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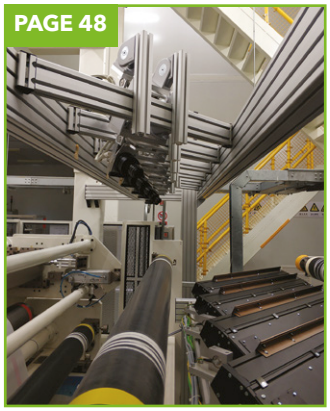
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This event has been postponed to 7-8 October 2020. More details HERE

Food for thought in Essen

I am pleased to invite you to join me at the **Plastics Extrusion World Expo 2020**, which takes place at Messe Essen in Germany on 3-4 June. Tickets are free for both the dedicated plastics extrusion exhibition and its focused conference theatre. Register for both **here**.

Film and Sheet Extrusion magazine will be hosting a thought-provoking debate on the future for flexible packaging, featuring senior representatives from Berry bpi, Bischof + Klein, Cofresco, Klöckner Pentaplast and Sealed Air. Another debate will feature industry leaders from Barbier and Amando Alvarez discussing trends in agricultural film.

There will also be keynote presentations from AMI consultants presenting their latest findings on market trends for plastics films and flexible packaging. In addition, I will be introducing a series of technical presentations from industry experts on a wide range of topics, including blown film cooling, the circular economy, roofing membranes, and REACH authorisation. You can download the full conference programme **here**.

Your **free ticket** to the Plastics Extrusion World Expo will also give you free admission to the Plastics Recycling World, Compounding World and Polymer Testing World Expos, which are all taking place at Messe Essen on the same days. In total, there will be more than 300 exhibitors and five free-to-attend conference theatres across the four shows.

The exhibition will feature a wide range of key players from the plastics extrusion supply chain, including Amut, BASF, Bausano, Borealis, Clariant, Dynisco, Evonik, ExxonMobil, Gabriel Chemie, Gneuss, KraussMaffei Extrusion, Labtech Engineering, Maag, Macchi, Mitsui, Motan Colortronic, Nordson, Piovan, Plastic Systems, Reifenhäuser and Starlinger. It will be a great place to build industry knowledge, identify new technologies, make new contacts and compare suppliers.

I hope to see you in Essen in June.

Lou Reade, Editor
Film and Sheet Extrusion
lou@filmandsheet.com

PS If you're in America and can't make it to Europe in June, then you'll be pleased to know that the Plastics Extrusion World Expo will return to Cleveland, Ohio on 4-5 November 2020. Put the dates in your diary and find out more **here**.

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Machine sales recover in North America in Q4

A recent increase in deliveries of plastics machinery in North America could not make up for a disappointing performance in 2019.

The value of deliveries for the final quarter of the year rose by nearly 8%, to US$316 million, compared to the previous quarter – according to statistics from the Plastics Industry Association's Committee on Equipment Statistics (CES).

Despite the rise – due mainly to sales of injection moulding machinery – sales of extruders declined. Single-screw extruders fell by nearly 1% in the final quarter of the year, while twin-screw sales were nearly 8% lower.

Although final quarter values generally improved, the performance against the final quarter of 2018 shows a 16% decline. Sales of twin-screw extruders were down by 35%, while those for single-screw extruders fell 12%. (For comparison, sales of injection moulding machinery fell 15% in the same period.)

Pineda: "Fourth quarter numbers confirm weaker 2019 plastics machinery shipments"

"The fourth quarter numbers confirm weaker 2019 plastics machinery shipments compared to 2018," said Perc Pineda, the organisation's chief economist.

"Weaker business investment spending in 2019 – due to uncertainties from trade and tariffs and overall weaker manufacturing activity – explains the low numbers."

The CES also conducts a quarterly survey of plastics machinery suppliers that asks about present market conditions and expectations for the future. In the coming quarter, almost 70% of respondents expect conditions to either improve or hold steady – a reversal of the 39% that felt similarly in the previous quarter. As for the next 12 months, 74% expect market conditions to be steady-to-better, which is up from 63% in the previous quarter's survey.

Trade and tariffs issues in 2019 negatively affected the plastics machinery trade. Exports of plastics machinery totalled nearly US$353m in the final quarter of 2019 – almost 7% lower than the third quarter.

Mexico, Canada, and Germany remained the largest US export markets. The combined exports to these countries in the fourth quarter totalled $157m. China was the fourth-largest market in the quarter with plastics machinery exports reaching nearly US$23m.

› **www.plasticsindustry.org**

Scientex adds USA stretch film

Scientex Packaging Film, a Malaysia-based producer of stretch film, is to invest US$43 million to build a second manufacturing facility in the USA.

The new plant, in Lancaster, South Carolina, is expected to open by the start of 2021, and create 69 jobs.

Its existing USA plant, in Phoenix, Arizona, opened in 2018.

"This is an ideal location for us to manufacture products for our customers in the eastern half of the United States," said Goh Tian Chin, senior general manager at Scientex. "We look forward to being operational early next year and active in the community."

Scientex makes a variety of custom films including shrink films, polyethylene (PE) films, tubes and bags and lamination films. It exports to more than 60 countries, and employs 3,800 people.

› **www.scientex.com.my**

Pregis buys protective films maker Soprad

US-based Pregis has bought Soprad of Italy – a global supplier of temporary protective films.

Soprad's products will now be marketed under Pregis' PolyMask brand – which also includes temporary surface protection films and speciality films.

"Soprad's robust European customer base provides an ideal foundation from which to expand the availability of our existing temporary adhesive film products," said Kevin Baudhuin, president and CEO of Pregis. "The acquisition strengthens our position as a leading global producer of surface protection films."

› **www.pregis.com**

Vynova launches "bio" PVC

Vynova has launched a range of "bio-attributed" PVC resins. Available for both rigid and flexible applications, the new grades will be offered in a range of K-values and will be produced at its sites at Beek in the Netherlands and at Mazingarbe in France, according to the company.

The resins are manufactured using renewable ethylene from second-generation biomass feedstock from SABIC's facility at Geleen in the Netherlands. The company said that this will reduce its fossil feedstock requirement and cut CO_2 emissions by more than 90%.

Vynova said the materials carry ISCC Plus certification.

› **www.vynova-group.com**

RKW expands waste bag capacity in Echte

RKW has expanded capacity of waste bags at its Echte site in Germany.

It has commissioned two new production lines with a capacity of 3,000 tonnes per year. This brings its total stock to 10 lines, with an annual capacity of 15,000 tonnes.

The expansion is linked to its long-term partnership with bag supplier Emil Deiss. One of Deiss' other suppliers recently stopped production – and RKW has stepped in to take over the additional capacity.

"We are pleased we have been able to increase production of waste bags by 3,000 tonnes," said Markus Brinkmann, director of the Echte site. "This underlines the close partnership with Emil Deiss and the importance of the garbage bag as a sustainable product for our location."

RKW has expanded capacity to Echte in order to meet the needs of its customer Emil Deiss

On the new lines, RKW produces waste bags in the Premium and Premium plus categories.

The Echte plant specialises in developing and manufacturing resource-saving industrial packaging solutions and waste bags. In a three-stage production process, it makes FFS films, shrink films and ready-made bags. Waste bags are produced with a high percentage of regenerated material.

"Sustainability is a differentiating feature of the films," said Brinkmann.

› **www.rkw-group.com**

BOPP film boost in sub-Saharan Africa

A leading producer of BOPP packaging in Nigeria – Africa's most populous country – is to increase production, following the delivery of a new high-speed line.

Tempo Paper Pulp & Packaging, based in Ota in Ogun State, recently took delivery of its second BOPP film production line from Bruckner.

"Since our first BOPP line started some years ago, markets have developed," said Seun Obasanjo, CEO of the Tempo Group. "Now for us it's time for further investments."

Tempo has bought a second BOPP line from Bruckner

He says that local demand for packaging film is rising – and especially in Nigeria.

Tempo's existing BOPP line – also from Bruckner – has a current production capacity of 33,000 tonnes/year. The company offers a wide range of transparent, white, pearlized and metallised BOPP packaging films for applications such as labelling and food packaging.

Tempo's expansion plans include a BOPET film production line, a second CPP film line and more metallisers.

Its deputy managing director, Nassos Sidirofagis, said: "Our investment strategy is long-term. We are already thinking of several investments to consolidate our position in the market."

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EU classifies TiO_2 as inhalation carcinogen

IMAGE: SHUTTERSTOCK

New CLP rules apply to substances/mixtures containing TiO_2 from 2021

The EU moved last month to classify TiO_2 as a category 2 suspected carcinogen by inhalation under its classification, labelling and packaging (CLP) regulation of substances and mixtures.

The move follows an opinion from the Risk Assessment Committee (RAC) of the European Chemicals Agency (ECHA). This has been consistently challenged by the Titanium Dioxide Manufacturers Association (TDMA), which argues that it was not based on new scientific evidence or understanding of potential harms and is contrary to available data of more than 24,000 workers demonstrating no link between exposure and cancer in humans.

While TDMA acknowledges that the EU has attempted to limit the classification of TiO_2 to powders –the regulatory text refers to "powder TiO_2 and mixtures placed on the market in powder form containing 1% or more of TiO_2 which is in the form of, or incorporated in, particles" – it said the text introduces several new concepts and terms without providing meaningful definitions or interpretative guidelines. It predicted this will open the door to various interpretations.

"The EU's decision will apply on 9 September 2021 and the time until then will be needed to attempt to address ambiguities created by the text," according to the association.

› **www.echa.europa.eu**
› **www.tdma.info**

Coronavirus postpones Chinaplas

Organisers of the Chinaplas 2020 plastics trade fair – which was due to take place in Shanghai on 21-24 April – have postponed the show until August, due to coronavirus health restrictions.

The new dates for the show are 3-6 August. The rescheduled event will be held at the original venue, the National Exhibition and Convention Centre (NECC) in Shanghai.

The annual show is one of the world's biggest plastics exhibitions and has traditionally alternated between Shanghai and Guangzhou. The previous event in Shanghai in 2018 attracted 180,000 visitors.

Adsale said in January it would relocate the Guangzhou show to Shenzhen in 2021 to cope with growing visitor numbers.

Dates have been set for 13-16 April 2021, which puts it three weeks ahead of Italy's Plast exhibition and five ahead of the US NPE show.

› **www.chinaplasonline.com**

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The latest applications in thermoforming – from a tractor cab roof a tray for a medical screw – rely on the many recent advances in machinery technology. Lou Reade reports

IMAGE: DALLAGER PHOTOGRAPHY

Drawing strength: recent advances in thermoforming

Thermoforming technology has become increasingly sophisticated – with the technique used in a number of precision products in industries such as automotive and medical.

The thermoforming division of US-based **Society of Plastics Engineers** (SPE) recently showcased the winners of its annual parts competition. They included a tractor cab roof, a medical tray to keep bone screws in place and a microwaveable polypropylene (PP) food tray.

Plastics Unlimited was the overall winner with its tractor cab roof – which comprises two thermoformed parts glued together. Inside the roof, there are many different steel and thermoformed parts.

"Our customer approached us about producing a cab roof top for them that would incorporate mounting brackets and air ducts," said the company. "They wanted a colour-matched Class A top side with a black textured bottom side – and also wanted to keep tooling costs low."

The outer material is an acrylic-capped ABS with a starting thickness of 0.156in, and the bottom is a black acrylic-capped haircell ABS with a starting thickness of 0.187in. Challenges included: controlling the shrink; and making sure the top and bottom fitted correctly so the glue gap was consistent. Another difficultly was to ensure that everything is held correctly when gluing the top and bottom together, so there is proper pressure on all sides.

Tooling for the design proved much cheaper than for other processes such as injection moulding or twin-sheet moulded plastic. This part was formed from temperature controlled, single-cavity production tooling.

Medical success

There were several medical winners. US thermoformer **Placon** won for a custom tray that keeps medical screws suspended to prevent hydroxyapatite (HA) coating damage.

The product, made for medical device manufacturer Orthofix, is a tray package designed to hold two medical screws – coated with HA – in place until they were used in the operating room. The HA coating on each screw helps reduce the screw from backing out of the bone after being implanted into the patient. Once screws are fastened into the retainer base, a retainer cover snaps into place to create a second secure barrier for the HA-coated screws.

