76mm) 316 stainless steel Line Vacs are powerful in-line conveyors that transport high volumes of material – from coffee beans to plastic granules – through ordinary hose or tube.

Commonly used to fill hoppers, move trim and waste or transfer parts, the 316SS Line Vac conveyors eject a small amount of compressed air through directed nozzles into the throat to produce a vacuum on one end and high output flows on the

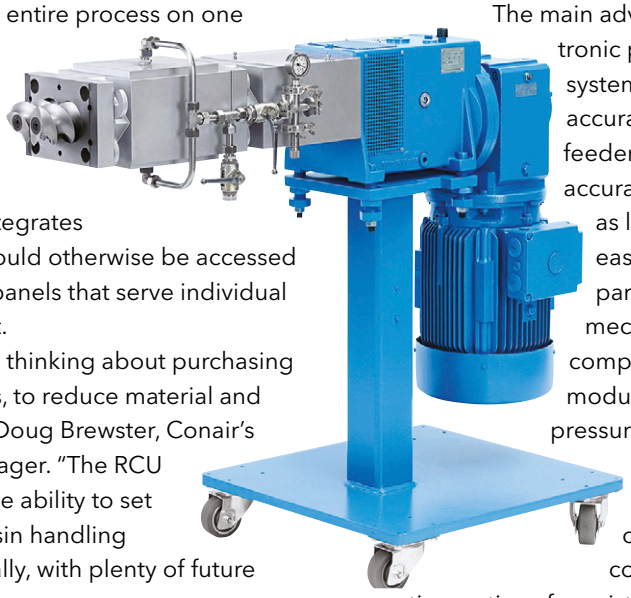
other. The material conveying rate is easily controlled with a pressure regulator. An optional bracket permits easy mounting.

Nine sizes are available that fit popular hose and tube diameters. The two new sizes make it possible to convey more material over long vertical and horizontal lengths, says the company.

Railcar resin control

The Railcar Unloading (RCU) controller from **Conair** is now available as an option for its FLX-128 Plus material-handling control system – or as a standalone control package. It offers processors a time-saving, secure, expandable way to monitor and manage the unloading and storage of railcar-quantity resins from any convenient indoor location, says the company.

The RCU controller allows any authorised user to view and manage the entire process on one touchscreen – such as railcar unloading, silo selection, material routing or silo filling – without the need to go outside. It seamlessly integrates control functions that would otherwise be accessed with dedicated control panels that serve individual systems across the plant.



Right: Coperion's ZS-B side feeder with FET can increase material intake capacity by up to three times (Image: Coperion)

"More processors are thinking about purchasing resin in railcar quantities, to reduce material and production costs," says Doug Brewster, Conair's conveying systems manager. "The RCU controller offers them the ability to set up and manage bulk-resin handling securely and economically, with plenty of future expansion capacity."

The controller includes an Allen-Bradley PLC pre-programmed with necessary control logic, an I/O control panel, and a separate 10in high-resolution HMI monitor designed for indoor/outdoor use. In plants equipped with Conair FLX-128 Plus material handling controls, the RCU PLC and control-I/O box plug directly into the main FLX-128 Plus control panel. Otherwise, it operates in stand-alone mode.

Fakuma solutions

At last year's Fakuma show in Germany, **Coperion** and **Coperion K-Tron** presented a number of solutions for efficient feeding of bulk material.

Among them was the Coperion ZS-B side feeder, which is used to feed raw materials into numerous extrusion processes. The side feeder includes the patented Feed Enhancement Technology (FET) that increases the material intake capacity in the processing of feed limited products by up to three times, says the company. For improved feeding accuracy of loss-in-weight feeders, it presented its EPC electronic pressure compensation system.

The ZS-B twin screw side feeder enables the reliable side feeding of fillers and additives in powder or pellet form or cut glass fibres into the process section of tahe twin screw extruder. It features a self-cleaning profile of the twin screws and product feeding into the screw flights of the extruder without stagnant zones. It requires little space due to its compact design. Coperion's FET applies a vacuum to the feed zone by means of a porous, gas-permeable wall. The resulting gas extraction increases material intake capacity in the processing of feed limited products up to threefold, says the company – boosting throughput rates.

