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Investment fund takes over Italian film producer Irplast

UK-based investment fund Cheyne Strategic Value Credit has taken control of Italian film producer Irplast.

The new finance includes issuing of a bond for €39 million, while Banca IFIS has prepared a short-term credit line for €20m and capital funds invested will increase by a further €3m, which will ensure "new liquidity to reinforce the assets of the company".

Investment from Cheyne Strategic Value Credit will help Irplast make key investments

"This will allow us to make some key investments, which are required for our business development plans – particularly in the area of environmentally sustainable products," said Fausto Cosi, CEO of Irplast.

Cosi will retain his position in the company, along with COO Luca de Bartolo, and Gabriele Corradi as president of the board of directors. Matteo Canti becomes a director on the new board.

The company's goal is to maintain the sales growth trend of recent years and accelerate margins further. Because it is a key supplier to the food industry, the company has managed to maintain production during the Coronavirus pandemic.

In 2019, Irplast generated a turnover of just over €97m, and estimates that it will end this year some "small further growth" in sales.

Over time, the company plans to optimise its film manufacturing process, which will increasingly use raw materials from renewable sources and from plastic-to-plastic chemical recycling.

■ Irplast has already begun using more renewable plastics by joining SABIC's Trucircle initiative. Here, it has chosen renewable polymers to make its S-BOPP range of products.

Naomi Lunadei, sustainability manager at Irplast, said: "We have now brought out two new innovative product lines: one reduces the carbon footprint of BOPP flexible packaging; the other introduces the possibility of entering the circular economy."

› **www.irplast.com**

› **www.sabic.com**

Ineos adds flexible recyclate grades

IMAGE: INEOS

Ineos will extend its Recycl-IN polyolefins to stretch film grades

Ineos Olefins & Polymers Europe has secured a supply agreement with waste management company Saica Natur covering recycled LDPE and LLDPE – which will enable it to extend its Recycl-in range to include flexible packaging applications with over 60% post-consumer recyclate (PCR).

Recycl-in combines recycled plastic with what Ineos calls "highly engineered virgin polymers" to give properties equivalent to standard virgin grades. According to the resin producer, this new development "pushes technical boundaries" by incorporating higher levels of PCR for demanding applications such as stretch and lamination films.

Saica Natur is a subsidiary of the Saica Group, one of Europe's largest suppliers of recycled paper.

■ Our feature on recycling and granulators begins on page 13.

› **www.ineos.com**

Econcore's recycled PET cores used in concept electric car

Econcore of Belgium has supplied its recycled PET honeycomb core for a sustainable concept car.

The company has worked with the TU/Ecomotive team at Eindhoven University of Technology for four years. This year, it has supplied more than 20m² of recycled PET honeycomb cores.

The TU/Ecomotive team has used the cores in the design of its Luca electric vehicle.

The chassis was made using the honeycomb core material, as were other areas such as the seat support structure, parts of the dashboard and the battery housing. After laminating the composite skins, the lightweight panels were used in most of the structural parts of the car.

Econcore has supplied its recycled PET honeycomb core for the Luca concept electric vehicle

As well as supplying the material, EconCore provided technical advice and consulting – such as advice on gluing the recycled PET core to a composite sheet comprising flax fibres and a recycled polyolefin matrix from other partners. The two materials do not work well together when using adhesive. EconCore recommended using a polyester non-woven fleece – which is compatible with the adhesive and composite skin layers – to cover the surface of the honeycomb core.

A thin PET barrier film ensured the glue did not flow through the fleece into the honeycomb cells.

Wouter Winant, technical manager at EconCore, said: "The Luca car demonstrates how versatile the recycled PET honeycomb core panels are – not just in automotive terms but in other applications where strength, rigidity and light weight are important characteristics."

› **www.econcore.com**

Recycling returns in Russia

Messe Dusseldorf says Interplastica – the plastics show that it organises in Russia – will run its 'Recycling Solutions' again at the next edition of the show.

Interplastica 2021 is scheduled to run on 26-29 January 2021. It is one of the few plastics industry events not to have been cancelled or rescheduled due to Covid-19.

It will be held concurrently with Upakovka, which covers processing and packaging.

› **www.interplastica.de**

Danimer to go public after private equity firm takeover

Bioplastics producer Danimer Scientific is to go public, following a takeover deal with Live Oak Acquisition.

Stephen Croskrey, Danimer's CEO, will remain in his position.

The company's products include its Nodax polyhydroxyalkanoate (PHA) polymer, which is made from natural resources rather than petroleum. The material is biodegradable and uses canola oil as its primary feedstock. Danimer says that Nodax is the first PHA to be certified as marine degradable.

It currently produces the material on an industrial scale level at a facility in Winchester, Kentucky in the USA. It supplies the resin to companies including PepsiCo and Nestlé for applications including food and beverage containers and flexible packaging.

Based on signed and pending contracts, Danimer is sold out of all production from its production facility. It says it will use its increased capital base to increase production, to meet the needs to its customers.

"We are excited to transition Danimer to be a public company," said Croskrey. "We are at an inflection point in our growth trajectory and this will fuel the next phase of our commercial expansion."

He said the partnership with Live Oak would allow further scaling of production to meet strong customer demand.

"We believe PHA has the ability to eliminate pollution caused by single use plastics worldwide and are well positioned to expand our products to a wide range of plastic and speciality applications," he said.

› **www.danimerscientific.com**

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LCA study: recycled plastic is 'best option for packaging'

Reducing or recycling plastic packaging are better options – from a carbon footprint perspective – than replacing it with alternative packaging materials, says a study by Imperial College London in the UK.

The study, *Examining material evidence - the carbon fingerprint*, commissioned by Veolia UK, reviewed 73 publications on life cycle analyses (LCAs) comparing different types of packaging.

"Findings indicate that in the applications it is used, most of the time, plastic packaging performs better than its alternatives, mainly due to its very lightweight properties," according to the report's executive summary.

"Recycling always wins over virgin production on all environmental indicators. For plastics, there seems to be consensus that recycling saves 30-80% of the carbon emissions that virgin plastic processing and manufacturing generate," said the study's authors.

From the LCAs studied, the Imperial College researchers found that if all plastic were recycled it could result in mean annual savings of 30m-150m tonnes of CO_2, equivalent to stopping between 8 and 40 coal-fired power plants globally.

"With only 9% of plastics recycled worldwide, there is still a lot to do to improve things," said Richard Kirkman, chief technology and innovation officer at Veolia UK and Ireland.

"Paper, metals and glass are widely recycled, but plastic is a newer material. We need the right policy drivers in place, backed by consumer and manufacturer awareness, to allow us to build the new recycling infrastructure."

The full report can be accessed **here**.

› **www.imperial.ac.uk**
› **www.veolia.co.uk**

AMB buys PTS of Germany to boost European footprint

Italian food packaging manufacturer AMB has bought Prime Tray System (PTS) of Germany – which develops innovative industrial packaging solutions.

PTS has also acted as a distributor of AMB products over the last 20 years. With the takeover AMB says it will strengthen its market position, particularly in Germany, Austria and Switzerland.

"The acquisition will help AMB further widen our European footprint to be more local to our clients from the heart of Europe," said Bruno Marin, CEO of AMB.

"We have always had a clear vision to extend our reach. Acquiring PTS is the next step on this journey."

AMB now has five production locations in Europe

This is AMB's second acquisition in the last 12 months. In June 2019, it acquired UK-based TDX (Europe), which makes PET and R-PET films, and laminated rigid films for the food and packaging industries. AMB says this takeover helped it become a full-service provider for packaging design, rigid and flexible films and tool manufacturing.

The combined company will have five locations in Europe, employ around 435 people and has a turnover of over €160 million.

› **www.ambpackaging.com**

Lactips plans new facility

Lactips of France is to open a new plant to produce its soluble biodegradable plastic.

The new plant, in the Gier Valley, was formerly a whipped cream factory, but closed in 2018. The 12,000 sq m site includes a 2,500 sq m production building.

It is scheduled to open in 2021, after which it will be capable of producing 3,000 tonnes/year of pellets – which doubles the company's existing capacity. Lactips has a production target of 10,000 tonnes/year.

The new facility was acquired as part of a €6 million real estate project, said Lactips.

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EuPC: waste tax on plastics packaging will harm recycling

European plastics industry groups reacted strongly after the EU Council of Ministers approved a plan in July to tax unrecycled plastic packaging waste.

The Council reached agreement on a new Multiannual Financial Frame-work to aid economic recovery from the Covid-19 pandemic, containing the proposed tax among other measures. The plan involves a €0.80/kg levy on non-recycled plastic packaging waste which would be paid by member states into the EU budget. It would take effect from 1 January 2021.

The European Plastics Converters (EuPC) industry body criticised the basis of the tax, presented by the European Commission as "contribution to the EU budget designed to incentivise member states to increase recycling from plastic waste" – warning it might have the opposite effect.

"As the revenues of the EU plastic tax are not earmarked to be invested into the waste and recycling infrastructure, it will not increase the recycling of plastic waste in Europe," said Alexandre Dangis, managing director of EuPC. "Instead, it will further increase the cost of plastic recycling and encourage the shift to other packaging materials with a bigger environmental impact. Landfilling of plastic packaging waste would be more efficient."

GKV, the German plastics processors association, agreed that an EU land tax would be better.

"The EU plastic tax is withdrawing valuable investment funds from the member states who do not yet have a good recycling infrastructure," said Oliver Möllenstädt, general manager.

Martin Engelmann, general manager of the IK plastic packaging group in Germany, warned of unwanted side effects: talk of a plastic packaging tax in Italy has already led to a switch from plastics to plastic-paper composites – which is more difficult to recycle than plastics packaging, he said.

› **www.plasticsconverters.eu**
› **www.gkv.de**

Constantia signs up new flexpack customer in India

Constantia Flexibles has signed up a new customer for its EcoLamPlus flexible packaging: Indian healthcare company Nuvae Healthcare.

Nuvae, based in Ahmedabad, makes products such as hand sanitiser in small batches. Its Gosan, a 70% alcohol-based sanitiser, will now be available in recyclable packaging made of EcoLamPlus.

The mono-polymer packaging has a water vapor and oxygen barrier, and can also contain volatile products such as alcohol.

"Health and safety is one of our key pillars and that's why Nuvae Healthcare is such a strong partner for us," said Tony Sirohi, executive chairman of Constantia Flexibles India.

"We are looking forward to further joint projects."

› **www.cflex.com**

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Machinery and materials suppliers are offering a variety of ways to help film and sheet producers increase the amount of recyclate in their products

Squaring the circle: latest in recycling and granulation

The use of recyclate in film products is becoming more prevalent – whether the film is for consumer packaging, industrial applications of a host of other end uses.

RKW has begun production of lawn and garden films on a five-layer line in Pori, Finland.

The line is running new formulations that use a higher proportion of regranulate – including post-consumer recyclate (PCR).

"Our customers are delighted with the quality, feel and appearance of the products," said Pekka Saariluoma, director of the site.

Lawn and garden films need high printability, opacity and puncture resistance, among other properties, he said.

"We aim to increase the share of recycled PCR material while not sacrificing on materials qualities," he added.

PCR is typically used to manufacture lower-quality end products such as garbage bags, says the company. Making higher quality film with a high proportion of PCR places "high demands on development and application technology", it added.