The tray and all packaging components are made from PETG. The tray comprises two designed parts – a retainer tray and tray cover – and two pre-validated, double sterile barrier trays. These go

Main image: Plastics Unlimited's tractor cab roof includes two glued thermoformed parts, which helped keep tooling costs low

Right: Commodore manufactures five different thermoformers, with platen sizes of 16in to 44in

inside each other and hold the newly designed tray and tray cover.

The customer is using the double sterile barrier trays to package around 2,000 different products from its portfolio. Placon was able to save over US$50,000, as this is the average cost of validating a new medical package.

The customer had to find a solution that would hold the product without causing the HA coating to rub off while in the package – which would make the product defective. This was done by creating a locking retainer for the head of the screw, while keeping the body of the screw suspended.

Profile Plastics won a gold award for a clear part – made from cast acrylic sheet. The part requires total clarity on all flat surfaces to give nursing staff an unimpeded visibility of premature newborn babies. At the same time, a precisely 'shaded' section was required, to hide the unit's electronics and wiring. This was done via distortion printing of each sheet of cast acrylic prior to forming. Ridge forming was chosen for the moulding process. To achieve the customer's target price point, the part was produced in a rotary forming machine equipped with a quartz oven.

Food for thought

Lindar met its customer's brief for a tamper-obvious package to sell single serve bakery items. Criteria included a design that could use production automation, automated label application and a package that would hold the product in place even if tipped upside down. The result was a tamper-obvious hinged package called Simply Secure. It is made from black/clear APET.

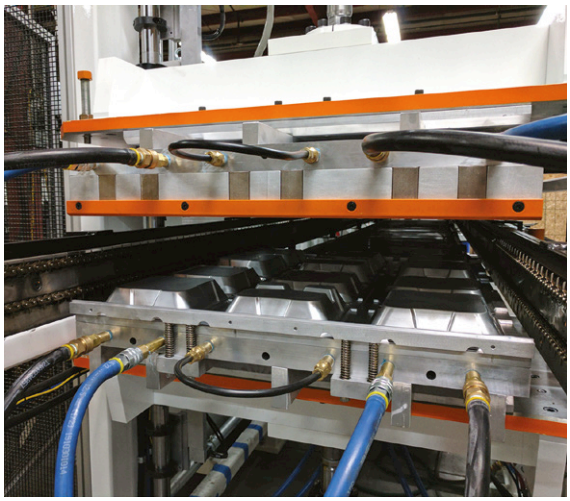
At the same time, **Placon** developed a modular and stackable PP foodservice package with high leak resistance – that can also be microwaved.

A vent channel was designed and located within the base of the compartmented containers to allow steam from hot foods to escape from the container when closed. The channel allows air to circulate through the container compartments and escape through a vent on the compartmented lid. Incorporating the vent channel eliminated the need for more than one vent opening in the lid.

Because the container is made from PP it can be washed, heated, and reused. At the end of its useful life, it can be recycled. The lids are made from Placon's Ecostar, a food-grade, post-consumer recycled PET sheet.

K highlights

The recent K2019 exhibition saw the emergence of many new machine developments in thermoforming.



For instance, US-based **Commodore Technology**, part of Dolco Packaging, highlighted its line of expanded polystyrene meat tray, plate and hinged-lid container thermoformers. The company manufactures five different narrow web thermoformers ranging from 16in to 44in platen size. The equipment is designed for quick changeover, ease-of-access and flexibility.

Another benefit of the design is that all the tooling (mould sets) is interchangeable across the line. This gives manufacturers a high degree of flexibility. Also, the 22in to 30in wide web enables fast changeover in less than 2.5 hours – against an entire day needed for a wide web machine. This gives smaller producers more flexibility to change container types and colours.

Following the rule

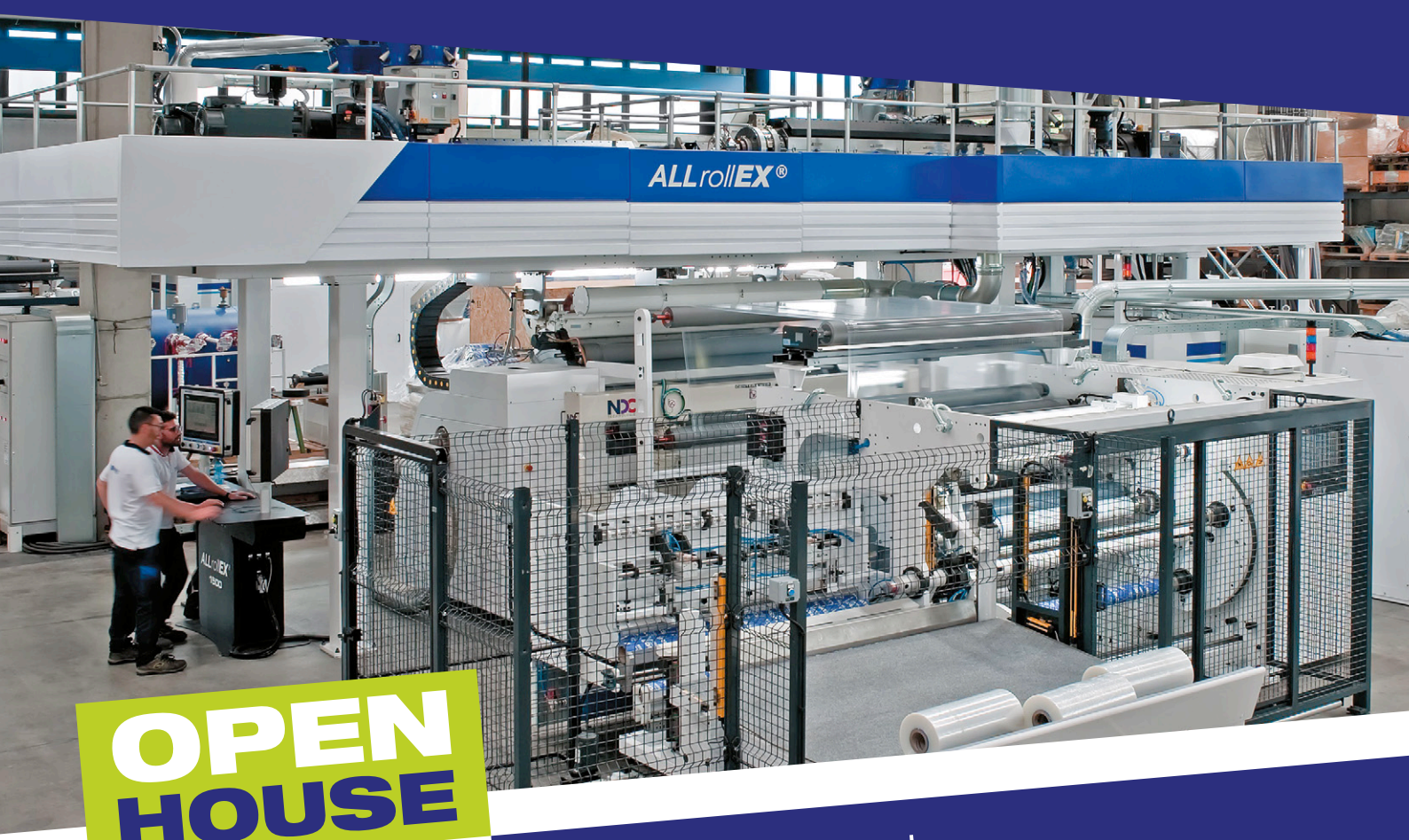
WM Thermoforming of Switzerland has developed a new new steel-rule-die thermoforming machine – called Flex 92 – which is designed to provide thermoformers with more freedom of choice.

It says that the new machine requires no major mould modifications, has a movable clamping frame, pub assist and electrical driven ejector. Its steel rule die technology improves parallelism stability, cutting precision and steel rule die longevity. A remote machine-viewer interface allows real-time remote monitoring of the machine's functions via smart phone, tablet or PC.

At K2019, the machine ran with a 24-cavity lid-mould from Marbach, using 450-micron PP sheet incorporating Milliken's nucleant technology. WM also demonstrated new laser technology called TLA, alternative thermoforming materials and a new coffee capsule machine.

In-mould labelling

Illig presented a number of thermoforming novelties at K2019. Its IML-T system – which combines



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Right: At K2019, Illig showed its IC-RDKL 80 thermoforming system to make IML-T lids

thermoforming with in-mould labelling – was seen in action, demonstrating cups made of rPET with easily separable paper labels. For the first time, the company showed its new IC-RDKL 80 thermoforming system, which can be used to make IML-T lids.

Another innovation is the company's first 'fourth-generation' thermoformer. The IC-RDM 76K has a new drive system and a much higher closing force. At the show, it was used to make drinking cups from recycled PET.

The company also highlighted developments in digitisation in thermoforming – to increase overall availability and productivity. Illig Connectivity connects a customer's thermoforming production systems into the network, so they are better integrated into the value-added chain. Connectivity optimises job and process control, and facilitates data exchange, logging and archiving, says the company.

Separate to the K show, Illig presented details of a joint project with **BASF** at the recent *Thin Wall Packaging* conference in Dusseldorf – organised by **AMI**.

BASF recently developed a grade of its Ultradur PBT with a higher melt strength – making it suitable for extrusion applications including thermoforming. It has tested its B6560 M2 FC TF grade with impressive results.

The material was used to make medical cups, in collaboration with machinery manufacturer Illig. A first trial used an IC-RDM 70 KC automatic roll-fed machine to make cups that were 185mm in height. It was made on a single-cavity mould and had a deep-draw ratio of 1.

This led to a second trial on an IC-RDK 80 – an automatic pressure-forming machine with a 10-cavity production mould. It was designed for trays with a maximum height of 120mm, and had a deep draw ratio of 0.2. This second trial acted as a proof of concept for the production mould.

One future development is to develop a thermoformable Ultradur grade with barrier technology – giving a 30-fold reduction in oxygen transport rate (OTR). This is not yet commercially available because a new additive requires classification, says BASF.

Expanding to PET

Processing Technologies International (PTI) has extended the use of its Super-G HighSpeed extruder to PET sheet.

"With this line, a 75mm extruder has the output of a typical 150mm extruder," said Matt Banach, senior vice president of sales and marketing.

The extruder has previously been used to process PP and PS, he said. The company now has plans to process ABS on the machine.

"ABS is similar to polystyrene in some ways – but there are challenges," he said. "We may be able to produce thicker sheet with ABS."

Earlier, PTI formed a strategic business alliance with and **Farrel Pomini** to supply integrated compounding and extrusion systems for production of plastic sheet under the Direct-to-Sheet (DTS) Compounding name. The goal of the alliance is to eliminate the need to create pre-compounded resins prior to extrusion processing. ›

Expanded composite sheet production

Meanwhile, **Renolit** has expanded production of its Tecnogor thermoformable composite sheet with a new line in India. It has added the line at its APPL Gor Plastics India plant in Pune – the first time it has made the sheet outside Europe. The product is aimed at manufacturers of automotive interiors in India and Asia Pacific.

A key feature of the line is Renolit's patented extrusion processing technology for making the product – a glass fibre-reinforced, PP-based thermoplastic composite. High-quality 3D trim parts can be thermoformed in a high productivity 'glue free' one-step-process, which reduces production costs, says the company.

Renolit says the production process gives the product high stiffness and impact performance. The patented fibre-embedding extrusion technique also makes it a clean, safe material to handle on the shop floor and after moulding. This is because the glass fibres are encapsulated in the polymer matrix during extrusion.