The main advantages of the electronic pressure compensation system (EPC) – for its high-accuracy loss-in-weight feeders – are its improved accuracy and reliability as well as lower initial cost and easier installation compared to traditional mechanical pressure compensation systems. The modular design incorporates pressure sensors and electronics tailored to interact smoothly with Coperion K-Tron's KCM feeder control system. Retrofitting options for existing feeders are available. EPC can be installed on most of the company's gravimetric feeders.

Also at Fakuma, **Piovan** of Italy showed a number of materials handling products – including an EL20 model in its Easylink+ range, which includes a state-of-the-art pipe cleaning procedure that guarantees the absence of cross-material contamination, says the company. Easylink+ was seen operation together with a Modula series auto-adaptive dryer and Pureflo filterless granule receivers.

And, for the first time at Fakuma, Piovan showed its Quantum E gravimetric batch blender with continuous extrusion control, complete with a 15in touch-screen panel control. Under its FDM brand, the company exhibited a gravimtric dosing system in the GDS series, featuring Siemens control, which is designed for the needs of pellet, flakes, regrind, additives and powder treatment. ›

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Above: MTI showed its M2000/K8000 mixing unit at NPE last year

Extrusion control

Maguire has developed a new blender with built-in extrusion control which, when combined with a suitable supervisory system, can control the extrusion line from start to finish. The system has been shown to be effective in sheet, and blown and cast film applications.

The WXB Weigh Extrusion Blender incorporates a gain-in-weight (GIW) weigh bin and a loss-in-weight (LIW) mix chamber in a single machine, along with a 4088 controller. While GIW weighs batch ingredients as they are dosed sequentially into the weigh bin, the LIW mix chamber allows accurate metering of the blend into the processing machine and facilitates control of extrusion and haul-off in accordance with process variables. The tight tolerance achieved by the blender (within +/- 0.1%) is a key to conserving raw material.

Right: Maguire's WXB Weigh Extrusion Blender can control an extrusion line from start to finish when combined with a supervisory system

The 4088 controller, Maguire's most advanced blender control, is designed for communication with other systems in an Industry 4.0 setting. It enables the WXB blender to interface with the Maguire + Syncro supervisory system, which provides control of all segments of the production line from a single touch-screen HMI control. In blown film production, for example, the system controls extruder temperature, raw material metering and consumption data, air ring automation, gauging, internal bubble cooling, web and cage handling, haul-off, and winder. The system can be deployed for coextrusion with multiple extruders.

The Maguire + Syncro control display allows users to easily visualize single-layer and coextrusion processes. Modes of extrusion control available include pounds or kilogrammes per hour; weight per length of extrudate; and product thickness in microns.

The WXB is initially available in three models: WXB 100 for throughputs of 100-220 lbs/hr (50-100 kg/hr); WXB 200 for 220-440 lbs/hr (100-200 kg/hr); and WXB 400 for 440-880 lbs/hr (200-400 kg/hr). The blenders can be configured for up to 12 ingredients, each with a separate dispenser.

Mixed up

At the NPE exhibition in the USA last year, **MTI Mischtechnik** exhibited a heating/cooling mixer combination Flex-line.

The M2000/K8000 unit features an 8,000 litre cooling vessel and is over 7m (23ft) long and nearly 5m (16.5ft) high. Installing the system – the largest heating/cooling mixer combination MTI has ever supplied to the USA – will almost double mixing capacity at the customer's site.

Burkhard Wulf, area sales manager at MTI, said: "We have seen a trend towards increasing production volumes in the US market for some time."

The M2000/K8000 is a heating/cooling mixer combination for a typical batch volume of 950kg (around 2,100lbs). It can provide more than 7,500kg (16,600lbs) of mixed material per hour. Designed on a modular principle, these mixers can be put to use in most applications because their sizes, drive units and equipment options can be individually configured.