RKW plans to install a similar line at its site in Ville le Marclet, France – where it produces films for food and beverage packaging – in the near future.

PCR for packaging

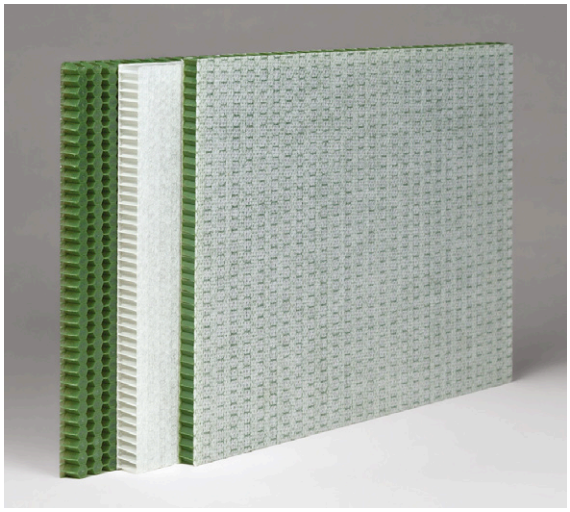
Nova Chemicals has agreed a long-term deal with a Canadian plastics recycler to supply it with post-consumer recyclate (PCR) – which will be blended with virgin resin and used to make consumer packaging.

The deal, with **Merlin Plastics Supply**, marks Nova's debut in PCR resin.

"This partnership – and our forthcoming suite of PCR-containing resins – will help meet our customer and brand owner needs and expand high-quality PCR supply for use in consumer packaging," said Luis Sierra, president and CEO of Nova Chemicals.

Nova will finance a multi-million-dollar project to accelerate Merlin's expansion into PCR for food contact applications, making it a source of such resin for its customers. Nova says this is one of several collaborations it is pursuing to build its PCR offerings with commercial quantities, beginning in

Main image: RKW's new film line in Finland runs formulations with a higher proportion of regranulate



Right: After two years of research, EconCore has commercialised a honeycomb core made from recycled PET

2021. Ultimately, it plans to offer 100% recycled PE, and PCR blended with its virgin grades including LLDPE, LDPE, and HDPE.

Tony Moucachen, president of Merlin Plastics, added: "With this agreement, we will be able to turn more recycled plastic packaging into valuable new source material for consumer products and packaging."

R-PET honeycombs

Recycled PET (R-PET) honeycomb is now commercially available to license from **EconCore**. The company conducted two years of research, to develop the best way of processing used PET into a continuously produced honeycomb core.

The company was awarded a grant to fund research over a two-year period from Flanders Innovation and Entrepreneurship (VLAIO), a Belgian government agency that finances strategic and industrial research.

The R-PET honeycomb core is typically made from more than 95% recycled PET from a variety of sources such as bottles and food packaging. It is a cost-effective solution as it does not require much pre-production processing to achieve a product that outperforms PP honeycombs.

Wouter Winant, technical manager at EconCore, said: "Our technology has been proven to work with many thermoplastics. Adapting it to use PET and R-PET honeycomb is another great step forward. By adjusting the content of additives or fillers, we can optimise the performance characteristics."

Part of the project involved adapting the equipment in order to increase production efficiency, which was done in partnership with extruder manufacturer Meaf.

While companies can now license EconCore technology to make honeycomb core sandwich panels from R-PET, the development is ongoing.

"We will continue to push the boundaries for more demanding applications," said Winant. "We are learning how to adapt our technology for lower volume, high-specification applications such as rail transport and aerospace where strength and low weight are important."

Film from recycled PP

Taghleef Industries has introduced a new range of films called Relife, which incorporates recycled polypropylene (PP).

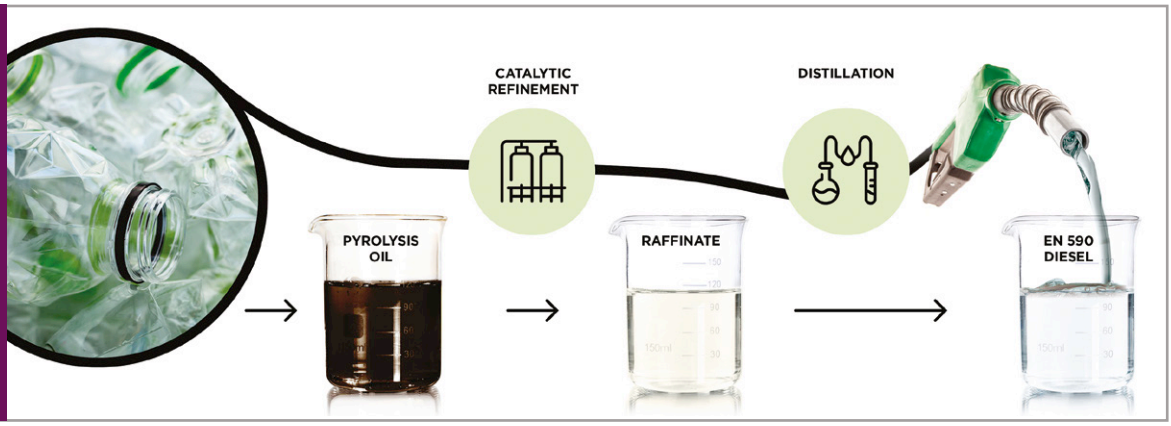
The films can be used in a number of packaging and labelling applications, depending on the type of recycled PP that they contain. Films containing either chemically recycled PP, or granules reprocessed from internal production, are food-contact compliant. Those that contain mechanically recycled PP are not.

The films are suitable for most of the same applications as traditional film grades, and ensure the same technical function and performance, says TI.

Fuel from plastic

Additives manufacturer **Clariant**, in collaboration with Slovak fertiliser producer Duslo, has converted plastic waste into winter fuel distillate.

The process has been proven in a pilot plant in Slovakia. As plastics and fuels are both mainly composed of natural gas or crude oil, turning one into the other has major implications for sustainable



Clariant has teamed up with fertiliser producer Duslo to convert plastic waste into liquid fuel

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Right: Toyo Ink Europe's new Lioplax black plastic masterbatch allows NIR sorting and material recovery

and lucrative fuel production, says the company.

"Upgrading gas oil fractions to more valuable products has become essential for improving refinery economics," said Stefan Heuser, senior vice president and general manager at Clariant Catalysts.

Clariant's Hydex E hydro-dewaxing catalyst was used in a pyrolysis process to make the conversion. The technique can convert a variety of plastic waste – including PE, PS, PP and PET – into diesel fuel. It thermally degrades the plastic above 300°C (530F) into liquid oil comprised of various hydrocarbons. Recently, Duslo's Vucht research institute developed a way to further convert the liquid oil into a high-quality fuel distillate known as winter diesel.

Following the pilot plant testing, Vucht now plans a custom-built demonstration plant with a fuel distillate capacity of 40 tonnes/year.

Branislav Brežný, Vucht's managing director, added: "Scaling up to near-plant capacity was the ultimate test of the process. It could not have been achieved without Clariant, whose new dewaxing catalyst has delivered beyond expectations."

Plastics sorted

Toyo Ink Europe has developed a new range of Lioplax black plastic masterbatch that allows near-infrared (NIR) sorting and material recovery.

Most optical sorting methods use NIR wavelengths. Standard black masterbatches are typically made with carbon black – which absorbs IR light, making identification by optical sensors impossible. This results in undetected black or dark-coloured packaging waste being sent to landfill or incineration.

Toyo Ink Europe has developed an alternative to standard carbon black in this masterbatch.

"We have developed a sustainable alternative to carbon black, enabling packaging to integrate the recycling loop," said Xavier André, technical and research manager at Toyo Ink Europe. "Packaging using a new Lioplax black masterbatch can be detected by NIR sensors during the sorting stage at material recovery centres. This allows dark-coloured packaging to be sorted and integrated back into the value chain as a reusable raw material through recycling."

Below: BASF says its Sicopal Black K 0098 FK colorant allows smart recycling of dark plastics such as food containers

Its NIR black colorants are certified according to the Cotrep recyclability test protocol and received positive results at both Pellenc and Tomra testing centres, he said.

The Lioplax series of NIR-sorting black masterbatches are formulated for use in PP trays, PET preforms, films, bottles and other packaging applications. Different grades are available in varying black colour shades, grades of resins (polyolefins, PET) and processing compatibility such as extrusion or blow moulding.

Recycling dark plastics

BASF has developed Sicopal Black K 0098 FK, a colorant which it says allows smart recycling of dark plastics such as food containers.

Carbon black is typically used in these applications, but hinders recycling because it absorbs NIR technology – which is commonly used by sorting systems. This means that the plastic is more likely to be incinerated or landfilled. However, the Sicopal grade overcomes this – so is an effective replacement for carbon black, says BASF.

"Our research and development team has taken on the industry need for recyclable black plastics that can pass through infrared sorting at materials recycling facilities," said Christof Kujat, head of global technical industry management for plastics at BASF. "Building on our Sicopal Black technology, we have developed a new member of the pigment family that is optimised for use in packaging."

The NIR-reflective grade allows the reliable detection of the polymer even at high pigment content. With its high processing stability, it can be used for multiple processing steps and closed loop recycling, says BASF. ❯

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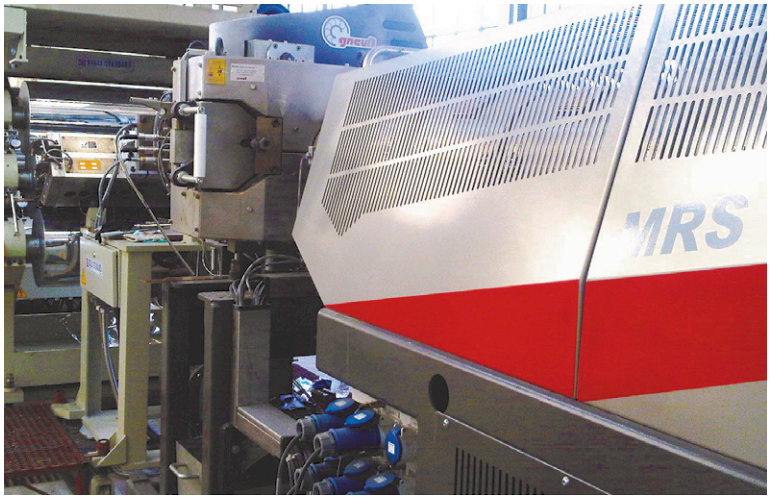

Above: Cotnyl of Argentina has installed a Gneuss processing unit with MRS extruder and RSFgenius filtration system

NIR sorting

Trinamix, a BASF subsidiary, has developed a new application for its mobile near-infrared (NIR) spectroscopy solutions in plastic sorting and recycling.

A portable handheld device, using Trinamix technology, can determine the precise composition of different plastics. Sophisticated data analysis can now be processed in the field via wireless cloud uploading. The device is slightly larger than a mobile phone.

"We have packed an established test and analysis method into a handy portable format," said Adrian Vogel, sales and business development Manager for spectroscopy solutions at Trinamix. "The product miniaturisation and its wireless connection to the cloud make it possible to use NIR spectroscopy anywhere and at any time for precise material identification."