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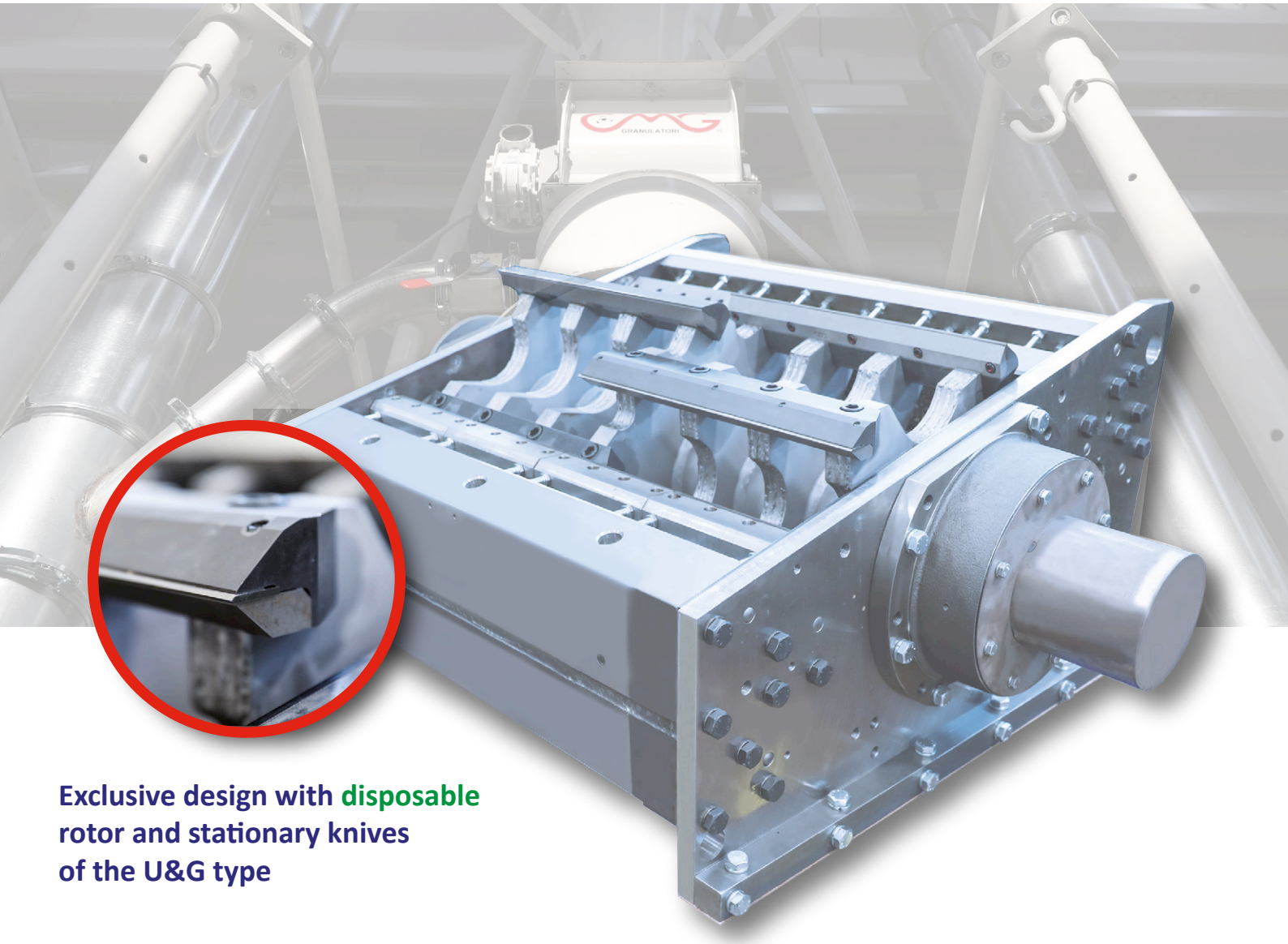

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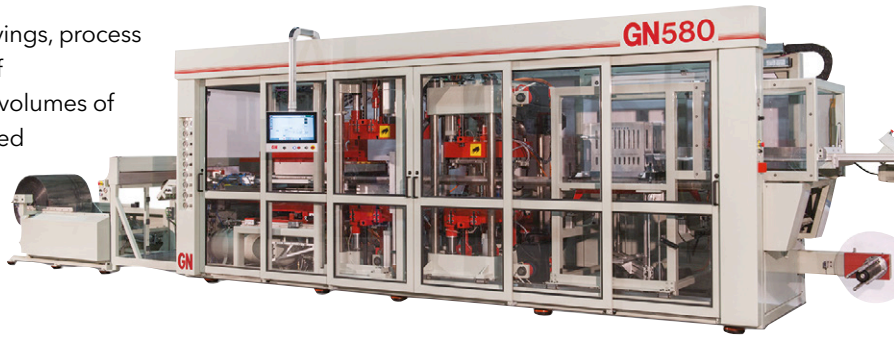

Right: GN's GN580 can accommodate tools from rival manufacturers

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.

Swing into action

Gabler showed its Swing 3 model for the first time at K2019. It offers maximum flexibility due to fast, simple product changeover. Thanks to a unique stacking and counting mechanism, deep products such as cups – and flat products such as trays and lids – can be produced within one machine type. An integrated system allows fast, effective tool changing.

By increasing the forming area to 600 x 271mm, productivity has been increased. The Swing 3 can produce up to 31,500 cups per hour – a significant increase compared to the previous generation. It was specifically developed for processing PET materials and biodegradable material. Thanks to the combination of high cutting forces in the forming area and high-quality tools, from its supplier Marbach, recyclable materials can be processed without loss of quality or productivity.

It has a compact design so can easily be integrated into any production environment.

Simple tool changes

GN Thermoforming Equipment says that its new GN580 thermoformer – launched at K2019 – is a form/cut/stack model aimed at small factories that run lots of different products.

"Tool changing is very simple – which is ideal if you are running multiple products," said Paul Phillips, sales and marketing manager.

The GN580 has a forming area of 580 x 465mm and a cycle time of 45 cycles/min at full stroke. The machine forms 120mm (4.7in) deep parts above and below the sheet line. It also features an operator-friendly HMI with integrated diagnostics and remote connection, an energy recovery system incorporated in all drives, and maintenance-free precision roller bearings in the toggles.

It shares many features with its larger GN800 – such as the same energy recovery system – but its smaller size means it has three stations instead of four. However, it does have one new feature: it can take competitor tooling without the need for an adapter plate.

"Tooling is a big investment," said Phillips. "If you have tools that fit one machine, you can't usually run them on another type without an expensive adapter plate."

He says the machine's flexibility and small size makes it attractive to smaller companies – and the ability to run rival tools means that a thermoformer would not need to invest in new tooling for the new machine.

Phillips did not explain exactly how the GN580 accommodates competitor tooling, but said: "It has to do with where the chain reel is. The forming press has been modified so that you can manage different tools."

At the show, GN ran the new machine with recycled PET using a common-edge tool – producing meat trays with minimal scrap. The machine had been pre-sold to a European

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Right: Kiefel showcased an egg tray made from totally recycled PET

packaging manufacturer for the production of food trays and blister packs, says GN.

Higher productivity

Kiefel showed its new Speedformer KMD 78.2 thermoformer at K2019. It says that the new generation of steel rule machines offers high quality with greater productivity and energy efficiency.

"The new generation of machines is fast and reliable," said Erwin Wabnig, director of the packaging division at Kiefel.

"Operators, even without specific training, can operate them intuitively. the new system can also process novel film materials and produce even complex products whilst consuming a minimal amount of energy."

Kiefel's designers focused on higher productivity, process control and availability when designing the new machine.

The heating system is ready for use within a very short time and has a 20% higher heating capacity – despite reduced energy consumption. This, combined with the energy recovery system of the servo drives, leads to considerable savings.

Kiefel also showcased an egg tray, made completely from recycled PET. Close analysis and re-engineering of the material, tray and processing have led to a tray that is of similar – or better – quality to the ones available in virgin PS or PET.

Kiefel says that its premium flatbed tooling – combined with the new generation flatbed KMD thermoformers – helped streamline the development of the tray.

Next to a transition to 100% PCR material, Kiefel offers the expertise and support for more drastic material changes – such as plant-based materials including PHA or PEF.

Left: SML and Kiefel have developed three-layer PET sheet with a foamed central layer, for making heat-resistant cups

Hot fill foam

In a new joint R&D project, Kiefel and **SML** are exploring and developing the potential of foamed sheet for hot fill applications – with new features in terms of heat resistance, insulation and recyclability.

As well as developing end products with specific mechanical and thermal properties, the research will look to optimise the manufacturing processes and develop new recycling methods. The basis for the new products is a three-layer PET (or PP) sheet with a physically foamed central layer.

The first outcome is that cups with a heat resistance of up to 100°C have been created from standard APET. The sheet for such cups can have an overall density of about 0.65 kg/dm³, which saves material and increases the insulating properties – making it possible to hand-hold the cups when they are filled with hot liquids. The cups were seen at K2019.

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Film and Sheet EXTRUSION

Beyond easing processing and boosting performance, additives for film production are increasingly helping to enhance product and system sustainability. Mark Holmes reports

IMAGE: POLYONE

Formulating better films

Additives and additive masterbatches have long played a big role in production of films for both packaging and industrial applications, acting as processing aids to boost slip, providing antiblocking and antistatic properties, enhancing antifog, or improving light stability. However, the need to simultaneously meet circular economy targets and improve film recyclability is climbing up the priority list for all solution providers.

The current market for film additives and masterbatches presents many opportunities, especially in the area of sustainability, according to **Ampacet**. The company says that additive masterbatches will continue to have a significant role to play in enabling new and innovative solutions that support sustainability goals. The drive towards a more circular economy is well underway in plastics and Ampacet believes it has a number of valuable contributions to make in this area.

"Vibrant economic conditions in the United States currently are supporting demand growth in many film markets. The growing demand for on-the-go convenience and shelf appeal continues to drive significant growth in smaller, easier-to-handle packages. This is why, for example, Stand Up Pouches (SUP) are growing faster than just about any other packaging format. They are easier to 'grab-n-go' and offer the bonus of providing sustainability advantages, significantly increasing the product-to-package ratio," says Jim Morrison, Strategic Business Manager, Flexible at the company.

"While we talk about the consumer preference for on-the-go convenience favouring SUPs and flexible packaging, the conflicting consumer preference is for more sustainable solutions. Whereas films certainly offer product-to-package ratio advantages, there are more challenges when it comes to the collection, sorting and recycling of films at materials recovery facilities (MRF). We support the recent passage of the RECOVER Act in the United States that provides funding to support state and local recycling infrastructure. There is much work to do with respect to these challenges," he says.

Morrison adds that multi-layered barrier films contribute significantly to sustainability by protecting products and extending shelf life, but

Main image: Film additive demands are changing as producers look towards mono-layer and more homogenous structural components to meet sustainability targets

IMAGE: PALSGAARD

Above: Palsgaard is developing plant-based and food grade additives to provide good antistatic and antifog performance in films

multi-layered films are challenging to recycle, even if collected. As a result, there is a trend towards developing mono-material solutions. In turn, this is driving developments for increasing the oxygen barrier in stretched PE films, for example. He says Ampacet is active in research and development on new solutions to satisfy the unmet needs of film processors in this area.

Improved recycling

One recent development is the ReVive compatibiliser product line, a blend of functional additives that enable barrier film scrap to be recycled back into a polyethylene layer. The company says it has been rigorously tested internally against industry protocols for film recycling and found to effectively homogenise EVOH and PA with PE. Ampacet is also developing compatibilisers for other mixed resin streams.

"Given that PE recycle streams are more developed than PP, there are on-going efforts in the industry to replace BOPP with BOPE in more applications," says Morrison. "This requires additives tuned specifically for BOPE. As a leading supplier of masterbatch additives for oriented films, Ampacet is active in this area."

As well as ReVive, Ampacet also has new products in its R3 Sustainable Solutions portfolio. "We recently launched a REC-NIR Black that enables black plastics to be detected by near-infrared sorting equipment critical for materials recovery facilities. In the same vein, we also have a new masterbatch that enables films to be detectable by metal detectors. In order to improve the appearance of plastics that have been slightly discoloured through the incorporation of recyclate, we have developed BlueEdge and GreenEdge masterbatches," adds Morrison.

"Future developments will include a portfolio of odour scavengers developed for multiple applications, including incorporation of various types of recyclate. However, as more recyclate is used from disparate sources we anticipate requests to neutralise new odours that will require further solutions," he says.