Christian Honemeyer, managing director at MTI, added: "It is our declared strategy to resolve even the most challenging mixing tasks jointly with our customers, including custom developments to address highly specific boundary conditions. It is on the basis of this approach that, over the last few years, we have been building our current strong market position as a globally leading provider of mixing equipment. This also applies to the booming US market, where over 100 MTI systems are now in operation."

CLICK ON THE LINKS FOR MORE INFORMATION:

- **www.motan-colortronic.com**
- **www.exair.com**
- **www.conairgroup.com**
- **www.coperion.com**
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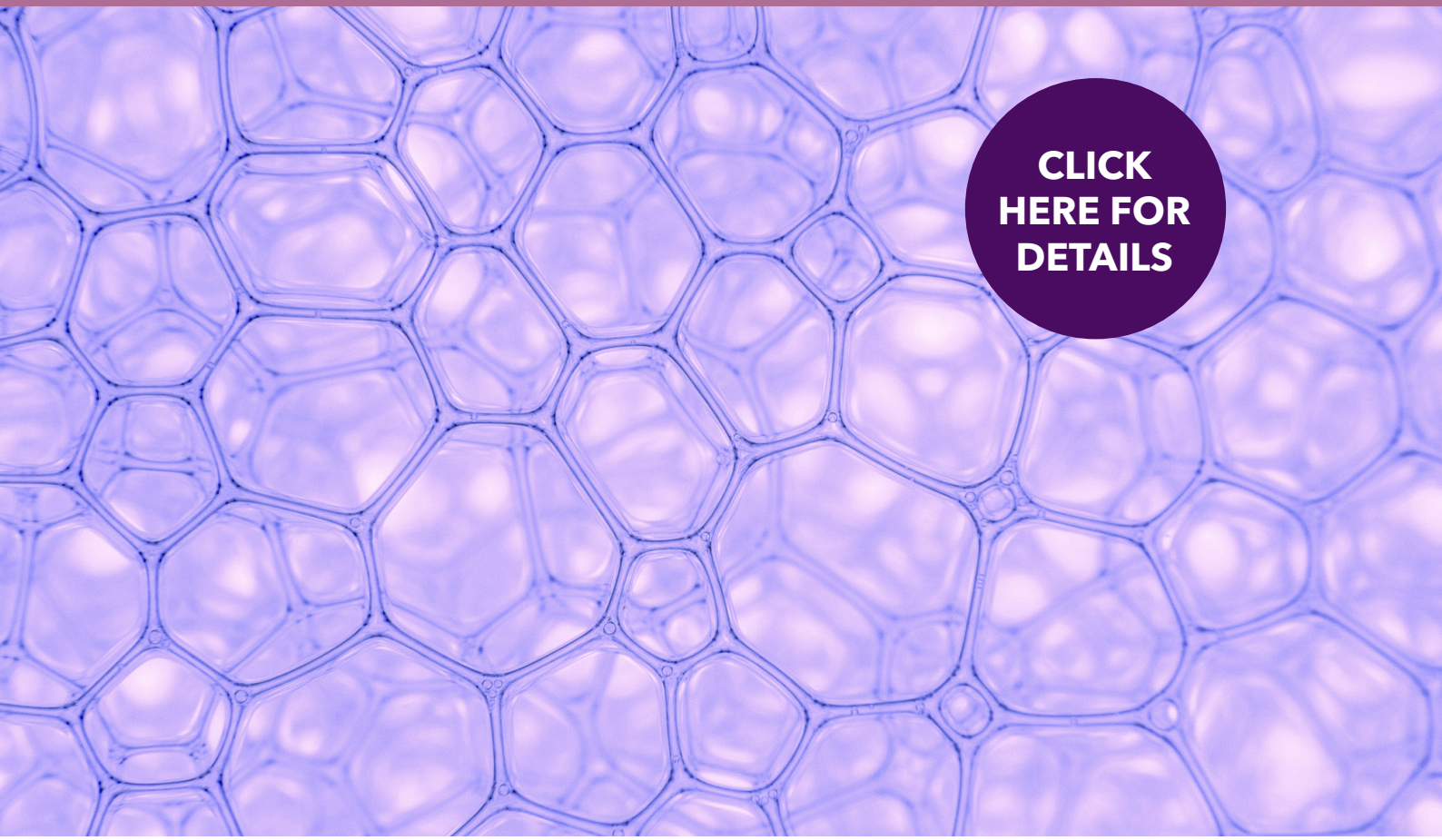