The device can identify common plastics in seconds, says the company. The spectrum ranges from materials such as PE, PP and PVC to PET, ABS and polyamide. Other materials can be added according to customer requirements.

Individual plastics spectra are stored in the cloud and matched with the measurement data from the spectrometer. The user receives the name of the identified material in the app. Results can be displayed on mobile devices and on the customer's PC. This allows both rapid ad-hoc analyses as well as further evaluations and downloads.

PET project

The demand for sheet made wholly or partially from recycled PET is growing – yet manufacturers must often invest in machinery that can process

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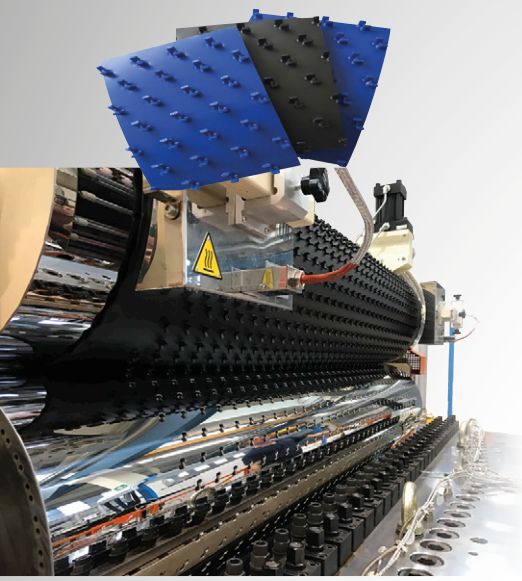

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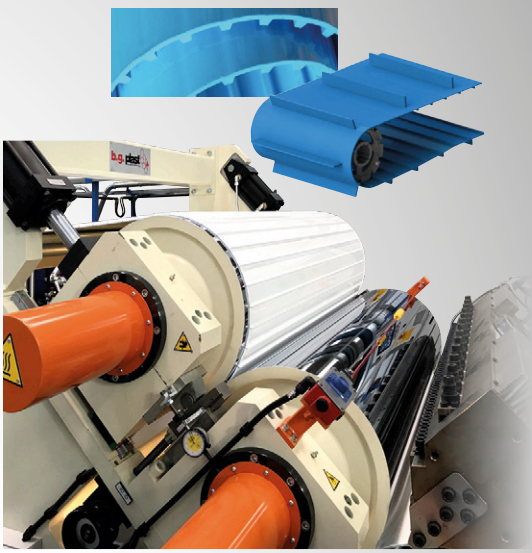

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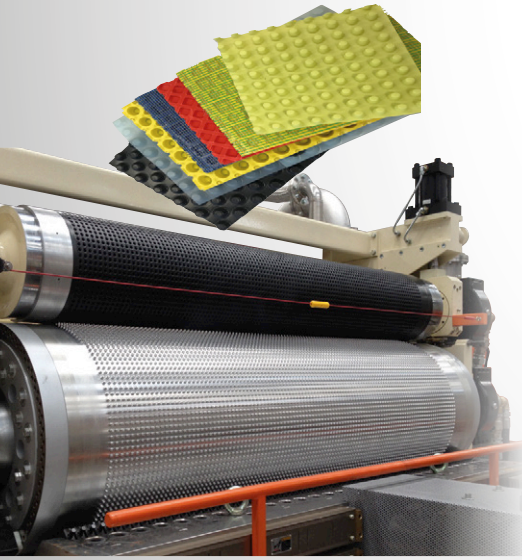

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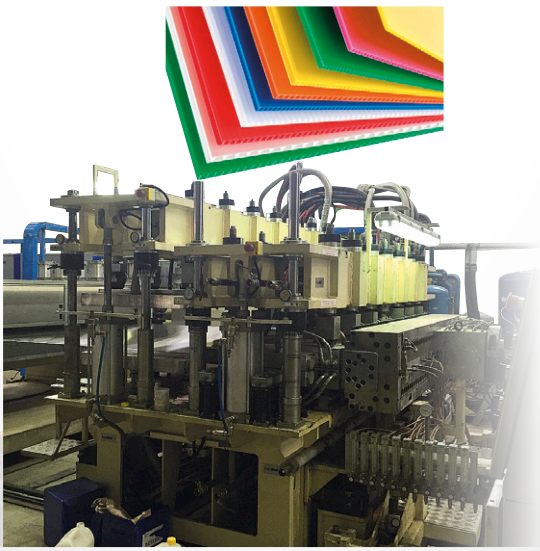

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Above: Vecoplan's VEZ 3200 pre-shredder has won a Red Dot award for product design

recycled materials.

One way to overcome this – which **Gneuss** of Germany recently carried out for a South American packaging producer – is to retrofit existing machinery with components that allow these materials to be processed.

Cotnyl, based in San Martín in Argentina, says it has become the first company in the country to obtain local approval to produce packaging made of 100% recycled PET.

Gneuss says that an existing South American customer has been using its Rotary Filtration Systems for several years to produce PET thermoformed trays with 70% recycled content. The filter discs operate automatically, continuously, and with constant pressure.

Fluctuating levels of contamination in the input material is a major problem when processing recyclate. This can cause screens to get dirty quickly – which increases upstream pressure and possible temperature and viscosity fluctuations.

The RSFgenius filtration systems have back-flushing technology to help overcome this. Screen cleaning is carried out automatically during production via an integrated back-flushing piston. Only a small portion of filtered melt is regularly shot through the dirty screen via a narrow gap by means of high-pressure pulses. Even with high contamination, the screens of the RSFgenius can be reused up to 400 times – allowing automatic production without the need for personnel for several weeks.

Cotnyl has invested in a Multi-Rotation System (MRS) extruder from Gneuss, which is based on a single screw extruder. It processes PET melt gently and provides a large melt surface in the multi-screw section with degassing zone. This ensures a large degassing and decontamination performance, says Gneuss. Recyclate processed on the line has received food contact approval.

A separate South American manufacturer has invested in an MRS 130 with a capacity of around 1,000 kg/h, plus a Gneuss Processing Unit – which includes an RSFgenius 150 and an online viscometer. The viscometer is also available separately and is ideal as a retrofit solution. It measures the temperature and pressure of the melt that is diverted into the slot capillary during production.

"Installing these key components makes it possible to process recycled material and still produce a high-quality PET sheet," said the company.

Red Dot pre-shredder

The new VEZ 3200 pre-shredder from **Vecoplan** is one of this year's winners of a Red Dot award for product design.

It was developed to produce refuse-derived fuel (RDF). Vecoplan focused on a contemporary appearance when creating the VEZ – and took on an industrial design company as a partner -- but said it was not "just about colour and shape".

"For us, the design was not all about appearance: ergonomics was also an important factor," said Werner Berens, CEO of Vecoplan.

He said that the design influences the machine construction – making the shredder easier to handle for operators. The company has already sold around 15 machines worldwide.

Blade discount cuts costs

CMG Granulators of Italy, which supplies a wide range of size reduction equipment, is offering discounts on its range of replacement blades and screens.

The company says that, as companies look to cut costs in difficult times, many will be looking to replace these common 'wear and tear' items – rather than invest in new machinery – but all within lower budgets.

Right: CMG Granulators is offering discounts on its range of replacement blades and screens

"The involvement of every party, internal or external, in the production of blades and screens – from fabrication all the way to packaging – allows us to offer a discount of 40%," said Giorgio Santella, general manager of CMG. "These spare parts help our customers to keep operating effi-

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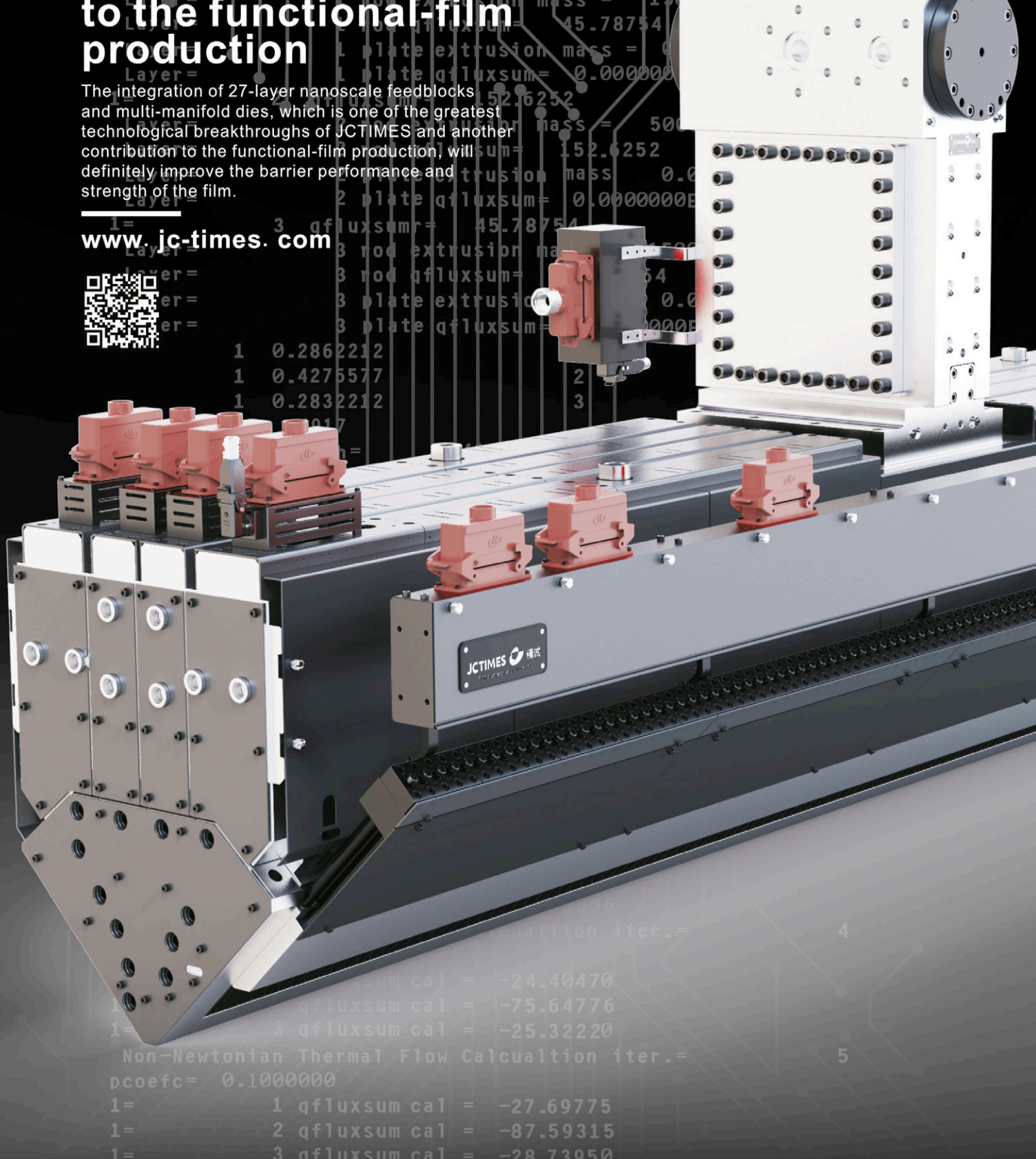

Above: Hellweg has begun construction of a new hall at its HQ in Roetgen, Germany

ciently and safely."