Optimised additives

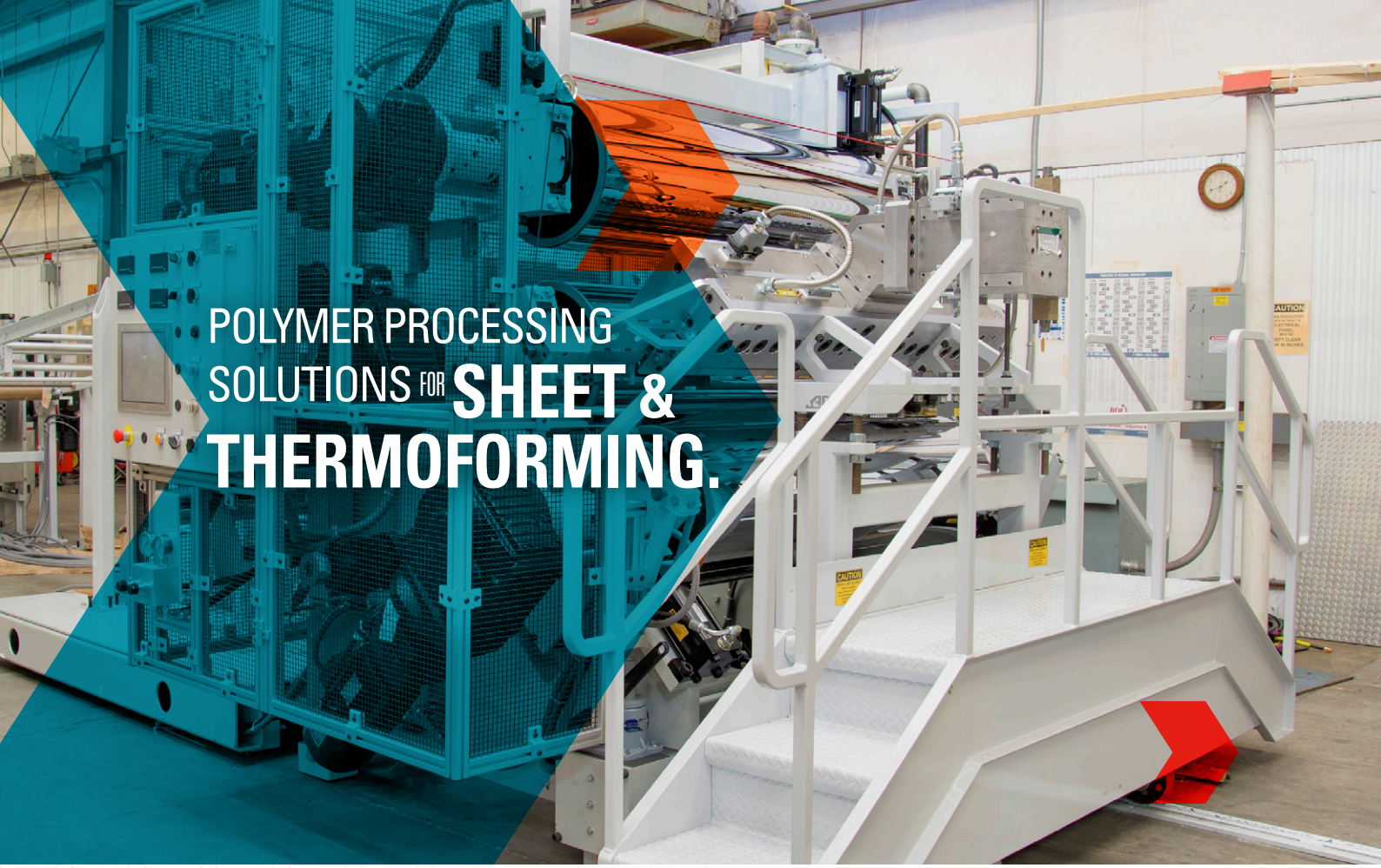
Danish company **Palsgaard A/S** is seeing a steady increase in film additive and masterbatch market activity as the standard of living increases worldwide, leading to increased demand for many consumer products. "As legislation tightens, and the demand for recyclability grows, the polymer additive industry faces the challenge of making optimised and safe additives and masterbatch solutions," says Christina Normann Christensen, Product and Application Manager, Non-Food.

"In particular, unhealthy additives and additives based on chemistry of increasing concern need to be replaced to offer the end consumer a safer solution. For Palsgaard, this means developing plant-based and food grade additives which match or surpass the performance of conventional additives with antistatic and antifogging effects," she says.

"Two of our developments stand out as they are highly efficient antistatic agents, Einar 411 and Einar 601. Both products, like the rest in the Einar series, are plant-based, food grade and produced in carbon dioxide neutral facilities," she says. Einar 411 gives both short and long-term antistatic effects and is said to be effective in challenging applications, such as impact copolymer polypropylene and BOPP film. Einar 601 is said to perform well across a broad range of PE applications at low loading levels and in low humidity conditions.

As a result of tightening legislation, Palsgaard cites the example of a customer that wanted to replace ethoxylated amines in food packaging but had been struggling to find an alternative with comparable performance. "After testing and validation of Einar 411, the customer approved it and has now completely replaced ethoxylated amines in critical applications and eliminated any safety concerns," says Christensen. "The main applications for Einar products are in polyolefins, polyethylene and polypropylene, as they are predominantly migratory. However, we are also starting to look at a broader range of polymers, both in masterbatches but also as coatings for PET and EPS."

According to **BASF**, film applications continue to experience solid growth globally as they offer an economical and sustainable solution to protect goods of much higher value and increase their service life. "Additives and masterbatches are



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Right: BASF's Tinuvin NOR 356 HALS stabiliser delivers good results in agricultural film exposed to high levels of UV and heat

essential for the retention of a polymer's physical properties in the initial high temperature processing when films are produced," says Sebastien Villeneuve, Head of Marketing Europe, Plastics Additives. "They also provide superior resistance to further stresses, for instance thermal or UV light exposure, to which the polymeric materials will be exposed in the end use application. Additives and masterbatches are also tailored to provide additional functions, such as barrier, antistatic and antifogging properties."

Application matters

When discussing factors driving market demand, Villeneuve adds that there is a need to distinguish between films involving packaging, typically of consumer items and largely dominated by food packaging, and industrial films, such as agricultural films and films used in construction or heavy-duty packaging. For packaging, additives and masterbatches are essentially providing physical and aesthetic property retention in the polymers at the processing stage, while not impairing compliance with stringent food contact requirements, organoleptic properties and management of migrating species, including non-intentionally added substances (NIAS). Hence, the user can claim a visible success with an invisible contribution. For industrial films, while ease of polymer processing for increasing throughput is also essential, the market continues to require resistance to ageing for extended service life expectations.

For both food packaging and industrial films, Villeneuve sees a significant trend to ensure a material's performance while downgauging the structure and improving raw material utilisation and the product's overall sustainability profile. This can be achieved by modifying a polymer's architecture, in conjunction with optimisation of the additives package.

"Regulatory and safety elements are also guiding new developments from different angles," adds Villeneuve. "For example, in films for food packaging applications, LLDPE grades are soon going to be reformulated globally without TNPP (tris nonylphenyl phosphite) after a transition period. Another example is in construction films, where flame retardant solutions are optimised in order to improve 'escape time' and smoke density, as well as long-term availability, due to the time and difficulty to get material approvals."

Villeneuve says BASF sees a variety of problem areas requiring new additive solutions. "An interesting example is the development of

IMAGE: BASF

solutions for long-lasting greenhouse covers used to cultivate vegetables in the Mediterranean or similar areas with good growing climates," he says. "Consumers are now demanding healthier food and this is influencing the rapid development of organic farming. However, organic practices are very demanding on the service life of film covers as it changes the type of crop treatments used during cultivation. In order to cope with this, new additives and masterbatches used to protect polyethylene multilayer films have been further developed."

At K2019, for example, BASF introduced Tinuvin NOR 356. This is the latest generation of hindered-amine light stabilisers (HALS) for films and other thin section agricultural plastics exposed to high levels of UV light, heat and contaminants. The company says that Tinuvin NOR 356 is recommended for any PE-based agricultural applications in extensive horticulture exposed to strong UV radiation, heat and agro-chemicals, including sulphur-based compounds and disinfection chemicals. It is based on BASF's NOR technology – a stabilisation system featuring low chemical interaction.

While long lasting performance is a constant focus for best use of greenhouse cover films, BASF adds that its NOR technology has also been studied in an agronomic institute to monitor film performance with regards to crop yield and quality. Both were shown to be improved for crops cultivated under films stabilised with the NOR technology.

Future developments in film additives at BASF will include stabilisation of very high viscosity resins, which are particularly challenging during processing on larger scale converting lines. ›

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IMAGE: POLYONE

Right: Additives are enabling mono-layer structures to deliver extended shelf-life and low vapour transmission performance for sensitive products

Long-term thermal and UV resistance will also continue to remain a major focus of development, adapting to ever changing conditions of exposure and environmental contaminants. The company will also support downgauging, closed loop recycling opportunities and regulatory trends.

Switching structures

PolyOne is observing a significant upward trend in the current market for film additives and masterbatches as components used in film production become more homogeneous. "Producers are switching from multilayer films to fewer layers and single materials to facilitate recycling. The recycling stream cannot manage materials such as polyamide in the middle of a multilayer film, so we are seeing producers working on improving the performance of polyolefins and seeking additive solutions to make that happen. They need to change the vapour transmission rates, odour control, meet longer shelf life expectations for fresh packaged meats, filter UV, and a variety of other requirements. Additives are making these goals possible," says William Reynolds, Senior Industry Manager.

"In addition, commitments to the circular economy are now being made by brand owners and OEMs. These commitments require more recycled content in their products. For example, Walmart has created a scoring system for its suppliers' packaging that gives higher scores for recycled materials and reduction of materials. As a result, there is a demand for more recycled materials that perform similarly to virgin resin. We are also evaluating the components in our additives to make sure we are not contaminating the downstream recycling path of the final product," he says.

"The European Union has a good model for recycling, while the US is evaluating what future steps to incorporate to allow for increased recyclability in a period of lower recycling activity. However, there is still no economic incentive or direction around recycling in the US. OEMs are not being penalised, but instead they are stepping up and saying that we need to do something," Reynolds says.

On the technical front, he says that downgauging of plastic films is happening and that additives are required to ensure they perform the same as thicker multilayer films with the same properties for outgassing, odour control and sealing capabilities, all of which is required at a cost that is the same or lower than thicker films.

Marked improvement

Clariant is collaborating with pigment supplier **Merck** and resin producer **SABIC** to develop laser-marking technology and materials to ease the recycling process for flexible polyethylene (LDPE, LLDPE) packaging film. "There is growing demand for clean, high-quality recycled PE," says Chun-Yip Pang, Clariant's Global Product Manager Additive Masterbatches – Laser. "While recycling rates for PE films continues to increase, there are still a number of challenges that need to be overcome. This collaboration is focused on eliminating the printing ink used for tracking, shelf-life, bar codes and other variable information that must be placed on almost any package on the market. Less ink means less contamination when it comes to recycling."

The companies say their collaboration demonstrates a complete supply-chain solution for laser-marking of films. SABIC contributes the polymer technology that delivers the properties required in the film packaging (and can supply circular-certified polymers), laser-sensitive Iriotec pigments and marking expertise is provided by Merck, while Clariant developed the additive masterbatch formulations. Most plastics are transparent to the radiation used in the laser-marking process, so additives are needed to achieve a visible reaction in the film. The visible marks are permanent and resistant to water, oil, grease or fatty foods. They can be applied to the surface of a mono-layer film or to a laser-sensitive

IMAGE: CLARIANT

Right: Clariant has partnered with Merck and SABIC to improve laser marking of flexible packaging materials

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IMAGE: CLARIANT

Above: Clariant's AddWorks PKG 906 Circle supports recycling of polyolefin film manufacturing waste without compromising quality or efficiency

layer placed beneath a laser-transparent surface layer. The additives provide good contrast and allow high-speed marking.