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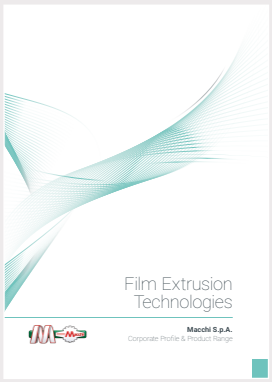

This 28-page brochure from Macchi covers the company's wide range of film extrusion technologies including coextrusion lines, wide webs, die heads, take offs, winders, trim recovery and control systems.

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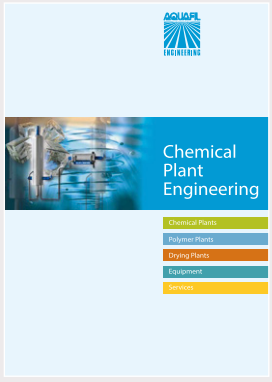

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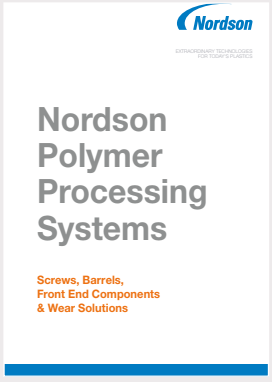

In this Nordson Polymer Processing Systems brochure, find out about Xaloy bimetallic extrusion screws and barrels, designed to meet process requirements, help optimisation, combat wear, boost output, and improve and maintain quality.

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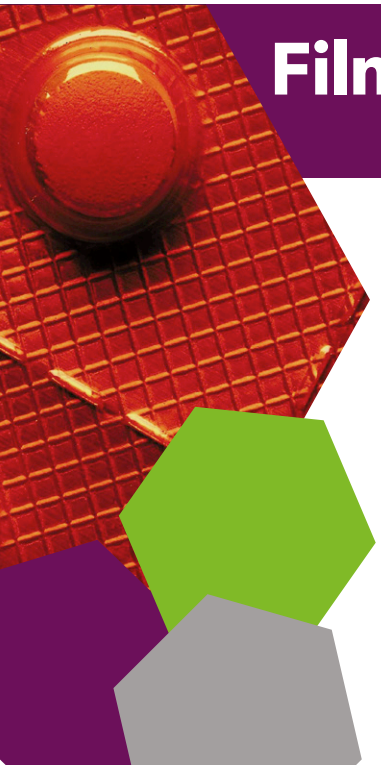
Granitol

Head office:	Moravský Beroun, Czech Republic
CEO:	Jaroslav Fibichr
Founded:	1895
Ownership:	Private
Profile:	Granitol was founded in 1895 as a weaving mill making artificial leather, but began making LDPE film in 1967 and HDPE films in 1976. It now says it is the Czech Republic's largest producer of polyethylene films. In addition to making a wide variety of PE film-based products – such as carrier bags and sheets – it is also a producer of PP strapping bands. Its main export markets are Slovakia and Poland, though it also delivers to some western European countries such as Germany and Denmark. In total, it exports to more than 25 countries.
Product lines:	Granitol offers a wide variety of PE film products – ranging from boil in the bag films through to agricultural and industrial products. Its main brands include: Granoten, a new generation of multi-layer PE co-extruded shrinkable LDPE film; Mikroten HDPE monolayer blown films, which are used in a wide range of packaging applications, including food – as they have minimal permeability to moisture, oxygen and fat; Perforten – its boil-in-the-bag films, which are stable up to 110C; Lamiten multilayer films, which are made from a range of materials for applications ranging from pet food to pharmaceuticals; and Granopen, its range of PP-based films for applications such as magazine wraps.
Factory location:	The company's 56,000m^2 factory in Moravský Beroun has an output of around 30,000 tonnes/year of plastic film – which is produced on 32 blown film lines. Around 15% of its production is printed – and its facilities in this area include an eight-colour SomaFlex Imperia.