The promotional sale of blades and screens has will be kept in place until September 2020, he said.

Facility expansion

Granulator manufacturer **Hellweg Maschinenbau** is building a new production shop at its Roetgen headquarters.

The facility will provide around 500m² of additional manufacturing space. With a height of 11 metres, it will have enough space for assembling large granulating systems.

"We urgently need the extra space to accelerate handling of the large volume of orders which we have won since K2019," said Mark Hellweg, the company's managing director. "We have also been seeing a trend toward large and complex machines. In future, we will be able to assemble and test these in our own facilities and ensure trouble-free commissioning on our customers' premises."

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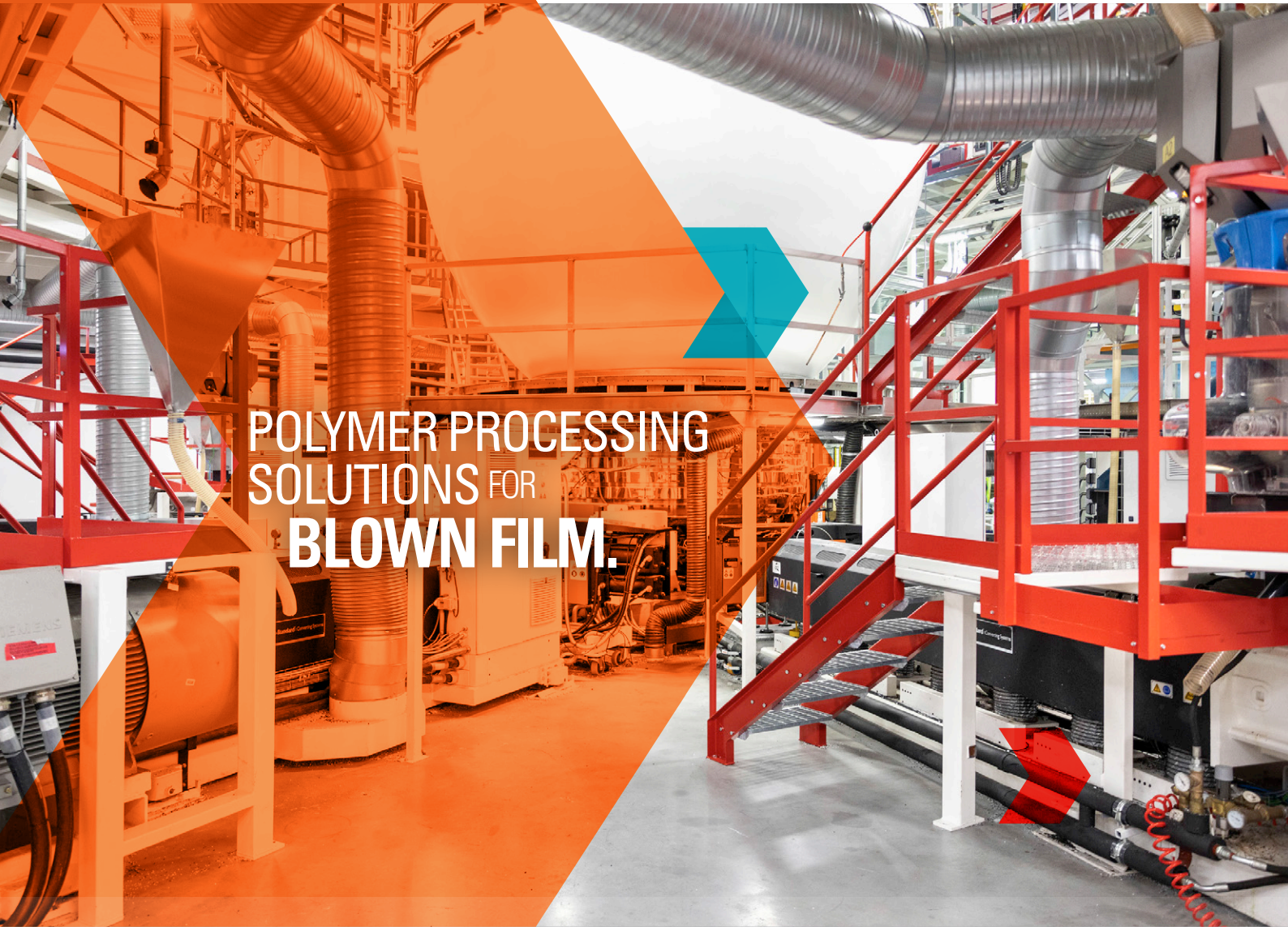

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The need for speed: the latest extruder developments:

The latest extrusion lines have stepped up their game: faster output, greater use of recycled polymer and multi-layer capability – with some even being installed remotely

Outputs in film and sheet extrusion continue to increase, and in response machinery suppliers are having to develop products that keep pace with this trend.

Processing Technologies International (PTI) of the US has developed a new high-speed sheet extruder – the Super-G HighSpeed SGHS3500-36D.

The extruder, which can handle multiple resins (HIPS, PP, and PET), claims higher regrind recovery rates, reduced maintenance costs and increased throughput – despite minimal changes to the footprint of the earlier SGHS3000 model.

Like its predecessor, the machine will operate up to 1000 rpm, but with higher levels of both output and regrind consumption, said Dana Hanson, president of PTI.

To do this, specific design changes were necessary. A re-engineered – and increased – screw diameter from 3 to 3.5in (90mm), an L/D of 36:1, a 600hp motor and a larger feed opening are the main characteristics of the new model.

With a 40% increase in area, the feed arrangement allows a 70% increase in regrind recovery rates while maintaining consistent output. These design changes are the basis for a maximum output capacity of 3,600 lbs/hour (1,600 kg/hr) for PP – up to 38% higher than that of its predecessor, says PTI. For PET, output is 4,000 lbs/hour (1,800 kg/h) – an increase of around 33%.

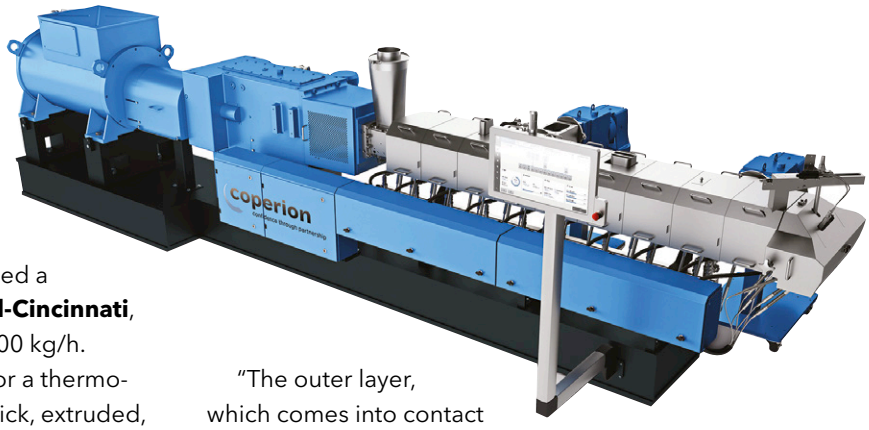
While the design of the SGHS3500 needed to add 18in (about 8.5%) to overall extruder length, it yielded a 20-25% increase in manufacturing footprint efficiency. Other original design features have been re-scaled for the new version.

The extruder also uses PTI's patented M-Atex barrel glide supports for assistance in managing thermal expansion and the two-stage Super-G lobe screw technology to ensure good mixing, melt quality and temperature control. These features play a key role in maintaining consistent sheet gauge thickness and achieving high clarity for crystalline and semi-crystalline polymers, said PTI.

The new extruder also uses CoolTough barrel guards to minimise heat emission on the surface, while the 'out-the-back' screw removal simplifies access to the screw.

A production scale machine is available for process trials at PTI's Technology Development Center (TDC). Its downstream configuration incorporates a G-Series configurable roll stand, TRC-66 transfer roll coater, Scantech X-ray gauge scanner, sheet accumulator and winder, plus a Titan

Main image: PTI's new SGHS3500 extruder has a throughput nearly 40% higher than its predecessor yet has a similar footprint



Right: Coperion has developed a closed-loop approach that re-uses up to 100% of multi-layer film production waste

Plus control system – which allows data logging, trending and analytics of process run conditions while producing rolled stock.

Greenhouse effects

Greenhouse panel manufacturer Staal og Plast of Denmark has installed a sheet extrusion line from **Battenfeld-Cincinnati**, which has a throughput of up to 3,000 kg/h.

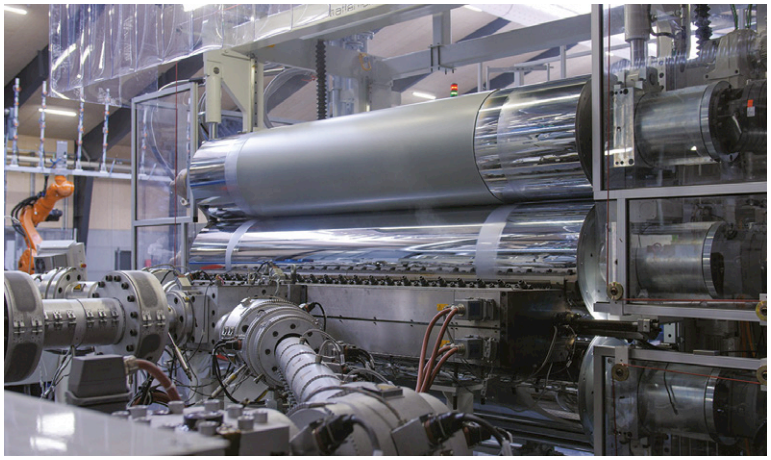
The line is used to supply sheet for a thermoforming line that transforms 3mm thick, extruded, semi-finished polystyrene (PS) sheet into what is known as ebb and flow trays for greenhouses. The installation has helped to company to quadruple production at its Danish facility, while simultaneously establishing a US subsidiary.

"Especially in North America, there is an enormous demand for our so-called 'Danish trays'," said Jacob Sörensen, managing partner of Staal og Plast. "The reason is the increasing cultivation of cannabis, which is not only grown for medical purposes, but due to its legalisation in several federal states is more in demand."

For the three-layer sheet line, Staal og Plast built a new hall with a total length of 65m – which also gave enough space for the thermoforming machine. In the new co-extrusion line, a 1-75 T6.1 high-speed extruder is used as the main extruder for a total capacity up to 3 tonnes/hour. The melt's residence time inside the extruder is long enough to achieve optimal homogenisation, but short enough to prevent mechanical or thermal damage, says the company.

The high-speed extruder plasticises the material for the main layer, with in-house scrap resulting from changeovers and cutting/stamping being added to the virgin material. The material for the outer layers of the three-layer composite is provided by two 1-75 T2.1 co-extruders, with outputs of up to 500 kg/h.

Below: Staal og Plast of Denmark has installed a 3,000 kg/h sheet extrusion line from Battenfeld-Cincinnati



"The outer layer, which comes into contact with the plant pots, is a distinctive feature of our trays," said Sörensen. "It is approved for food production and is resistant to UV radiation and chemicals."

Closing the loop

Coperion has developed a closed-loop concept for the production of flexible multi-layer film.