Clariant has also developed AddWorks PKG 906 Circle to improve recycling of polyolefin films. The company says that the addition of this polymer stabiliser allows producers to significantly increase reuse of waste materials in PP and PE films, recycling their own reground scrap without loss of performance or processing efficiency. It is particularly well-suited to BOPP manufacturing but is also applicable to cast and blown film processes.

Using Clariant's Circle additive, the reuse content of post-production waste in the final film can be increased by up to 30%. The additive also protects the resin so that film quality remains excellent with significant reduction of gel formation and prevention of additional yellowing at high line speeds. Clariant adds this polymer stabiliser is its first product to carry the 'Circle' designator, which it introduced to highlight solutions that have been specifically designed to deliver significant benefits to the re-use or recycle process.

Synergistic additions

DuPont Transportation & Advanced Polymers has developed Dow Corning AMB-12235 masterbatch for PE blown film, combining an antiblock agent with a compatible slip additive to improve film processing and improve consistency of quality. The combination is said to provide a synergistic effect that delivers a low coefficient of friction (COF) over an extended period of time. It is also said to help prevent migration to the film surface, which can affect downstream operations, and reduce film blocking at cost-effective low loadings. The masterbatch is approved for food contact in Europe, the US and China.

"This new technology advancement demonstrates our strong commitment to the success of the packaging industry by supplying innovative, silicone-based solutions that help customers achieve seamless throughput, high productivity and consistent quality," says Christophe Paulo, Industrial and Consumer Strategic Marketer EMEA at DuPont. "It helps film makers avoid spending time and effort to calculate the right ratio of antiblock and slip additives by trial and error. It also streamlines handling, storage and management of additive inventories."

DuPont adds that its silicone-based slip additive helps lower the COF of blown film to reduce its resistance to sliding over itself or manufacturing rollers. This improved slip performance – which is stable over time and under high temperatures – contributes to increased production speed, uninterrupted throughput and uniform film quality.

The masterbatch was formulated to ensure compatibility between the antiblocking and slip additives and provide the best ratio of active ingredients. This fine-tuned formulation frees customers from determining which individual additives work well together, and at what loadings. The masterbatch is claimed to be highly efficient at low loadings of 4-6 wt%.

Kafrit has developed antistatic additives with active ingredients from plant-derived ingredients. The new additives include AT 00U11 LD, which is a short or long-term antistatic masterbatch and is active at low humidity levels. AT 04139 LD and AT 04139 PP are also short and long-term antistatic masterbatches that function with PE and PP compatibility respectively.

IMAGE: DUPONT

Right: A candy wrapper manufactured using DuPont Dow Corning AMB-12235 combined slip and antiblock additive masterbatch

The additives are dual use in food products and have no hazardous substance indication. In addition, the additives have good organoleptic properties, without after-odours, so are suitable for packaging odour absorbing food such as milk powder. Dosage in the sheet is not limited by food contact certifications and can be adjusted until the desired result is obtained, the company says. Film applications include preventing dust accumulation in films and air distribution systems, shrink wrap packaging, twist film packaging, and easy handling and

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opening of rolls, especially in thin films.

The company has also developed new high-performance antiblock additives for BOPE films. Kafrit says that these 'next generation' films are produced from PE without the need for additional polymer layers. They allow a significant reduction in thickness compared to unstretched film – from 100 to 40 microns – without loss of mechanical properties. The new additives provide the film with improved properties, including a coefficient of friction of less than 0.25 (for a 20 micron thickness) and turbidity (haze) of less than 3%.

In addition, Kafrit has developed antifogging additives for PETG films. These are claimed to provide immediate good results in both cold and hot antifogging tests. Applications include sheets and films used either for agricultural purposes or for food packaging. In agriculture, the additive allows maximum penetration of light into a greenhouse by keeping the sheet transparent and preventing water from dripping from the greenhouse roof onto the plants, which can cause crops to heat and burn when sunlight passes through the water droplets that function as optical lenses. In food applications, the coating serves mostly an aesthetic purpose, allowing the customer a better view of the product by keeping the film transparent or reducing condensation.

Antifogging solutions for polyamide and biodegradable films have also been developed. Kafrit says a new masterbatch has shown good results in layers of PA6 and/or PA copolymer 6/66. The product was developed in collaboration with a leading European polyamide manufacturer. It is approved for food applications and is used for packaging fruit and vegetables, as well as for multi-layer food packaging. A 6% addition level is required. An antifogging masterbatch for biodegradable films is also commercially available. It is suitable for a variety of biodegradable polymers and its recommended usage percentage is 10-15%.

Mineral moves

HPF The Mineral Engineers, a division of Quarzwerke Group, has developed a number of mineral raw material additives for influencing various properties of plastic films and has recently undertaken studies on packaging films requiring good antiblocking and optical properties, as well as agricultural films with high requirements for high

Table 1: Dynamic coefficient of friction (μD) of 50 micron blown packaging film comprised of 0.75MFI PE with 3000ppm of different mineral antiblock additives

Product	Inside against itself	Outside against itself	Inside against stainless steel	Outside against stainless steel
Unfilled	0.48	0.42	0.45	0.40
Trefil 1313-400	0.46	0.45	0.32	0.34
Trefil 1313-600	0.43	0.37	0.22	0.24
Sikron SF 4000	0.46	0.43	0.27	0.31
Microspar 1380-600	0.38	0.38	0.28	0.30
Microspar 1379-300	0.48	0.46	0.28	0.31
Microspar 1379-350	0.46	0.44	0.28	0.29
Microspar 1379-400	0.47	0.40	0.26	0.26
Microspar 1379-600	0.39	0.38	0.32	0.32

Source: HPF The Mineral Engineers

Table 2: IR transmission measurements of 50 micron blown agricultural greenhouse film comprised of 0.75MFI PE with 10% of different mineral additives

Product	Transmission [%]
Unfilled	83.3
Microspar 1380-60	36.0
Microspar 1379-300	37.8
Microspar 1379-350	36.5
Microspar 1379-400	39.7
Microspar 1379-600	34.2

Source: HPF The Mineral Engineers

UV transmission and IR absorption. The additives used are characterised by a refractive index that is almost identical to that of the polyethylene films, resulting in good optical properties. Different particle size distributions also play an important role, especially with antiblocking films.

Trefil 1313-400 and Trefil 1313-600 are finely ground and processed natural anhydrite minerals belonging to the anhydrous sulphates group. Anhydrite has a tabular structure, density of 3.0 g/cm^3, Mohs hardness of 3.5, high whiteness (Y=89) and good transparency.

Sikron SF 4000 is a cristabolite that is synthetically-produced from pure silica at around 1,500°C in a rotary kiln (cristabolite rarely occurs in nature). During this process the lattice structure is widened, which reduces the density and results in a high degree of whiteness. Like silica, cristobalite is chemically inert. It has a blocky structure, density of 2.35 g/cm^3, Mohs hardness of 6.5, high whiteness (Y>94), high chemical resistance and a coefficient of thermal expansion of 54×10^{-6}/K (at 20-300°C).

Microspar 1380 and 1379 feldspars are chemically resistant tectosilicates with thick, plate-like grain morphologies. Using mainly potash feldspar, HPF processes, separates, classifies and finely grinds this material. Properties include a thick tabular structure, density of 2.6 g/cm^3, Mohs hardness of 6, high whiteness (Y>90), high chemical resistance, low refractive index and it behaves transparently in many binder systems.

HPF says that in its study, a 60% polyethylene masterbatch with an MFI of 2.0g/10 min was produced using the different additives. 50 micron thick blown films were produced with an additive concentration of 3000ppm for the antiblocking films and 10% for the agricultural films. The base film polymer was an 0.75 g/10 min MFI (190°C/2.16 kg) grade. Dynamic COF results for the antiblocking films are shown in Table 1. Table 2 shows IR transmission results for the agricultural films, demonstrating improved thermal properties that will reduce energy costs in greenhouse applications. Total transmission in the visible wavelength range is only slightly influenced by the use of the additives, says HPF. However, too much direct light can have a harmful influence on plant growth so a higher proportion of diffused light is a positive, says the company.

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Optimised film structures add hot tack/seal integrity

Modelling hot tack performance helps to ensure maximum performance of seals in multi-layer packaging, writes ***Dan Ward****, at Nova Chemicals in Canada*

A film's hot tack is a measure of its ability to maintain bond strength across the seal interface while sealant layers are still hot. Strong hot tack is critical for ensuring leak-free packages in high-speed packaging operations – where the molten seal experiences sudden separation forces. These separation forces happen when a product impacts the seal area before it has fully cooled or when converting stiff films that spring back as the seal jaws re-open. Films designed to package heavier or bulkier products – such frozen foods – typically need more hot tack than those designed for lighter products like lettuce or snack foods.

Curve limitations

When choosing a sealant for demanding applications, film developers often look for the sealant with the highest peak strength on a hot tack versus temperature curve. These curves are generated by measuring the seal separation force over a range of seal temperatures. However, focusing on peak strength may not provide the best ranking for two reasons. First, most published curves show results for monolayer test films with a specific gauge – though a sealant's hot tack performance can be very different in a multilayer film and is influenced by film thickness. Second, the peak hot tack strength often occurs at a distinct temperature – while converting seal temperatures rarely stay constant.

Chart 1 (on following page) shows the hot tack separation force versus seal bar temperature for two sealants. Sealant 1 provides the highest peak hot tack strength at 95°C. Sealant 2 has a lower peak but meets the required hot tack over a broader temperature range. Because seal temperatures are usually set above 95°C, Sealant 2 – which provides a broader and more consistent hot tack temperature window – may be the better choice.

Hot tack versus temperature charts illustrate an important fact: hot tack strength decreases at higher temperatures. Below the peak or plateau temperature, polymer chains are not yet mobile enough to move and form entanglements or bonds

Main image: If a seal is still partially molten, it can be weakened – or broken – when filled with heavy or bulky products

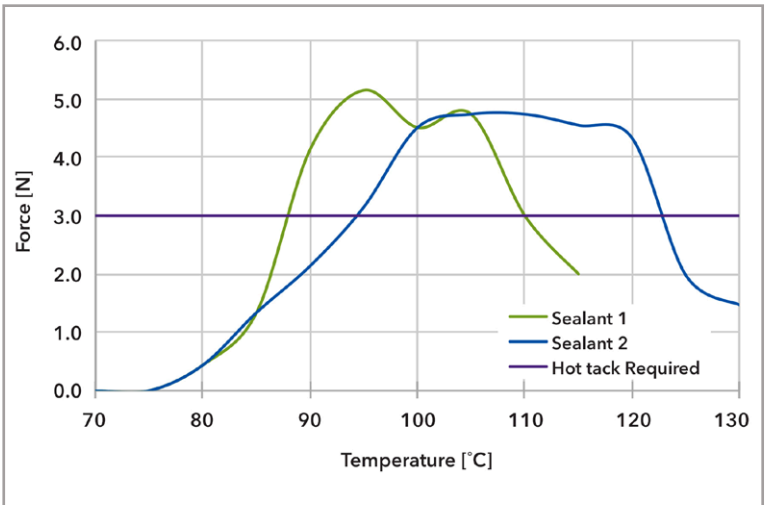

Chart 1: Hot tack versus temperature for two sealants tested in a 2-mil monolayer film

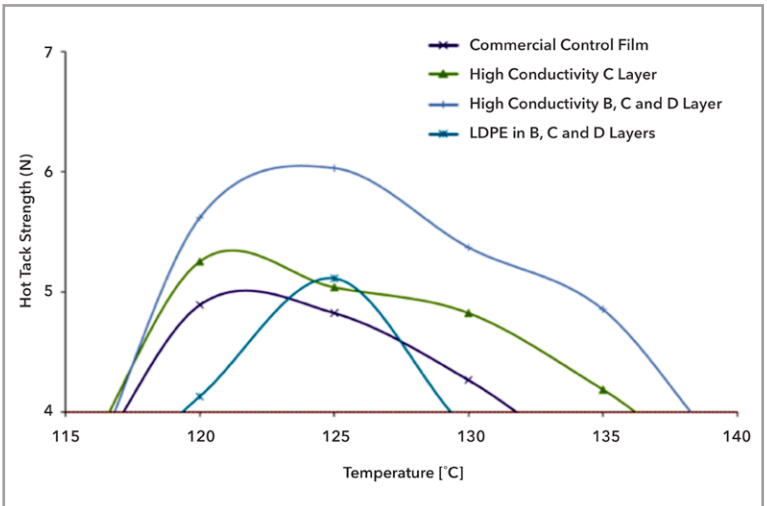

Chart 2: Hot tack of five-layer coextruded films with same sealant and different core layers. Required hot tack for this application is 4 Newtons

across the seal interface. Above the peak temperature, entanglements occur but can easily be re-separated if the polymer chains remain mobile. At high seal bar temperatures, retained heat keeps polymer chains mobile for longer, and hot tack falls off. Once the sealant completely re-solidifies, chains are immobile and maximum bond strength is achieved.