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



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Claire Bishop: claire.bishop@ami.international Tel: +44 (0)1732 682948
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Keep informed: read our latest editions

AMI publishes five process-specific FREE plastics industry magazines. Simply click on the cover below to read each magazine. Or download the issue in the relevant Apple or Android app

Film and Sheet
April 2019
The April issue of Film and Sheet Extrusion looks forward to the exhibitors at AMI's Plastics Extrusion World Expo in the US next month. Features in the magazine cover agricultural film, flat dies and slitter-rewinders.

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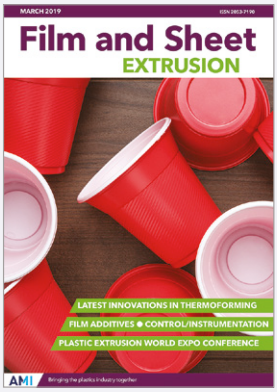

Film and Sheet
March 2019
The March issue of Film and Sheet Extrusion magazine takes a look at the latest in thermoforming, additives for films and innovations in film extrusion technology. Plus regular updates on machinery and materials.

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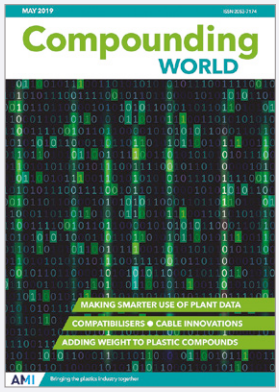

Compounding World
May 2019
In the May edition of Compounding World, there are features about smart use of plant data, compatibilisers, cable compounds, and high density plastics. Plus, a preview of the Chinaplas 2019 exhibition and AMI's Compounding World Congress.

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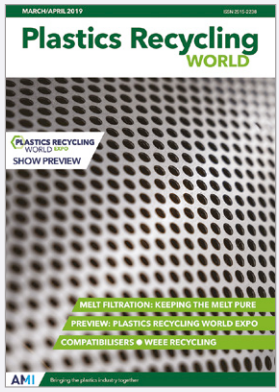

Plastics Recycling World
March/April 2019
The March/April edition of Plastics Recycling World examines the latest developments in melt filters and details innovations in WEEE recycling and polymer compatibiliaation. Plus, we preview next month's Plastics Recycling World Expo in the US.

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Pipe and Profile
May 2019
The May edition of Pipe and Profile Extrusion looks at the essential steps required when planning a new die design project. It also reviews the latest pressure pipe materials and recycling moves, plus previews the upcoming Chinaplas show.

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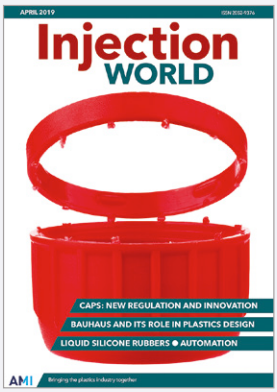

Injection World
April 2019
The April edition of Injection World looks at caps and closures and the drivers for innovation in the segment. Also included are features on LSR moulding and the role played by the Bauhaus in the history of plastics design.

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Take out your own FREE subscriptions to any of the magazines. Click on the logos below to simply register on-line.