Recycling multi-layer film is often complicated, due to the presence of multiple materials. However, Coperion says it has developed a closed-loop approach that can reprocess and re-use up to 100% of multi-layer film production waste.

Multi-layer film waste is shredded, then fed into a ZSK extruder via pneumatic conveying and feeding. There, the material is homogenised and devolatilised in a co-rotating ZSK Mc18 twin screw extruder. Within the extruder, dispersion and devolatilisation performance, gentle product handling and good mixing (even at high throughput) help to achieve high product quality.

Following homogenisation, the recycled material is added back into the multi-layer film production process – with a high proportion of added recyclate causing no loss in quality. This helps to ensure that multi-layer film manufacturing can be done sustainably and efficiently.

Coperion is developing a recycling system of this type for an unnamed customer.

Semi-customised line

US-based sheet producer Airlite Plastics has expanded production at its plant in Nazareth, Pennsylvania with a semi-customised **Davis-Standard** sheet line.

The new line supports various thicknesses and textures of Airlite's thin-gauge sheet production, including its Orthoform sheet used in making orthotics and prosthetics.

Davis-Standard engineered the line for strict repeatability, gauge control, product consistency and low scrap, which are essential to Airlite's processes. Airlite operates five sheet lines at the plant.

Tony Alfieri, vice president and general manager

of this division of Airlite, said that the correct equipment combination is important because thin-gauge sheet production is challenging. His plant schedules operations around processing a mix of sheet thicknesses from 0.16 to .25in (4-6mm), and with different textures ranging from smooth to haircell. For instance, sheet used for Orthoform is drape-formed using a very specific resin.

Key components of the new line include a Thermatic III extruder, DS-eVue control system, screen changer package, die, melt pump, and XP Express PS series roll stand system with a unique roll configuration to ensure quality and consistency.

"Engineering and installing a complete sheet line is a huge undertaking with a lot of attention to detail," said Alfieri. "Knowing we have the technology to make that happen is critical."

Above: Bandera ran a livestreaming event to demonstrate a new machine

Compact cast line

Colines has developed its Polycast Evo line, to produce both cast polypropylene (CPP) and polyethylene (CPE) film. The company says that the line satisfies the market's technical requests at a good best price-performance ratio.

KraussMaffei lays foundation for new extrusion systems facility

KraussMaffei laid the foundation stone earlier this month for its new 66,500m² extrusion systems production plant at Laatzen, near Hanover in Germany.

The new facility will be completed by Q3 2022 and will replace the company's Kleefeld factory – the traditional home of the Berstorff extrusion business – which it says could not be expanded any further. It will allow all KraussMaffei extrusion activities to be located under one roof.

Around 750 people will work on the site, which will include a 10,000m² Innovation Centre, within which customers will be able to run complex preliminary line trials under realistic production conditions before ordering new machines. The centre will house 20 machines ranging from laboratory to production-scale.

Left: Construction of KraussMaffei's new extrusion plant at Laatzen in Germany is now underway

KraussMaffei is working with commercial real estate developer VGP on the project. It recently completed construction of a new factory for the company's Burgsmüller subsidiary in Einbeck in Germany and is also building the new KraussMaffei Technologies HQ at Parsdorf near Munich (the foundation stone for that was also laid this month).

› **www.kraussmaffei.com**

The new cast line has a compact layout and is available in a configuration starting from four extruders and five layers. Polycast Evo lines can be optionally equipped with Colines' patented MDO IR1 (single stage) or MDO IR2 (double stage), which allow the production of mono-oriented polypropylene (MOPP) and polyethylene (MOPE) film.

As with other lines, Colines applies its 'quick delivery' police to the Polycast Evo lines.

Cool customer

Amut has delivered a co-extruded sheet line to Walton Hi-Tech Industries of Bangladesh – adding to the line that the company installed in 2017.

Walton manufactures components for the electronics, white goods, automotive and telecommunications industries. It ordered the new line – to make ABS and PS sheets, with thicknesses of 0.8-5 mm – in order to fulfil an extension project for refrigerator panel doors and cabinet liners.

The line's main extruder, an EA 160 40 L/D with venting, can extrude up to 1,000 kg/h of HIPS and 800 kg/h of ABS using a dryerless process. The co-extruder is an EA 60 40 L/D with venting, for making the 'glossy' layer, with an overall capacity up to 200 kg/h. Both are equipped with bushing on the first zone to guarantee stable feeding of the material by the screw.

The calender has a 2,400mm nominal width and cooling rolls with optimised thermodynamic design, to ensure a maximum differential temperature of ±1°C between the two sides of the roll. The cooling roller conveyor is 20 m long. This allows the sheet to cool without locking in surface tensions – which could cause shrinkage problems during thermoforming.

Livestreaming demos

In the face of lockdown, companies must think of creative ways to interact with their market. **Luigi Bandera** of Italy recently organised an open house session – via live streaming – to demonstrate its new HDBFlex five-layer co-extrusion technology.

The line, which makes heavy duty bags, was first demonstrated to a customer who is due to have a line installed. This private session allowed the customer to preview the running of the line and verify its production parameters. Afterwards, three live streaming sessions were transmitted in two days, attracting more than 500 customers, potential customers and suppliers.

"Thanks to digital innovation, the barriers imposed by the Covid-19 pandemic have been overcome – and turned a time of temporary stagnation of manufacture into an opportunity for a rapid post-Coronavirus recovery," said the company.

VR service

Macchi of Italy is offering remote servicing via its Macchi VR Service, which offers a direct connection

Abovev: Reifenhäuser used its Visual Assistance technology to help a new customer set up a blown film line in Turkey

with Macchi through a dedicated internet call

Customers get a real-time view through the operator's 'eyes' thanks to the use of Macchi VR smart glasses. This allows Macchi technicians to highlight drawings or real images with arrows or other instructions. Electrical and mechanical drawings can also be sent directly to the smart glasses.

"With Macchi VR, you can increase the productivity of your field service organisation and reduce critical outage times," said the company.

There are two levels of service – Premium and Premium Plus – according to needs.

Remote start-up

Reifenhäuser recently helped a customer in Turkey to set up a blown film line remotely – using smart glasses.

The Coronavirus pandemic has severely restricted the ability to travel, which affects operations such as installing new lines.

In this case, the customer's assembly team sent on-site assembly activity live – by smart glasses – to the Visual Assistance Cockpit at Reifenhäuser. Reifenhäuser experts assigned to the project guided the customer's team through specific instructions and checklists. They also provided the customer's technicians with all the necessary information on an integrated display.

This is all part of a software platform that instructs technicians with exactly what needs to be done in a specific situation at the right time.

Visual Assistance has been used to start up Reifenhäuser blown-film lines across the world. Reifenhäuser says that support using smart glasses is one of a number of IoT solutions in its Visual Assistance package.

In a separate move, the company has converted another pilot line to make protective medical garments. It has been used to make 110 tonnes of protective film, which will be converted into medical coveralls for use in hospitals.

The increased demand is currently very high for coveralls worn to treat highly infectious coronavirus patients. This volume is enough to make more than 1 million coveralls.

CLICK ON THE LINKS FOR MORE INFORMATION:

- **www.ptiextruders.com**
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AMI is holding the first Global Virtual Summit in Agricultural Film in October. Get a taste of the online event in this Q&A with some speakers from across the value chain

Hear from the experts at agricultural film summit

The new Global Virtual Summit in Agricultural Film takes place online over four days on 26-29 October. Organised by AMI, the publisher of *Film and Sheet Extrusion*, the summit provides a unique forum for the global agricultural film industry. Details can be found at the event **website**.

Ahead of the summit, AMI spoke to some of the expert speakers: Ralf Dujardin (VP Marketing and Innovation, Imaflex), Lindy Savelle (President, Georgia Citrus Assn), Michael Lebidakis (Managing Director, Plastika Kritis), Pierre Sarazin (VP R&D and Sustainability, Polyexpert) and Jan-Torsten Vollmer (Head of R&D and QM, Coveris Flexibles).

What do you consider to be the most exciting opportunity for agricultural films in the future?

Jan-Torsten Vollmer: I guess the challenging opportunity for the agri film market will be finding the right sustainability solution. We think that the plastic discussion, which is ongoing in the consumer packaging business, will affect the agri film business, too. I will present a few developments and solutions in my presentation.

Pierre Sarazin: A good part of our activities are concentrated in mulch film production, as well as flexible packaging material. There are great concerns in both industries about the waste generated by used films. Until now, biodegradable mulching films – those made with certified compostable resins – have been the only alternative to traditional mulching films and I believe that these films have a bright future ahead of them.

Nonetheless, in the age of circular economy, there are a lot of questions being asked about the end of life of traditional agricultural films after use, which generates plastic waste. More development in this area is to be expected, without it being detrimental to film functionality and performance.

Lindy Savelle: Several of our growers have used landscape fabrics and plastics to cover the beds beneath their citrus trees. We are seeing more and more traditional produce farmers diversify by adding citrus to their product lines. Typically, these are the farmers who plant citrus using film. ›

Michael Lebidakis: We see an opportunity in developing specialty films for particular uses, for example greenhouse films with higher strength, more light-transmittance, permanent anti-drip and anti-mist or barrier silage films for better quality and reduced spoilage of the animal feed.

On the other hand, one of the greatest challenges our industry is facing is the collection, recycling and reuse of films alongside how to expand biodegradable mulch films usage, to respond properly to environmental concerns.

Ralf Dujardin: Because of stringent regulations, increasing disposal costs for PE agri film waste and the new European product standard EN 17033, I personally think that the most exciting opportunity lies in using certified soil-biodegradable agricultural films for organic fruit, vegetable and hemp production. The new standard specifies the necessary requirements and test methods, which dispels the myth that only 100% bio-based agricultural films are "safely biodegradable" in organic crop production and that petrochemical-based agricultural films are not.

The reason for using plastic mulch films in crop production is their well-known benefits in suppressing weeds and conserving water and fertiliser use. A prerequisite to enjoying those benefits is that the agricultural film remains intact on the soil over the whole growing season. One hundred percent bio-based agricultural films simply biodegrade too fast on soil during the season, while petrochemical-based agricultural films only biodegrade quickly and completely when they are ploughed into the soil after the season ends and, therefore, they are the more logical choice.

Has agricultural film production been affected by the Covid-19 pandemic? In what ways?

Jan-Torsten Vollmer: Overall we were not really affected by the pandemic. There were a few issues around transportation and logistics and lock downs of suppliers and/or the regions our suppliers are based in, but in the end we were able to handle it. The positive of the pandemic is that the plastic film industry has been

defined as system relevant. My hope is that all of us stay healthy.

Pierre Sarazin: The production of traditional polyethylene mulch film, as well as biodegradable and compostable film has not been affected by the pandemic. Orders were placed in advance as usual, and film was installed in many parts of North America, sometimes before March. However, some distributors were overwhelmed at the time of deconfinement, probably enhanced by a slow start due to unusual weather conditions in certain areas.

Lindy Savelle: During the summer months here in Georgia we are hit with pests, dry weather and extremely humid, hot weather. In citrus growing we have to balance between over-watering trees and giving them enough water to keep them cool during the hottest times of day. The pandemic has not affected our industry much... yet. We continue to have the ability to grow and plant citrus trees, as well as grow fruit for the coming season. The biggest challenge is likely to come during harvest time when workers may not be available.