Therefore, a practical way of broadening a sealant's hot tack temperature window is to reduce the temperature at the seal-to-seal interface quickly. Accelerating the sealant's cooling rate leads to a faster decrease in the polymer chain's mobility – which effectively increases the hot tack strength of any sealant.

Accelerating cooling

Once the seal jaws open, heat moves from the seal interface through the film's interior layers and dissipates from the outer skin layer. Strategically placing materials with higher thermal conductivity in the core or skin layers accelerates the heat transfer rate, which can effectively increase the hot tack strength when separation forces are exerted. **Chart 2** shows similar five-layer coextruded films with the same sealant and outer skin layers but different interior core layers. Using more thermally conductive medium density polyethylene (MDPE) in the core layers widens the hot tack temperature window. Using a lower-conductivity low density polyethylene (LDPE) in the core narrows this window.

High density polyethylene (HDPE) resins typically have greater thermal conductivities than LLDPEs or LDPEs, so placing HDPE in the interior layers might seem a good way to broaden the hot

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Table 1: Five-Layer Coextruded Structures for Films in Chart 2

Film	A Layer: Sealant	B Layer	C Layer	D Layer	E layer skin
Control	Octene LL	Butene	Butene	Butene	Octene LL
High Conductivity C layer	Octene LL	Butene	MDPE	Butene	Octene LL
High Conductivity Core Layers	Octene LL	MDPE	MDPE	MDPE	Octene LL
LDPE Core Layers	Octene LL	LDPE	LDPE	LDPE	Octene LL

Table 2: Five-layer coextruded film structures for films in Chart 3

Film	A Layer: Sealant	B Layer	C Layer	D Layer	E layer skin
LLDPE in B Layer	Octene sLL	Butene LL	Octene LL	Butene	HDPE
HDPE in B layer	Octene sLL	HDPE	Octene LL	Butene	HDPE

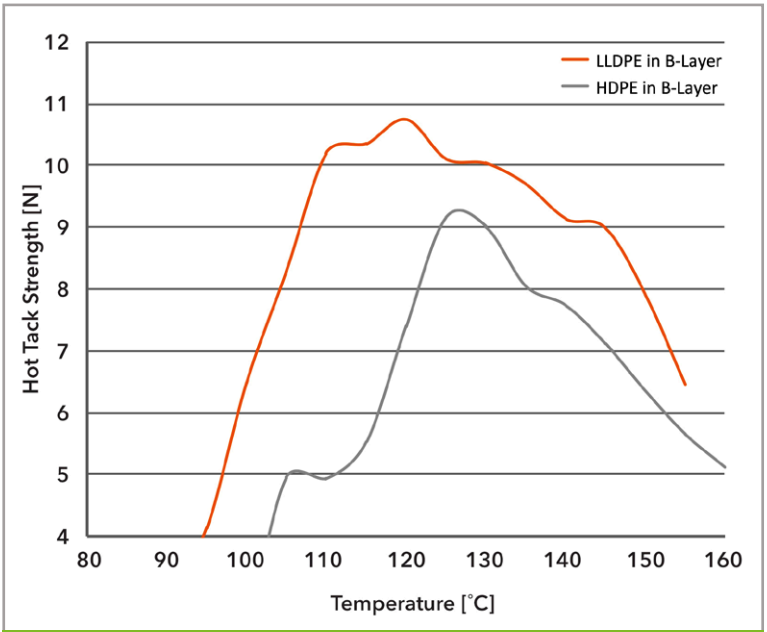

Chart 3: Hot tack for five-layer coex films with LLDPE or HDPE in B-layer

tack window. However, HDPEs also have higher crystallinity. The crystals require more heat to melt – compared to lower density PEs – so release more heat into the structure during the cooling cycle. The extra heat – released when the polymer re-solidifies – is called the specific or latent heat of fusion. When a highly crystalline polymer is placed next to the sealant, the extra latent heat released during recrystallisation will slow the sealant's cooling rate. A sealant that retains heat longer will have lower overall hot tack and a narrower window. So, the benefits of higher thermal conductivity can be negated by higher specific heats when certain polymers are used in interior layers.

HDPE effect

The impact of placing HDPE next to the sealant is shown in **Chart 3**. The two films are five-layer coextrusions with the same sealant – and are identical except for the resin used in layer B (next to the sealant). The film with LLDPE in layer B has a much broader hot tack window – even though LLDPE has lower thermal conductivity than HDPE. The narrower hot tack window for the film with HDPE in layer B is likely due to the higher specific heat of fusion of the HDPE layer.

These competing thermal conductivity and latent heat effects make it difficult to optimise multilayer structures for maximum hot tack. Heat transfer models that predict temperatures in multilayer films as a function of time can help address these complexities. A useful model will predict temperatures at discrete points within a real or virtual film as a function of time – derived from the thermodynamic properties of the component materials – and run parameters such as seal jaw temperatures and dwell times.

Chart 4 (on next page) shows the predicted seal interface temperatures versus time for the two films in Chart 3. Looking at the cooling rates after 0.8 seconds, the HDPE-containing film has a steeper slope, indicating that it cools faster due to its higher thermal conductivity. However, the HDPE film is retaining more heat after jaw release at 0.5 seconds due to the heat of fusion released from the adjacent high-density layer. High-speed photography suggests that separation forces from the spring-back effect occur within milliseconds after the seal jaws open and the maximum separation force from product impact occurs about 0.3 seconds after the jaws open in a representative Vertical Form Fill and Seal pouch line.

The seal interface temperature of the film containing LLDPE is predicted to be much cooler at about 0.8 seconds when the product impacts the seal. This temperature differential helps explain why LLDPE film has higher hot tack strength at various seal temperature settings and a broader hot tack window. ›

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Optimising performance

Chart 5 shows predicted seal interface temperatures for three alternative structures. These five-layer films have the same sealant, core and skin layer resins but now contain very-low-density polyethylene (VLDPE) in layer B and either HDPE, LLDPE or VLDPE in the D layer. The predictions suggest that placing a VLDPE in layers B and D provide the fastest cooling which should results in the best overall hot tack performance.

These results are only applicable to this specific five-layer film structure. When layer ratios, other component resins, film thicknesses or seal conditions change, cooling rates and hot tack performance will also change. Results from simulations on different films sealed under different conditions showed beneficial effects when higher density resins were strategically placed in the coextruded film.

So, broad assumptions about materials or structures should be avoided or validated when designing coextruded films for high performance applications.

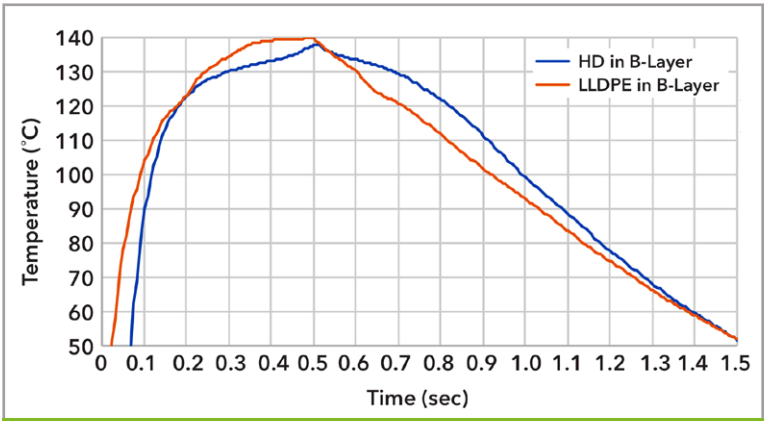

Chart 4: Predicted seal interface temperatures for five-layer coextruded films with different B-layers

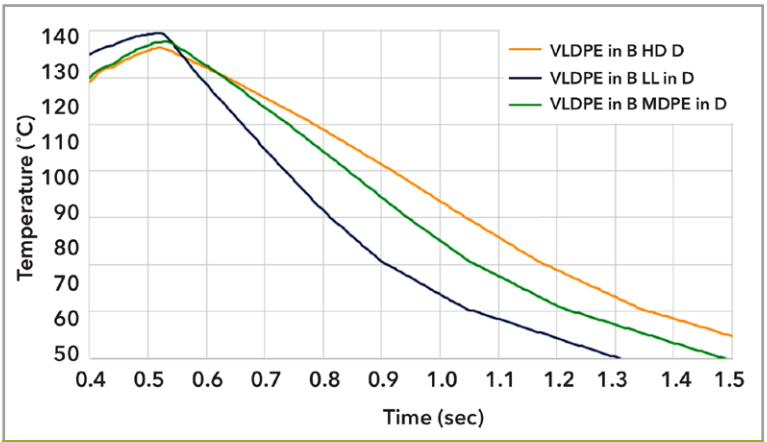

Chart 5: Predicted seal interface temperatures for similar structures with different B and D layers

Performance range

The hot tack of a sealant resin is not a static property but a performance range – influenced by many factors such as the multilayer structure, sealing conditions and thermodynamic properties of adjacent layers. Accurate heat transfer models are a valuable tool for testing assumptions and designing structures that provide the best hot tack performance for a specific application. However, no model is perfect – and designers should always verify the predicted properties and performance in actual films.

› **www.novachemicals.com**

■ ***Dan Ward is technical service specialist at Nova Chemicals in Canada***

Two industry experts share expertise and insights in advance of their participation in the Stretch and Shrink Film conference, which takes place in Barcelona in April

Trends and technology in stretch & shrink film

AMI's *Stretch & Shrink Film* conference is held on 20 - 22 April 2020 at the Melia Sitges hotel in Barcelona, Spain.

The conference brings industry leaders together to discuss essential information on key topical issues, including recent material and technological developments.

This year's event features a workshop that focuses on the increasing challenges in the global supply chain – and how shrink and stretch wrap technologies can help to solve them.

The programme includes presentations across a range of topic areas: market trends and industry outlook; possibilities and challenges in load stability; manufacturing and technology trends; and innovative materials and solutions for sustainability. It includes speakers from Sukano, Dow, Siegwerk, Sibur, Norner, SABIC and many others.

More details about the conference can be found on the **conference website**.

Ahead of the conference, AMI interviewed two industry experts who will be sharing their insights at the event.

Denis Treacy, Chief Executive Officer, culture compass ltd (Former Group Executive Office, Pladis Global)

What are the three trends shaping the future of stretch and shrink packaging?

1) The drive for the reduction – or removal – of shrink wrap packaging as Corporate Social Responsibly sets agendas for plastic.

2) This includes the increasingly extended supply chain, both in terms of sourcing of materials from further afield and the exporting of foods further around the world.

This may be even more so with our relationship with Europe changing – so our trade deals shift more globally.

3) Consumer choice driving changes in portion size and ever-increasing convenience. Frozen and convenience foods are growing at 30% per year in countries like Turkey, which will have a huge impact on a shifting landscape of packaging. ›

Main image: The challenge of improving load stability will be one of the key topics addressed at the conference

UPDATE: This conference has been postponed due to corona virus restrictions. New dates to be announced shortly.

UPDATE: This conference has been postponed due to corona virus restrictions. New dates to be announced shortly.

What can attendees expect from your interactive workshop on the increasing reach of the global (food & personal care) supply chain?

Attendees will enjoy a unique and compelling session, which is designed to ensure that everyone gains a richer knowledge of the direction the industry should be considering in future. This interactive workshop will affect the way delegates think. To explore a subject in the presence of others – who may have a different problem-solving approach, a different level of invested energy or a different emotional attachment – often creates an environment that sparks new ideas and new thinking.