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

GLOBAL EXHIBITION GUIDE

2019	**8-9 May**	Compounding World Expo, Cleveland, USA	www.compoundingworldexpo.com
	8-9 May	Extrusion Expo, Cleveland, USA	www.extrusion-expo.com
	8-9 May	Plastics Recycling World Expo, Cleveland, US	www.plasticsrecyclingworldexpo.com
	21-24 May	Chinaplas, Guangzhou, China	www.chinaplasonline.com
	21-24 May	Moulding Expo, Stuttgart, Germany	www.moulding-expo.com
	28-31 May	Plastpol, Kielce, Poland	www.targikielce.pl
	19-22 June	Interplas Thailand, Bangkok	www.interplasthailand.com
	18-21 September	T-Plas/Tiprex, Bangkok, Thailand	www.tplas.com
	16-23 October	K2019, Dusseldorf, Germany	www.k-online.com
	25-28 November	Plastivision Arabia, Sharjah	www.plastivision.ae
	27-29 November	Plastics & Rubber Vietnam	www.plasticsvietnam.com
2020	**16-20 January**	Plastivision India, Mumbai, India	www.plastivision.org
	21-23 January	Swiss Plastics, Lucerne, Switzerland	www.swissplastics-expo.ch
	7-13 May	Interpack, Dusseldorf, Germany	www.interpack.com
	13-17 October	Fakuma, Friedrichshafen, Germany	www.fakuma-messe.de

AMI CONFERENCES

18-19 June 2019	Thin Wall Packaging, Chicago, USA
25-26 June 2019	Multilayer Flexible Packaging, Chicago, USA
17-18 September 2019	Housewrap, Coral Springs, USA
12-14 November 2019	Polyolefin Additives, Vienna, Austria
18-20 November 2019	Agricultural Film, Barcelona, Spain
18-20 November 2019	Waterproof Membranes, Cologne, Germany
18-20 November 2019	Multilayer Flexible Packaging, Vienna, Austria
2-4 December 2019	Thin Wall Packaging, Dusseldorf, Germany
3-4 December 2019	Stretch & Shrink Film, New Orleans, USA
4-6 February 2020	Polyethylene Films, Coral Springs, USA

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

www.ami.international

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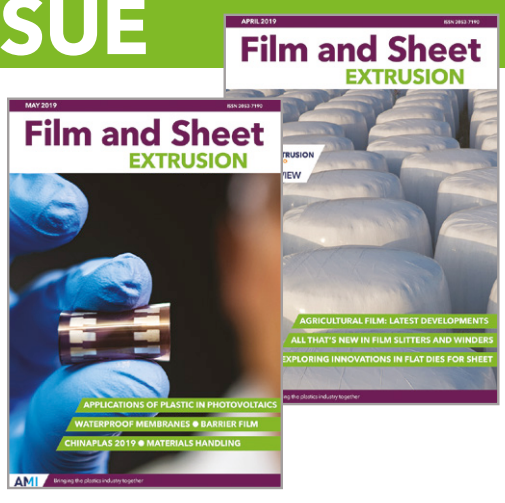
www.filmandsheet.com



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PLASTICS EXTRUSION WORLD EXPO

MAY 8 - 9, 2019

HUNTINGTON CONVENTION CENTER, CLEVELAND, OHIO, USA

Focused conference programs on film, sheet, pipe, profile and tubing extrusion

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FILM AND SHEET EXTRUSION: THEATER 1 - DAY 1

9:30 - 10:00 **KEYNOTE: Exploring opportunities in high barrier packaging**
Charmaine Russell, Business Manager - Conferences, AMI

10:15 - 11:00 **INDUSTRY DEBATE: The future for plastics packaging**
Salvatore Pellingra, Vice President Global Application and Innovation Development, PROAMPAC • Rodney Weaver, Market Development Manager, SEALED AIR • Steve Sargeant, General Manager of Technology, FLEX FILMS

11:10 - 11:30 **Coextrusion technology: A critical tool for product development**
Olivier Catherine, Technical Director, CLOEREN

11:40 - 12:00 **Adding value in extrusion - continuous production of thermoplastic honeycomb panels**
Tomasz Czarneck, Chief Operating Offi cer, ECONCORE

12:10 - 12:30 **Title to be confirmed**
Peter Greenlimb, Owner, CHEMAGINEERING

1:15 - 2:00 **INDUSTRY DEBATE: The future for agricultural films**
Ralf Dujardin, Vice President Marketing & Innovation, IMAFLEX • Roger Tambay, Director, FILMORGANIC • Ramon Parellada, Director, GRUPO POLYTEC

2:10 - 2:30 **Global megatrends affecting flexible packaging and how to adapt**
Steve DeSpain, Vice President, REIFENHAUSER