Michael Lebidakis: To the best of my knowledge the impact of Covid-19 on agricultural film production has been relatively limited. Despite problems in some areas due to lack of labour, farming in most cases has continued to grow. An exception was the flower industry which suffered a major decline in demand during the first phase of the pandemic.

Ralf Dujardin: Agricultural film production has not been affected by the pandemic, neither in demand nor by loss of production, at least not for our company. Demand for fresh market produce sold to supermarkets and grocery stores has actually slightly increased compared to past years, only the demand for fresh produce for the hospitality industry has decreased. The latter market has no impact on agricultural film production because fresh produce for the hospitality industry is mostly grown without the use of agricultural films.

Register for the new Agricultural Film Global Virtual Summit on 26-29 October at the event ***website***.

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Film stars: developments in multi-layer packaging

Multi-layer film is used to add barrier properties or higher strength to packaging – and is increasingly being achieved in a mono-material format

An emerging theme in plastics is to make multi-layer packaging from a single material – usually a polyolefin – making it easier to recycle.

Nova Chemicals has developed a material for making biaxially-oriented polyethylene (BOPE). Its HD-BOPE material allows the creation of all-PE, recyclable multi-layer film structures with improved physical performance compared to blown film, it says. Nova says that HD-BOPE can help film manufacturers create recyclable PE mono-material structures without sacrificing stiffness and print clarity.

Biaxial orientation can produce films with higher toughness, barrier and optical properties. HD-BOPE resins are designed for use in the print web, before being laminated to a sealant film made with lower density PE. The finished film has high stiffness, which allows downgauging and improved processability in converting steps compared to blown film alternatives, says Nova. BOPE films also demonstrate good thickness uniformity and film flatness for high yield rates, it says.

BOPE films can be used to create moisture and oxygen barrier packaging depending on the design of the finished multi-layer film. BOPE-HD film structures can be metallised or coated with barrier technologies to provide an oxygen barrier. A BOPE-HD web can also be laminated to a blown film partner web to provide oxygen or moisture barrier performance.

The company has progressed past the proof of concept phase with a number of film manufacturers.

"Currently, we're working on optimising the materials, process conditions and film designs," said Schrob. "Film formulations are being testing in-field and several partners are looking to qualify packages within the next few months."

The initial focus has been food packaging applications (including VFFS and HFFS applications – which includes stand-up pouches).

"We don't know yet what will be first on the store shelves, but BOPE is ideal for any number of food packaging applications as well as heavy-duty shipping sacks and e-commerce packaging," he said.

It is also suitable for applications including metallised films, flow wrapper, pillow packs, tapes and labels.

Although BOPE-HD can bring recycling advantages, making successful film from it requires machine adjustments and equipment upgrades on legacy tenter frame lines. Qualification of a new material for conversion and packaging is a rigorous, time-consuming process – and the settings for converting steps such as printing, lamination and packaging will need to be refined, says Nova.

Nova has been working with stretch line machinery manufacturer Brückner to accelerate the development and commercialisation of the technology.

Sebastian Ruhland, senior sales manager at

Main image: Dow has extended its family of Innate PE packaging resins with a range called TF-BOPE

Schrob: "BOPE is ideal for food packaging, heavy-duty shipping sacks and e-commerce packaging"

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Brueckner, said: "We have been pleased with the performance of Nova's products on our equipment and are getting positive feedback from the converters who are making film with it."

Ruhland said that the technology could open new possibilities to provide PE films for mono-material packaging films, to help overcome recycling challenges.

BOPE range

At the same time, **Dow** has extended its family of Innate polyethylene packaging resins with a range called TF-BOPE – for tenter frame biaxially orientated PE films.

The company says that, compared to traditional PE films, those made with TF-BOPE have higher mechanical properties and material rigidity, superior optical and printing performance, and sustainability advantages – including the potential for all-PE structures that are easier to recycle.

Films have up to 80% less haze compared to traditional PE films, says Dow, while also having twice the impact strength and tensile modulus. They also boast three times the puncture resistance and tensile strength of traditional blown PE films. Other benefits include good flex crack resistance – even at low temperature – plus good tearability for convenient use.

The TF-BOPE film can be used directly as the printed layer of the packaging, allowing a combination of PE functional layers to achieve an all-PE structure.

In collaboration with a number of partners, such as Guangdong Decro Film New Materials, Dow has developed several commercial applications that are already on the market. These include all-PE pillow pouches, recyclable stand-up pouches (SUPs) and liquid product SUPs. Other potential applications include rice bags, pet food bags, heavy-duty shipping sacks and liquid detergent pouches.

Above: Nova is working with Brueckner to accelerate development of BOPE film

Dow is collaborating with other partners to develop new applications for the material.

"With their downgauging and recyclability potential, Innate TF resins already offer answers to the plastic waste issue, and we believe more advantages can be found together," said Kodak Xiao, of Dow Packaging and Specialty Plastics in Asia Pacific.

Simultaneous stretching

At last year's *Multi-Layer Flexible Packaging* conference, organised by **AMI**, Giovanni Stocchetti, sales manager at Italy-based **GAP**, told delegates how its Miralayer technology has helped customers to produce 'micro-layered' film. The process can

produce thinner film that has higher barrier and toughness performance, he said.

"We have experimented, and achieved good results with 30-50% thickness reduction," he said.

Stocchetti said this was achieved through a combination of GAP's die technology – which produces multi-layered film – and the use of its no-contact, simultaneous orientation double- and multi-bubble line, with widths up to 4,000mm.

Simultaneous orientation plays a key role in reducing thickness and improving barrier performance – by changing the morphology of its molecular structure. Other benefits include improved printability, resistance to oils and glossy appearance.

According to Stocchetti, there is a growing trend to produce micro-layered film – which has many layers, improved properties and a small number of processing steps.

The company's technology has been used to produce 21- and 27-layer film with annular profiles.

"We can produce blown film where the circumference of the structure avoids a conventional welding or overlapping area – where structure properties will be undesirable or adversely affected," he said.

Crystallisation in films with thinner layers tended to happen more slowly, and was more confined.

The technology can handle combinations of several polymers with different viscosities and processing temperatures into a single film.

"The repeated layering of two materials with different properties can create a new film that can exceed the average or maximum value of the individual layers," he said.

The new film saw a 60% improvement in tear and tensile strength – and a doubling of the barrier after flex cracking, he said.

Overall benefits included: less expensive materials – such as recyclate – could be added without sacrificing performance; and it was easier to orient an EVOH barrier layer – which increased as the layer became thinner.

Ceramic assistance

At the same event, Neil Morrison, director of R&D for display and flexible technology at **Applied Materials Web Coating** in Germany, explained how barrier performance could be improved by adding ceramic layers.

The ceramic -- added as a coating – can help packaging producers to avoid multi-material structures. For instance, a material such as PET or aluminium foil can be replaced with another polyolefin. The company has demonstrated the technology as part of an all-polyolefin pouch.

The original pouch design included multiple materials including PET, aluminium, and either polyethylene (PE) or cast polypropylene (PP). This was converted to a structure based largely on BOPP.

The 10-20nm ceramic layer was applied using vacuum processing and was used to make high barrier laminate pouches for hot fill or pasteurised foods.

Scanning electron microscope (SEM) analysis of the ceramic layers showed the ability of plasma assistance to reduce void defects.

"Plasma-assisted AlOx void density was significantly lower and more evenly distributed throughout the layer," said Morrison. ›

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All-PE packaging keeps petfood fresh

Mondi has developed all-polyethylene (PE) packaging for German petfood retailer Zooplus.

The barrier packaging is used for a new dry dog food in its 'Wolf of Wilderness' line.

Mondi is supplying Zooplus with a pre-made FlexiBag Recyclable and BarrierPack Recyclable form-fill-and-seal (FFS) reel material. The company said it was able to deliver the necessary barrier properties against moisture, oxygen and odours while maintaining a premium look and feel.

At the same time, the previously metallised highlights on the label – and in the eyes of the wolf – are also recyclable.

"We were able to replicate the look – without the use of any metallic substances – to produce recyclable packaging," said Thomas Kahl, a project manager at Mondi.

Above: Petfood retailer Zooplus is using Mondi's all-PE barrier packaging for a new dry dog food

Biodegradable coatings

Shahab Jahromi, managing director of Netherlands-based **Knowfort Technologies**, told delegates how his company has developed organic biodegradable coatings that can be applied to multi-layer packaging.

Its Freshure technology is based on the vacuum deposition of inexpensive biodegradable coatings – which are approved for use by both the FDA and European Union (EU).

"Vacuum deposition of biodegradable organic compounds offers a new avenue in developing environmentally friendly barrier solutions," he said.

Jahromi said that the conditions for applying the coating are far more environmentally friendly than for inorganic coatings such as aluminium. While aluminium requires a vacuum of 10^{-4} mbar, a deposition temperature above 1500°C and a cooling temperature below -15°C, the conditions for Freshure are 10^{-3} mbar, a deposition temperature below 350°C and cooling at room temperature.

"Compared with vacuum deposition of aluminum, deposition of organic compounds is more environmentally friendly because it is carried out at softer conditions," he said.

Because of this, organic compounds can be vacuum deposited onto temperature-sensitive polymers such as PE. There are two different variations of Freshure coating: a single coat delivering transparent gas barrier coatings; and as an inline top coat – on metallised film – providing barrier enhancement, printability and protection.

Freshure has been applied to a number of substrates, including BOPP, CPP, PET, BOPA, PE and PLA.

The oxygen barrier of Freshure is stable on elongation above 6%, while AlOx barriers fail at 1% elongation, he said.

"Second generation Freshure coatings will have improved compatibility with a wide range of commercially available inks," said Jahromi.

■ The next *Multilayer Flexible Packaging* conference takes place in Chicago, USA on 24-25 June 2021. Contact Carole Charrade on +1 610 478 0800 (**carole.charrade@ami.international**) for details.