The key topics that will be discussed are:

- **Load Value** – What are the challenges in ensuring loads travelling across continents, oceans, climates & humidity reach the customer as intended and expected, both in terms of product integrity and the commercial value of the loads?
- **Product Quality** – How can shrink & stretch technologies increasingly guarantee the substance, nature and quality of products across a global supply chain, in terms of the performance of materials at point of manufacture?
- **Product Defence** – What are the key capabilities of shrink & stretch technologies in safeguarding the integrity of products from the threat of deliberate contamination or adulteration for both economic or ideological gain?

What are your predictions for the stretch and shrink industry in the next 3-5 years?

The UN has determined that "plastic pollution is a material business risk that is relevant to insurers in all of their three roles as risk managers, insurers and investors". This should see a significant shift in the base materials used to produce stretch and shrink products – away from traditional chemical- and hydrocarbon-based materials, to those which have a less negative – or even a positive – impact on the environment culture.

Russell Dunn, Packaging Sustainability Manager, Britvic

How are brand owners making sustainability commitments to address potential concerns?

Britvic's sustainability strategy is focused on people, communities and planet. For example, on 'People' we have focused on leading the agenda on reducing calories per serve. In the UK, we are now down to a 16.5kcal per serve level (less than half an apple!), a year-on-year fall of 21%. For years, we have deliberately put all our marketing focus behind now and low sugar brands – such as Pepsi MAX and 7UP Free, rather than the sugar variants. We were the first UK branded soft drinks manufacturer to use front of label traffic lighting.

On 'Planet', we always ensure that all our factory waste is diverted from landfill. All electricity that powers our factories comes from renewable sources. Thanks to a targeted £240m investment in our supply chain, we have reduced our carbon footprint by 21%.

Last year we also signed up to Science Based Targets and committed to a 50% reduction in our direct footprint by 2025, and to achieve neutral status by 2050. We are also making great strides in reducing our water footprint. This month, we signed up to WRAP's Food Waste Reduction Roadmap.

Regarding packaging, we're proud that 100% of all our cans and bottles are recyclable, and we were founding signatory to the UK Plastics Pact.

What further developments are being worked on for the future?

We have a passion for ensuring we only put great designed packaging on the market, and that that great packaging never becomes waste. Our board have made it a top business priority.

To achieve this, recently launched a sustainable Packaging strategy focused around 4Rs – Reduce, Recycle, Reframe, Reinvent.

- To Reduce, we are committed to ongoing light weighting: this year we are committed to reducing another 500 tonnes of PET in this way.
- To Recycle, we are working to ensure that all our packaging, including secondary and tertiary packaging, is easily and widely recyclable, and to accelerate our use of recycled content. Our recent £5m investment with our partner Esterpet enables us to scale rPET quickly. This year we'll get two of our brands to 100% rPET status. We're also working hard with Scotland to ensure a well-designed DRS system.
- To Reframe, we're deploying the power of our brands to inspire and inform Britain to get recycling. We'll be supporting the new OPRL scheme and ensuring that 100% of our trade and consumer advertisements carry a strong, consistent recycling 'nudge' message.
- To Reinvent, we're committed to finding new ways to make packaging even better, and last month announced a partnership with BP Infina to accelerate the commercialisation of enhanced recycling technology. Also, we are committed to a future "beyond the bottle", and we'll be leveraging our strength in dispense and flavoured concentrates to do that.

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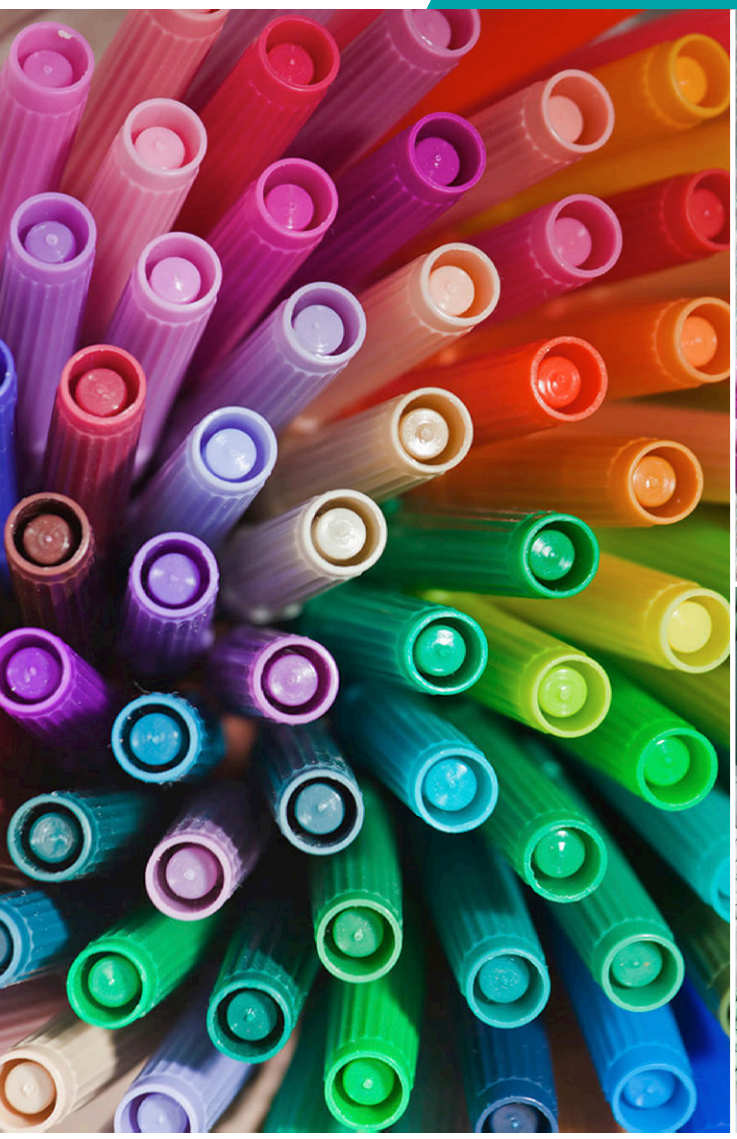

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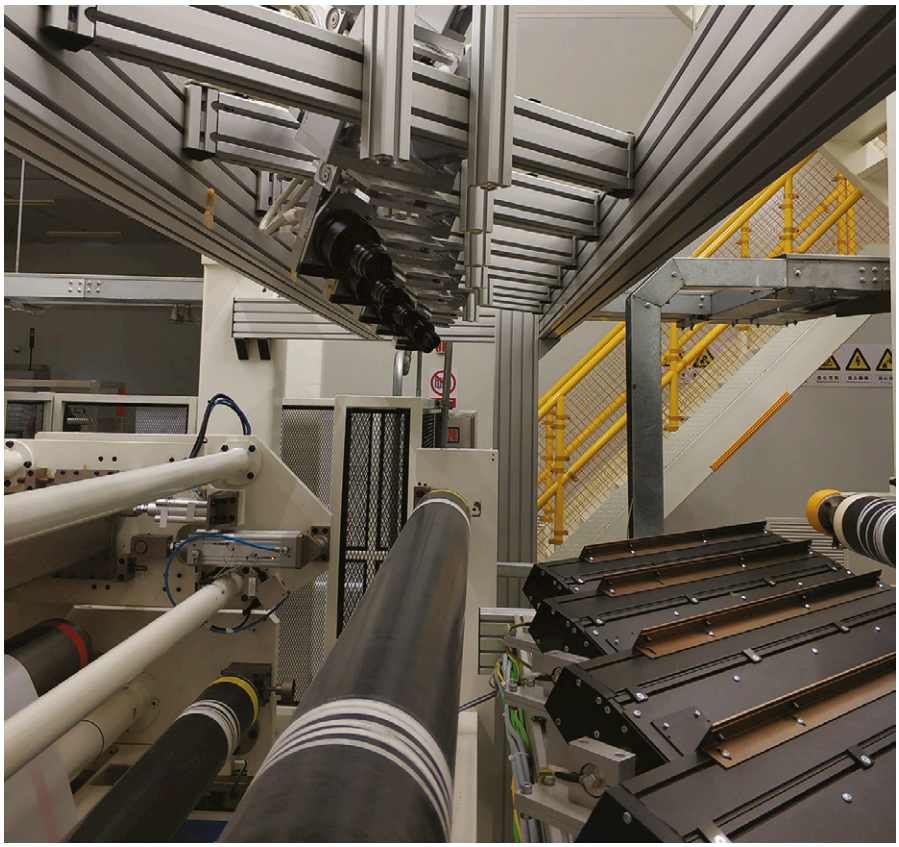
From optical inspection to bubble orientation, control systems help to ensure that the quality of extruded film is maintained



Under control: ensuring quality in film production

Main image: Chinese window film producer KDX has installed Isra's Smash system at its production plant

Product quality is vital – and sophisticated methods of ensuring this help producers to reduce the prospect of rejects and recalls.

One of China's largest producers of window film, for instance, has equipped its coating process line with a surface inspection system from **Isra**.

KDX has installed Isra's Smash system at its Zhangjiagang site in Jiangsu province. The company needs to detect very small scratches in the material – which until now could not be detected.

KDX identified the need to introduce a new inspection system to improve quality.

"Isra's system can detect surface defects like small scratches in real- time and classify the shape and location of such defects," said KDX. "It replaces manual methods for inspection entirely, significantly increases the production efficiency, reduces the production cost, and ensures the film quality."

Smash is used for surface inspection of optical film and finds defects in real-time. It has four main advantages, says Isra: the system ensures that end customers receive only flawless material; waste is reduced, and the marketable production volume can be increased; product properties are fully monitored and defect sources corrected; and, plant operators can make product changes efficiently, saving costs. Defects as glue line, bubbles, colour deviations, light distortion and scratches can all be avoided with the inline inspection system, says Isra.

Isra developed an optical configuration specifically for KDX, which says it has reached its objectives in quality control at optimal costs.

"We are now able to avoid continuous defects, to reduce waste and in-line adjustment time," said KDX.

Web monitoring

BST Eltromat has developed a number of new options for web monitoring and inspection.

Its QLink workflow and TubeScan systems can be integrated with customer ERP systems. Expanded options include a new, 4k high-resolution area scan camera, and Contour Light illumination option. This

laterally directed light source can be used to make the outlines of transparent labels visible on paper or plastic carriers.

The TubeScan range is known for diffuse standard background illumination, background illumination through the web, and UV illumination for security features. In addition to the new contour light, it also features three other independent illumination sources that cover a number of different web monitoring and 100% inspection requirements.

The TubeScan range was developed by Nyquist Systems, which became part of BST last year.

"Nyquist now has access to additional resources for continuing to evolve the TubeScan range," said Anne-Laureen Lauven, head of marketing at BST Eltromat. "This will generate a flow of new opportunities for our customers to optimise their production processes."

At K2019, the company also showed its new EKR CON 600 family of controllers – for web guiding applications. They comprise two controllers with an extended range of features. The EKR CON 600 is equipped with a fieldbus network connection. Both controllers run on the basis of the same operating philosophy as the other control units offered by BST. Their setup and use are intuitive and easy for machine operators to navigate using the touch control panel.

Ingo Ellerbrock, head of product management at BST Eltromat, said: "The new controller customers the option to easily expand their fieldbus system to include a web guiding system and use the information provided by the web guiding system to optimise their other processes. Our web guiding systems are quicker to set up, more efficient to run and increase process reliability."

Blown film control

DR Joseph has developed a range of products for blown film bubble control – including layflat calibration and neck height control.

Its DRJ 3G-IBC – which can be retrofitted to existing blown film lines – helps to improve the layflat tolerance and increase cooling rates, which helps to raise production rates. It uses a flat width measurement device placed near the winder, which automatically calibrates and compensates for film stretch and shrink as it makes its way down the tower.

Many factors cause degrees of stretch and shrink,which affect the width as it is wound: using automatic layflat calibration ALC boosts the precision of layflat tolerances, simplifying width management operations via automation and improving user safety.

For production where job orders change often, ALC speeds up job change time and improves long term accuracy, says the company.