2:40 - 3:00 **Contaminant migration considerations for recycled PET in food contact applications**
Sushant Jain, Senior Scientist - Applications & Technology, PROCESSING TECHNOLOGIES INTERNATIONAL (PTI)

3:15 - 4:00 **TRAINING SEMINAR: Food contact material compliance**
Kevin C. Kenny, Chief Operating Officer, DECERNIS

4:10 - 4:30 **Cost justification of a blown film extrusion line retrofit**
Carl Gillig, President, SYNCRO

FILM AND SHEET EXTRUSION: THEATER 1 - DAY 2

9:30 - 10:00 **KEYNOTE: Analysing global trends in film**
Andrew Reynolds, Director, ADVANCE BIDCO (owner of AMI)

10:15 - 11:00 **INDUSTRY DEBATE: Women in plastics: empowering industry change**
Lauren Hickey, Director of Marketing and Product Management, AMERICHEM • Meli Laurance, Regional Commercial Industry Manager Plastics, BASF COLORS AND EFFECTS • Candace Sanders, Assistant Plant Manager, GENOVA PRODUCTS • Molly Bridger, Group Director of Marketing, SIMONA AMERICA GROUP • Jennifer Profitt, Plant Manager, ASSOCIATED MATERIALS

11:10 - 11:30 **Adiabatic fluid coolers: replacing traditional cooling towers**
Tom Stone, Aquatech USA - National Sales Manager, UNIVERSAL DYNAMICS

11:40 - 12:00 **Machinery solutions for sustainability in flexible packaging films**
Maurilio Millefanti, Technical Sales Manager, MACCHI

1:15 - 2:00 **INDUSTRY DEBATE: The future for stretch & shrink films**
Sunil Daga, President, WRAPTITE • Luke Venechuk, Senior Packaging Engineer, HIGHLIGHT INDUSTRIES • John Cook, Technical Director, ATLANTIC PACKAGING • Ludovic Capt, Director Innovation, Business Development BALCAN PLASTICS

2:10 - 2:30 **Instrumenting your extruder for the industrial internet of things, IIoT, with a focus on predictive and preventative maintenance**
John Christiano, Vice President - Technology, DAVIS STANDARD

2:40 - 3:00 **Title to be confirmed**
Miriam Olivi, International Sales Director, FRIGOSYSTEM

3:15 - 4:00 **Finally, the truth: Learn the facts about plastics & the environment**
Chris DeArmitt, President, PHANTOM PLASTICS

4:10 - 4:30 **Exploring blown film technology for packaging applications and agricultural industries**
Carlo Pattini, Product Manager Blown Film Lines, LUIGI BANDERA

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Speakers over the two days include representatives from:

Sealed Air Re-imagine™ · FILMORGANIC We Deliver on Performance and Precision · ProAmpac · WRAP TITE "Your Source For Packaging, Shipping & Safety Supplies" · IMAFLEX inc. Committed to Excellence · FLEX

Information correct at time of publishing. Speaker line up and titles subject to change .

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PIPE AND PROFILE EXTRUSION: THEATER 2 - DAY 1

9:30 - 10:00 **KEYNOTE: Update on US vinyl industry**
Richard Krock, Vice President Regulatory and Technical Affairs, THE VINYL INSTITUTE

10:15 - 11:00 **INDUSTRY DEBATE: The future for plastic profiles**
Paul Adams, Director of Materials R&D, DECEUNINCK • George Walrath, Senior Scientist, CERTAINTEED • Keith Scutter, Owner, RESOURCE PLASTICS

11:10 - 11:30 **Intelligent industrial automation: Using your process data to solve quality, downtime, and production problems**
Willem Sundblad, Founder & CEO, ODEN TECHNOLOGIES

11:40 - 12:00 **Solutions in dark color outdoor architectural applications**
Kristin Meyers, Sr. Industry Manager - Extrusion, POLYONE

1:15 - 2:00 **INDUSTRY DEBATE: The future for medical tubing**
William Coulson, Vice President, ELDON JAMES • Pradnya Parulekar, Global Business Development, RAUMEDIC • Steve Maxson, Vice President of Sales - Vascular Technologies, SPECTRUM PLASTICS GROUP