CLICK ON THE LINKS FOR MORE INFORMATION:

- **www.novachem.com**
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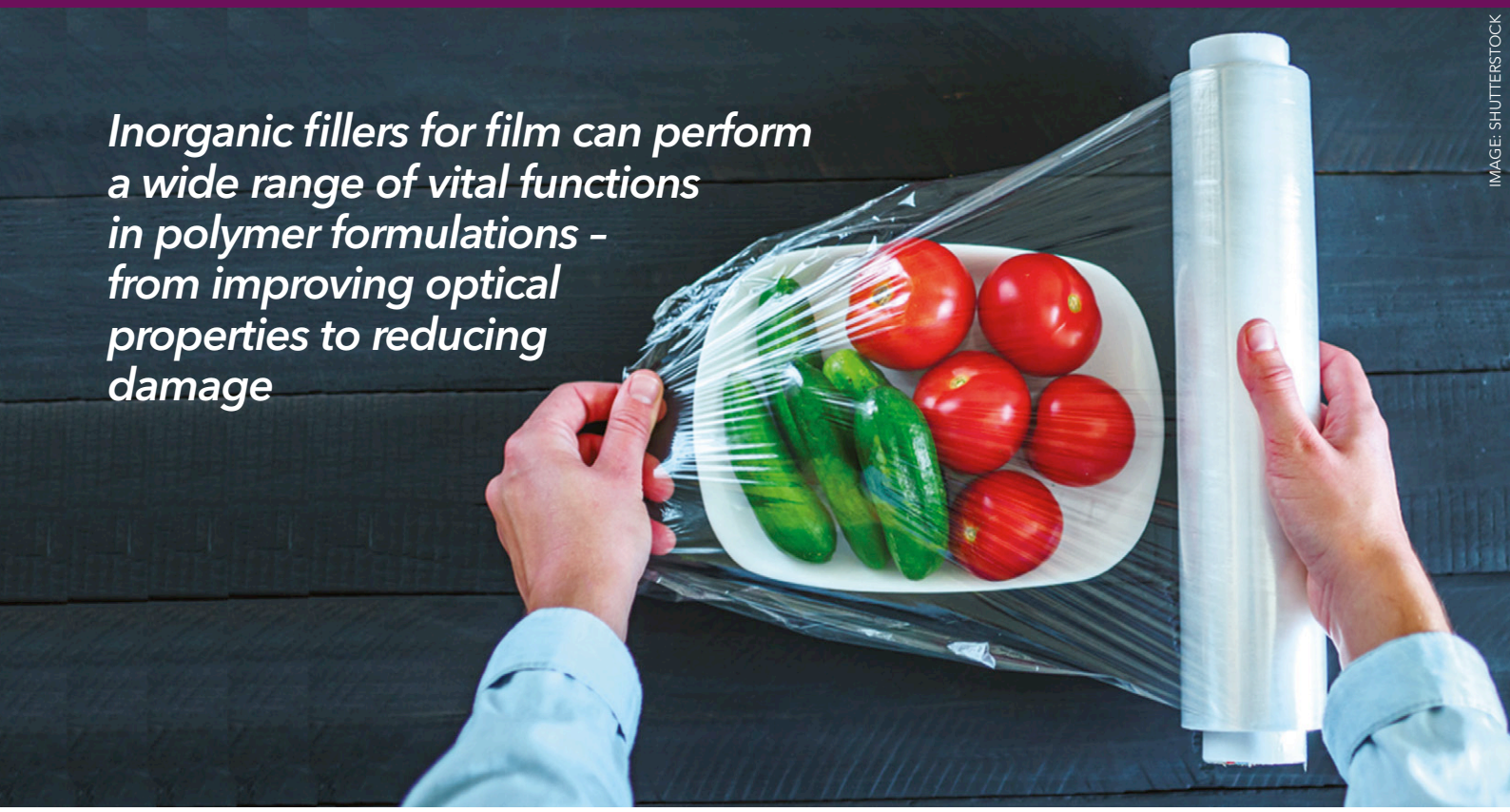

IMAGE: SHUTTERSTOCK

Inorganic fillers for film can perform a wide range of vital functions in polymer formulations – from improving optical properties to reducing damage

Enhancing performance: mineral fillers for film

Minerals dug from the ground – ranging from calcium carbonate to more exotic species such as nepheline syenite – can all be used as filler in plastic film, to improve their long-term performance.

At last year's *Multi-Layer Flexible Packaging* conference, organised by AMI, Christian Schanzer, global product manager for thin films and coatings at **Sukano**, told delegates about a new voiding agent that can be used to improve film quality – especially BOPET.

The new voiding agent, developed in collaboration with **Omya**, combines selected grades of calcium carbonate with proprietary masterbatch manufacturing to create an additive that increases opacity and lowers density in BOPET film. At the same time, it minimises the need for filtration – leading to improved productivity.

"Current results measured at Sukano's technical centre and pilot plant include co-ex film extrusion, Karo labstretching and analytical measurements," he said.

Results showed that BOPET films voided with $CaCO_3$ presented a less glossy surface than white films based on titanium dioxide (TiO_2). Three different grades of Sukano's $CaCO_3$-based additive were tested. In 50-micron white film, the surface gloss of film was 20-30% that of a film containing Sukano's TiO_2.

The company also tested these against clear PET and a barium sulphate-based formulation.

Sukano also tested the formulations for multi-layer structures, on a Bruckner pilot line, to determine the optimal settings. The line included a casting unit, MDO, TDO, pull roll and winder.

Results showed that gloss gets increased in co-ex films if the voiding additive is used in the core layer. In mono-structured films the surface gloss is typically 10-20%.

"The trials on the pilot line confirmed the functionality of the voiding effect that was discovered in lab trials," said Schanzer.

Optical improvement

Earlier this year, at AMI's *Polyethylene Films* conference in the USA, Kysle King, technical sales manager at **Sibelco** North America, compared the optical properties of a range of anti-blocks – with a focus on the company's nepheline syenite.

Nepheline syenite is a mix of three feldspars. It is used to improve clarity/haze in plastic films. Sibelco

Main image: Phosphites can improve stabilisation in plastic films, helping them to last longer

Right: Nepheline syenite is used in anti-blocks to boost the optical properties of plastic film

offers grades in its Minbloc HC range.

In a trial at the University of Massachusetts Lowell, a base LLDPE resin from Dow was evaluated with a range of anti-blocks – including Minbloc HC1400, diatomaceous earth (DE), talc and synthetic silica. Loading levels were 0.5-0.75%. Four tests were performed: haze/clarity (ASTM D1003); online transparency; FSP 600 vision system; and blocking at 40°C. Film was produced on a Battenfeld Gloucester blown film line.

While haze for the 'barefoot' grade was 6.27, it was 8.12 (for 0.5% HC1400) and 9.12 (for 0.5% DE). These values rose to 10.22 and 10.99, respectively, for 0.75% HC1400 and DE. All other formulations showed higher haze. For clarity, a barefoot value of 97.66 fell to 91.98 (for 0.5% HC1400) and 88.62 (for 0.5% DE). For 0.75% loadings, the values were 88.82 and 86.20 respectively.

The FSP 600 transparency test shines a light through the film and a CCD camera measures the light absorbed or scattered – and reports results such as gels, holes or die lines. The results showed that films containing HC1400 had the highest transparency.

In the blocking test, the blocking force of the barefoot grade was 20g. For HC1400 it was 4g (0.5%) and 3g (0.75%); for DE it was 5g (0.5%) and 1g (0.75%), for silica it was 5g and 1g respectively.

Nepheline syenite is able to achieve higher loadings in masterbatch than DE – up to 70%, said King. It also offered better size control and clarity/haze.

King recommended HC500 for thin films (below 1 mil), HC1400 for films of 1-4mil and HC2000 for thicker films (such as agricultural film).

Stable performance

At the same event, Hayder Zahalka, global technology leader at **SI Group** in the USA, explained how phosphites can improve stabilisation in polyethylene films.

Phosphites help to break the degradation cycle via decomposition of an intermediate polymer hydroxide, he said. Other stabilisers, such as phenolics, slow degradation by scavenging free radicals.

A number of factors can affect phosphite performance, including the percentage of phosphorus in the formulation, its chemical structure (such as tris-hindered aryl, or tris alkyl), hydrolytic and thermal stability, melting point, loading level and polymer type.

In a test, phosphite reactions of two of its grades – Alkanox 240 and Ultranox 626 – were investigated using nuclear magnetic resonance (NMR) to

IMAGE: SHUTTERSTOCK

monitor the spectrum of phosphorus-31 every 300 seconds.

Alkanox 240 was converted to its oxidised phosphate in a single step. For Ultranox 626, three species were detected at any one time: the unreacted phosphite; a 'half-oxidised' hybrid; and a fully oxidised diphosphate. The reactivity of the two reactions of Ultranox 626 were both faster than the Alkanox 240 conversion, said Zahalka.

In a multi-pass extrusion at 260°C, Alkanox 240 showed a yellowing index (YI) of around 4, while that for Ultranox 626 was zero.

In conclusion, Zahalka said that Ultranox 626 had a high active phosphorus content, and reacted eight times faster than Alkanox 240 at 313K. The new grade also showed a better in-polymer performance (at half loading) and blended well with other additives.

Separate to this, last year SI was granted an extension of FDA approval for Ultranox 626, for use as a food contact substance in polypropylene (PP) homopolymers and copolymers. This makes the additive suitable for use in a wide range of packaging applications. It has the highest phosphorus content of SI's secondary anti-oxidants, so can be used in lower concentrations – resulting in low migration and low volatile-contact plastics, said SI.

■ The next *Polyethylene Films* conference takes place in Coral Springs, Florida, USA on 2-4 February 2021. Contact Stephanie Hume on +1 610 478 0800 (**stephanie.hume@ami.international**) for more details.

CLICK ON THE LINKS FOR MORE INFORMATION:

- **www.sukano.com**
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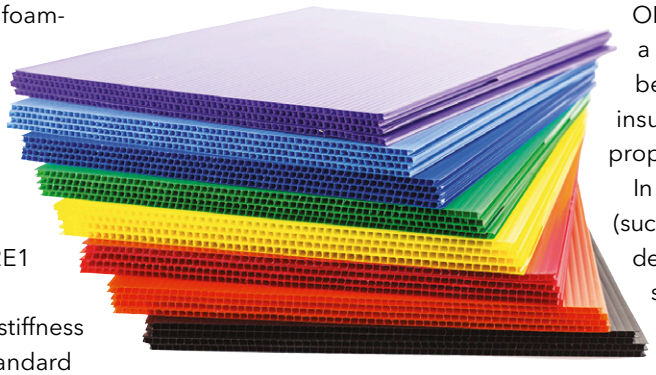
POLYPROPYLENE

Foamed PP boasts high melt strength

ExxonMobil has introduced a foamable polypropylene (PP) resin for high volume applications including food and beverage packaging, industrial packaging and building products.

Achieve Advanced PP6302E1 is a high melt strength (HMS) grade that improves product stiffness by up to 30% compared to standard HMS PP foam, according to the company.

"Historically, foam applications have been dominated by amorphous polymers such as PS, PU and PVC," said Olivier Lorge, global market development manager for polypropylene, Vistamaxx and adhesions at ExxonMobil.



The material is processable on existing PS foam lines with varied blowing agents.

It also reduces material use while delivering product integrity and is recyclable where appropriate collection and recycling facilities exist, says the company..

"Converters, brand owners and OEMS can unlock opportunities in a range of applications that benefit from lightweighting and insulation while leveraging PP properties," said Lorge.

In food and beverage packaging (such as meat trays), the material delivers stiffness and affordability, says ExxonMobil. It also offers insulation properties and durable grease and moisture resistance.

In industrial packaging it offers toughness, temperature stability, moisture and chemical resistance, as well as lightweight installation.

In building products (such as insulation), it gives durability and flexibility for ease of installation, according to the company.

› **www.exxonmobilchemical.com**

ADDITIVES

Dust-free pack of carbon black

Orion Engineered Carbons has developed soluble, meltable packaging as a way of making its carbon black products easier to handle.

The new Minibags are available in a range of material types, melting points and sizes. They are designed to improve the production process and serve small order quantities of between 100g and 10kg. They are suitable for both powder and beaded carbon blacks.

Carbon black is dusty, and often presents handling and packaging challenges. Minibags overcome this by allowing the material to be incorporated directly into the production process without the need to open the bags.

Depending on the material, Minibags can be water-soluble or meltable in polymers. This reduces waste and enables dust-free processing.