Neck height variance on high stalk bubbles can lead to variance in dart impact properties. As process conditions such as ambient temperature change, so will the neck height – resulting in off-spec dart impact and layflat. DRJ has solved the issue of drifting neck height with a new neck height control feature, which can be integrated with its width control systems.

Bubble orientation

GAP, which specialises in simultaneous multi-bubble orientation systems, presented an innovation for processing transparent, high-barrier oriented recyclable materials at K2019.

The simultaneous bubble orientation system available up to 4000mm and 1000 kg/h offers an intelligent solution for high barrier recycle oriented structure to convert laminate foil to homogenous oriented mono barrier multifunction materials.

The company also showed a new annular microlayer die for performance multiplication. In order to reduce thickness, improve film characteristics and squeeze maximum performance from mono material, the company also presented Mira-Layers, which can be use as annular die in processes like double bubble, blown films line and water quenching.

CLICK ON THE LINKS FOR MORE INFORMATION:

- **www.isravision.com**
- **www.bst.group**
- **www.drjosephinc.com**
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Below: BST Eltromat's QLink workflow and TubeScan systems offer new options in web monitoring and inspection

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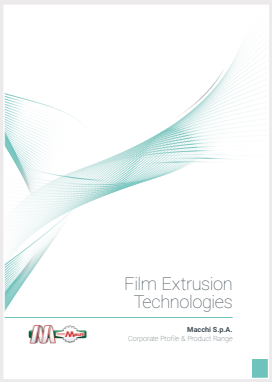

This 28-page brochure from Macchi covers the company's wide range of film extrusion technologies including coextrusion lines, wide webs, die heads, take offs, winders, trim recovery and control systems.

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COLINES: BARRIER FILMS

This new brochure from Colines focuses on extrusion lines for the production of barrier films for vacuum and modified atmosphere packaging to preserve foodstuffs and medical products.

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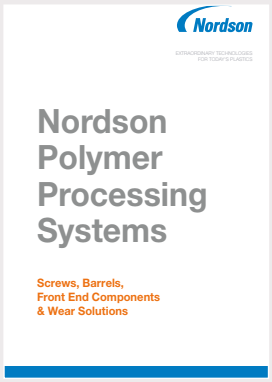

In this Nordson Polymer Processing Systems brochure, find out about Xaloy bimetallic extrusion screws and barrels, designed to meet process requirements, help optimisation, combat wear, boost output, and improve and maintain quality.

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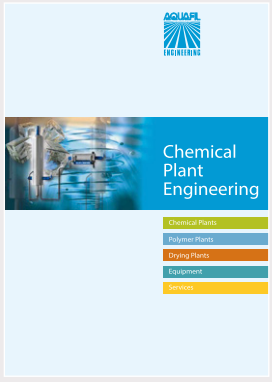

This 12-page brochure from Aquafil Engineering details its comprehensive range of chemical plant engineering capabilities, which include polyamide polymerisation, polyester condensation and polymer drying installations.

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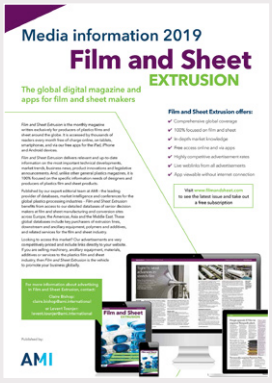

An advertisement in Film and Sheet Extrusion magazine is a highly cost effective way to reach key decision makers in the global plastics extrusion industry. Download our 2019 media pack to find out more about upcoming features, ad rates and distribution.

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If you would like your brochure to be included on this page, please contact Claire Bishop claire.bishop@ami.international. Tel: +44 (0)1732 682948

Learn more about AMI's upcoming conferences

Click on the relevant brochure cover or link to download a PDF of the full conference programme

POLYMERS IN FOOTWEAR USA

The second edition of AMI's North American Polymers in Footwear conference takes place in Portland, OR, USA, on 7-8 April 2020, presenting a comprehensive analysis of the latest advances in footwear materials and processing technologies.

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POLYMER SOURCING & DISTRIBUTION

The AMI event specifically created for companies involved at every stage of the European polymer supply, Polymer Sourcing & Distribution, takes place in Hamburg on 12-14 May 2020, reviewing recent trends in sourcing options for both commodity and engineering resin grades.

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POLYMER FOAM

The 8th edition of AMI's Polymer Foam US conference takes place in Pittsburgh, PA, on June 23-24 2020. The event is a chance to learn about the latest developments in technology, materials, applications and markets such as construction, pipelines, automotive, packaging and more.

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THIN WALL PACKAGING

The 9th edition of AMI's international Thin Wall Packaging conference will take place on June 23-24, 2020 in Chicago, IL, US. The event will cover functionality of plastics materials in protecting and preserving items such as meat, fish, yogurt, fruit and vegetables, dairy and ready meals.

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MULTILAYER FLEXIBLE PACKAGING

The 11th edition of the Multilayer Flexible Packaging conference takes place on June 30 and July 1 2020 in Chicago. Expert speakers share the latest market insights and developments in high-value films.

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AGRICULTURAL FILM

AMI is holding the first edition of Agricultural Film US in San Diego, California, on August 18-19, 2020. The programme benefits directly from AMI's 12 years of expertise in running Europe's must-attend conference now applied across the US, Canada and Latin America.

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To see our full line-up of more than 50 plastics industry events over the next 12 months, please visit www.ami.international/events

Alco High-Tech Plastics

Head office:	Corozal, Puerto Rico
CEO:	Gilberto Nieves
Founded:	1996
Ownership:	Private
Sales (2018):	Around US$12 million
Employees:	Around 90
Profile:	The company was founded in 1997 by Maria Nieves, with an investmet of US$1.2m and 22 employees. Since then, it has grown to become Puerto Rico's largest manufacturer of flexible packaging – whose expertise extends to printed and laminated bags, films, stand-up pouches, zip lock products and flexo printed labels.
Product lines:	The company serves a number of markets, including pharmaceutical, and food and beverage. It also makes general packaging. Its industrial packaging – used for a wide range of goods – is usually used on products that are sensitive and rely on stability. Alternatively, they are hazardous or bulky – or have components that are sensitive to one another.
Factory location:	The company makes all its products in a 70,000 sq ft facility in Corozal, where it runs seven extrusion lines from various manufacturers, including Carnevalli of Brazil. Most of its output is for local consumption, but it exports locally to countries such as the USA, Dominican Republic and Mexico – and to more distant markets, including Spain and India. While more than 70% of its business is still extrusion, it is growing its supply of printed products – as evidenced by the recent delivery of a Bobst Firenze (Gidue) eight-colour narrow web flexo line. It also took delivery of several static control systems from Vetaphone recently.

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

Film and Sheet Extrusion FORTHCOMING FEATURES

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

April 2020
Flat die developments
Agricultural film
Film winders
Chinaplas 2020 preview

May 2020
Waterproof membranes
Materials handling
Barrier film ● Photovoltaics
PEWE Europe 2020 preview

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

For information on advertising in these issues, please contact:
Claire Bishop: claire.bishop@ami.international Tel: +44 (0)1732 682948
Levent Tounjer: levent.tounjer@ami.international Tel: +44 (0)117 314 8183

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
January/February 2020
The combined January/ February edition of Film and Sheet Extrusion examines the latest developments in film technology, plus new polymer analysis equipment and some innovative medical materials and applications.

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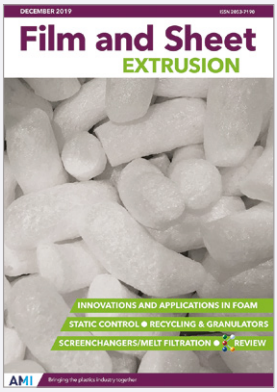

Film and Sheet
December 2019
The December 2019 edition of Film and Sheet Extrusion looks at the latest developments in foamed sheet. It also reviews new introductions in melt filtration, static charge control and granulation equipment, plus some of the best from K2019.

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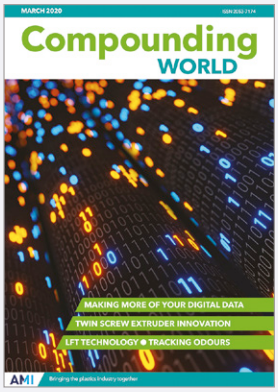

Compounding World
March 2020
The March 2020 edition of Compounding World shows how suppliers of twin-screw extruders continue to find ways to get more from this flexible machinery. Plus features on long-fibre thermoplastics, simulation and monitoring odour, and regular news on plastics compounding.

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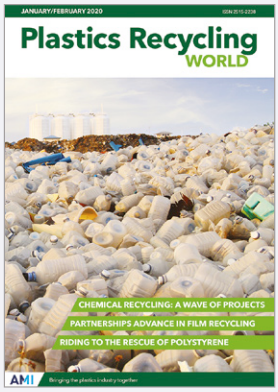

Plastics Recycling World
January/February 2020
The January-February of Plastics Recycling World takes a deep dive into chemical recycling, with features on the many technologies being developed for polyolefins and polystyrene. Plus the latest on film recycling technology and projects.

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Pipe and Profile
March 2020
The March edition of Pipe and Profile Extrusion magazine looks at the latest ideas in screw production. It also reviews developments in laboratory extruders, computer-based process simulation, and polyolefin applications.

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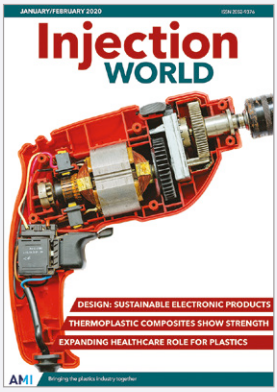

Injection World
January/February 2020
Injection World magazine's first issue for 2020 looks at how careful plastics design can make electrical and electronic items more sustainable. It also examines the latest in thermoplastic composites and healthcare polymers.

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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

2020

9-11 March	Plast Alger, Algiers, Algeria	www.plastalger.com
11-12 March	Plast Expo Nordic, Helsinki, Finland	www.plastexpo.fi
11-13 March	Expo Plasticos, Guadalajara, Mexico	www.expoplasticos.com.mx
26-28 March	MECCSPE, Parma, Italy	www.mecspe.com
7-13 May	Interpack, Dusseldorf, Germany	www.interpack.com
12-15 May	Elmia Polymer, Jönköping, Sweden	www.elmia.se
13-15 May	Plastic Expo, Osaka, Japan	www.plas.jp/en-gb.html
3-6 August	Chinaplas, Shanghai, China	http://www.chinaplasonline.com
29 Sep-1 Oct	Interplas, Birmingham, UK	www.interplasuk.com
7-8 October	Plastics Extrusion World Expo Europe, Essen, Germany	https://eu.extrusion-expo.com
13-17 October	Fakuma, Friedrichshafen, Germany	www.fakuma-messe.de
4-5 November	Plastics Extrusion World Expo USA, Cleveland, USA	www.extrusion-expo.com/na/
8-11 November	Pack Expo, Chicago, USA	www.packexpointernational.com
23-26 November	All4Pack, Paris, France	www.all4pack.com
2-4 December	Plastic Expo, Tokyo, Japan	www.plas.jp/en-gb.html

AMI CONFERENCES

17-18 March 2020	Plastic Pouches, Vienna, Austria
20-22 April 2020	Stretch & Shrink Film, Barcelona, Spain
23-24 June 2020	Thin Wall Packaging, Chicago, USA
30 June – 1 July 2020	Chemical Recycling, Hamburg, Germany
30 June – 1 July 2020	Multilayer Flexible Packaging, Chicago, USA
28-30 September 2020	Biax Film, Madrid, Spain
16-18 November 2020	Waterproof Membranes, Bonn, Germany
17-19 November 2020	Multilayer Flexible Packaging, Vienna, Austria

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

www.ami.international

PLASTICS RECYCLING WORLD EXPO

POLYMER TESTING WORLD EXPO

7 - 8 October, 2020

ESSEN, GERMANY

PLASTICS EXTRUSION WORLD EXPO

COMPOUNDING WORLD EXPO

4 - 5 November, 2020

CLEVELAND, OHIO

www.ami.international/exhibitions