2:10 - 2:30 **Understanding C-PVC processing**
Gianmarco Palladino, Sales and Technical Manager in Plastic Extrusion Process, BAUSANO

3:15 - 4:00 **TRAINING SEMINAR: Modernizing product stewardship for extruded, compounded, or recycled plastics**
Bernie Henn, Supplier Development Manager, VERISK 3E

4:10 - 4:30 **Exploring planetary roller extruders and their application areas in PVC direct extrusion**
Michael Batton, Overseas Sales Director, ENTEX

PIPE AND PROFILE EXTRUSION: THEATER 2 - DAY 2

9:30 - 10:00 **KEYNOTE: Technologies expanding the use of plastics in pipe systems**
Sarah Patterson, Technical Director, PLASTICS PIPE INSTITUTE

10:15 - 11:00 **INDUSTRY DEBATE: The future for plastic pipes**
David Fink, Senior Vice President, WL PLASTICS • • Tony Radoszewski, President, PLASTICS PIPE INSTITUTE • Arturo Valencia, Director of Research & Development/Engineering, DURA-LINE

11:10 - 11:30 **A guide to extruder upgrades: best practices and methods for achieving a successful upgrade**
Dan Barlow, President, INTEGRATED CONTROL TECH

1:15 - 2:00 **INDUSTRY DEBATE: The future for wood-plastic composites**
Paul Schmitt, Founder, ENVIROLASTECH • Matt Breyer, President, NORTH AMERICAN DECKING ASSOCIATION

2:10 - 2:30 **How transparent C-PVC fittings can clear up installation issues before they occur**
Senior Representative, SEKISUI

2:40 - 3:00 **High performance glass flake additives: no more performance trade-offs between strength and dimensional stability**
Liz Gershon, N.A. Business Manager, DREYTEK

4:10 - 4:30 **Optimizing mixing technology for high quality formulations in extrusion**
Jeremy O'Brien, Sales Manager, GREINER EXTRUSION US

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Speakers over the two days include representatives from:

WL PLASTICS The Ideal Piping Solution · deceuninck · CertainTeed SAINT-GOBAIN · Eldon James · RAUMEDIC Lifeline to Health · ENVIROLASTECH

Information correct at time of publishing. Speaker line up and titles subject to change .

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TYPES OF PRESENTATIONS

Business Debates

Business debates will run for 45 minutes and feature influential industry leaders discussing strategic issues facing the global extrusion market. They will be focused on specific sectors of the industry including: plastics packaging; profiles; agricultural films; medical tubing; stretch and shrink films; wood-plastic composites; and plastic pipes.

Training Seminars

Practical training seminars will be delivered by experts on topics including food contact legislation and regulatory compliance.

Industry Presentations

There will also be more than 20 presentations covering the latest technology developments and industry trends. Topics being covered include market outlooks; barrier packaging; co-extrusion technologies; flexible packaging; control and instrumentation; advances in blown film extrusion; retrofit economics; PVC trends; opportunities for plastics pipes; internet of things; mixing technologies; direct extrusion; and many more.

LOCATION AND VENUE

The Plastics Extrusion World Expo, will be held at the Huntington Convention Center in Cleveland, Ohio, USA. This state-of-the-art exhibition facility is located right in the heart of Cleveland's revitalized downtown boasting plentiful parking, free public transport and surrounded by an excellent selection of hotels.

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The two-day event will provide a cost-effective and time-efficient way to promote your company, and its products and services to a large international audience focused on your core markets.

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From the ground up, the Rock Hall delivers a legendary music experience like no other. Feel like a rock and roll music inductee and be one of the first to see the Class of 2019 exhibit, showcasing iconic items representing this years' inductees; The Cure, Def Leppard, Janet Jackson, Stevie Nicks, Radiohead, Roxy Music and The Zombies.

The party ticket is $20 per person and will give you full access to this iconic venue with drinks and nibbles. Doors open at 7pm.

Click here to find out more

*Tickets are available to registered attendees of the exhibitions only.