All common polyethylene (PE) and other compatible elastomer bases – as well as ethylene vinyl acetate (EVA) and polyvinyl alcohol (PVA) – are available as Minibags.

The different material characteristics and melting points enable the adaption of the bags to customers' needs.

Orion also offers small aluminium bags, where moisture protection of carbon black is most important.

› **www.orioncarbons.com**

ADDITIVES

Compostable plastic colours

BASF says it has created a pigment portfolio for compostable plastics and printing inks.
The portfolio, called Colors & Effects, is based on the evaluation of the pigment composition according to the requirements of EN 13432, the European standard for industrial composting.

"The regulation treats pigments as additives – and they must not hinder the industrial composting process," said Lindy Lin, senior commercial industry manager for plastics at Colors & Effects.

"Thanks to our long-term experience with purity limits for sensitive applications like food contact materials, we have built a comprehensive pigment portfolio with high purity standards."

The correct pigment chemistry supports a product's overall compliance with compost purity limits, says the company. It helps ensure that the remains of compostable packaging stay within the regulation limits, including the ink on its surface – which can include volatile matter, heavy metals and fluorine.

› **www.colors-effects.eu**

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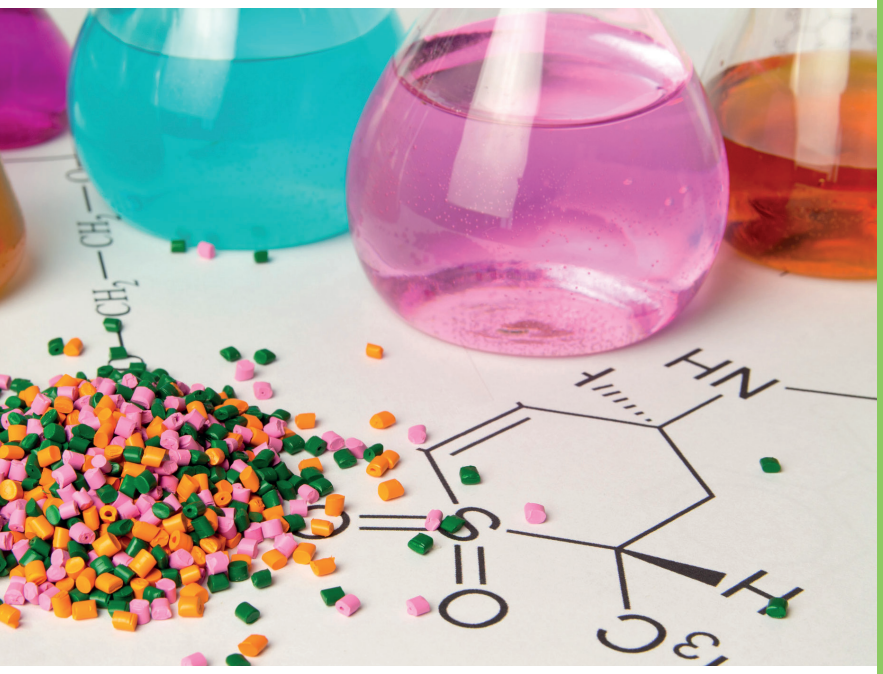

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COOLING

Mobile water cooling does not produce waste heat

GWK of Germany has introduced its mobile water-cooled Teco CW series, which do not produce unwanted waste heat.

The device connects to a machine cooling system, such as a temperature control unit. As a result, there will be no warm exhaust air in the production area – as would be the case with air-cooled compact refrigeration units.

Unlike traditional cooling units, a Teco CW can produce cold water with a temperature of 0°C without the need for adding anti-freeze to the water.

Cold water is often needed for individual units, and not all production machines – so that a central refrigeration system would not be economically viable. In these cases, users tend to rely on mobile refrigeration units. However, the additional heat generated in the production area by the exhaust air of the refrigeration units can be very annoying during the summer.

The mobile units are equipped with GWK's control system as well as other components. Any problems can be quickly resolved, thanks to the use of standardised spare parts.

The pump output is adapted to the needs of plastics processing applications with maximum flow rates of 60 litres/min and maximum pump pressure values of 3.5 or 5.8 bar. The refrigeration capacity up to 4kW or 10kW is optimised for the production machinery.

Teco CW units have an optimised refrigeration circuit with very small fill quantities, making them exempt from regular statutory leak tests. The water-cooled version does not have a fan, so is particularly quiet.

› **www.gwk.com**

COATING

Coating line meets demand

Jessup Manufacturing is installing a coating and laminating line from New Era Converting Machinery.

It has helped to speed up throughput, said the company – with the heater, chiller, and dual inline corona treaters in particular helping the company to be more competitive.

John Looser, vice president-sales engineer at New Era, said: "New Era's depth and experience with designing and manufacturing coating and laminating equipment, along with Jessup's production and product knowledge, resulted in a well-engineered, efficient and safe production machine."

› **www.neweraconverting.com**

ANCILLARIES

Portable chiller has PLC control as standard

The newest EP2 series of portable chillers from Conair now includes PLC control and a colour touch screen HMI as standard.

Theses chillers – which are available with air-cooled, water-cooled or remote air-cooled condensers – use a new sloped top electrical panel that places the 7in touch screen on the front of the unit for easy viewing and operation.

The PLC control system now displays digital pump pressure, compressor/pump/fan running hours, and performance trend charts for parameters such as process fluid temperatures, said Conair.

New controls also include Modbus RTU communications as standard to allow easy integration of the chillers with plant-wide process monitoring systems. In addition, the new control system is fully compatible with the SmartServices platform – Conair's cloud-based solution for ancillary equipment monitoring, management and analysis.

By automatically adjusting compressor speed, the optional variable-speed chillers work only as hard as necessary to provide optimum performance with reduced power use.

The chillers provide resistance to harsh fluids and operating environments. They feature stainless-steel pumps and evaporators, and a process-fluid circuit with corrosion-resistant materials to prevent rust, said the company.

› **www.conairgroup.com**

TESTING

Cooling device allows dynamic testing without thermal chamber

The Fraunhofer Institute for Structural Durability and System Reliability (LBF) has developed a new cooling device for its high-speed testing dynamic plastics machine – allowing it to perform low-temperature testing without a thermal chamber.

It will allow the LBF team to investigate plastic properties at temperatures as low as -40°C. In addition, it measures strain optically with Digital Image Correlation/ Greyscale Correlation (DIC/GSC) – to determine a 2D strain field on the specimen.

Low temperatures are generated with compressed air cooled by liquid nitrogen, with the sample standing in the flow of this air. A thermal camera monitors temperature over a large area, and measurements begin once the correct temperature has been reached.

The advantage of mixing compressed air and nitrogen is that the compressed air is dry and only a few ice crystals form on the sample surface. The gas mixture from the cold reservoir also ensures a more constant temperature of the air flow than when nitrogen is applied directly.

The cooling unit – developed at Fraunhofer LBF – consists of a controller and switching element, a cold reservoir, a nitrogen tank and a supply line to the sample. The lack of a thermal chamber means there is no pane between the camera and the sample, which could tarnish or freeze or form air vortices when the pane is heated. This improves DIC and allows flexible testing of different component sizes and different load types.

› **www.lbf.fraunhofer.de**

TESTING

Analysing moisture permeation

Systech Illinois has developed an accurate water vapour permeation analyser for packaging film.

Thanks to its high accuracy and wide measuring range, the Lyssy L80-6000 can be used in applications such as surgical and hygienic membranes, wound dressing, diaper materials and construction membranes. New features include a touchscreen display and intuitive interface for ease of use.

› **www.systechillinois.com**

DRYING

RF energy offers line boost

US-based Radio Frequency Co says that RF energy can offer an immediate boost in line productivity.

The technique can heat a wet substrate through its entire thickness with zero lag-time for thermal conductivity from the exterior surface – which is typical of conventional drying systems. Often, up to one-third of the length of a conventional web dryer is used to preheat the web before any real drying is accomplished, says the company – which offers systems in a wide range of widths and powers.

Heat transfer is accomplished without the need for high temperatures as the RF energy is generated by the polar water molecules in their liquid phase below 212F, according to the company.

Systems have been used for drying or curing aqueous-based solutions on cellulose webs, nonwoven polymeric battings – including medical foams – and other insulative continuous products.

› **www.radiofrequency.com**

AMI Webinars

Free webinars available to view on-demand

Stay up to date: watch these free industry webinars

Click on a webinar to **watch in your own time**.

Driving Processing Efficiencies in Optical Fiber Cable Manufacture
Pascal Amigouet
Senior Technology Manager
Ko Arts
Marketing and Sales Manager

AVIENT

Forecasting the impact of coronavirus on economies and plastics markets
David Buckby
Principal Global
Resin Analyst

AMI

Hidden inside – Performance outside! A short story of functional fillers used in Masterbatch for foil applications
Péter Sebö, Head of Marketing & Market Development

Hidden inside – Performance outside!
HPF The Mineral Engineers
A DIVISION OF QUARZWERKE GROUP

SLENTEX – The space saving, non-combustible insulation
Dr Wibke Lölsberg,
Manager Global Marketing

BASF
We create chemistry

Drill, Punch, Skive – The Hole Truth
Speakers:
Bryan Mathias, Director of Business Development
Kerri McGillicuddy, Office Administrator

SYNEO
precision tooling & automation solutions

Plastics and the Pandemic Virtual Forum Series
Analysing the impact of Covid-19 on the global plastics industry

VIRTUAL FORUM
Plastics and the Pandemic

AMI

Flexible Compounding With Kneading-block-free Screws
Klaus Hojer, Business Development, Feddem

FEDDEM

Applications and solutions of plastics in the medical sector
Ing. Raquel Llorens-Chiralt, Senior Researcher – Health Group, Aimplas

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PLASTICS TECHNOLOGY CENTRE

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Polymers for Oil and Gas

VIRTUAL SUMMIT

1-3 December 2020
13:00 BST

The global summit for polymer materials in onshore and offshore oil and gas engineering

Headline sponsor

TEIJIN

FREE VIRTUAL EVENT

AMI's Oil & Gas conferences have gone virtual for this year!

The free-to-attend global virtual summit will cover the latest technical developments and market trends in the Oil & Gas sector.

Five reasons to attend:

1. Learn how advances in polymeric materials are being applied in oil & gas
2. Identify opportunities for composites in sub-sea environments
3. Explore new material developments for optimal performance
4. Debate new approaches for the industry including 3D-Printing and AI
5. Network with industry experts and build professional contacts

All from the safety of your home or office!

Other ways to get involved:

- **Become a speaker** and showcase your knowledge and your company's experience
- **Promote your company** with your logo showcased throughout the event, on the website and in marketing communications

To find out more contact the conference organiser:

Harriet White
T/ +44 (0) 117 314 8111
E/ harriet.white@ami.international

REGISTER YOUR INTEREST

Organised by:

AMI

Download these new product brochures

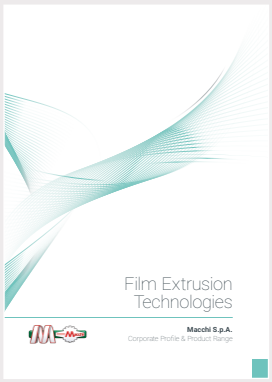
Simply click on the brochure cover or link to download a PDF to your PC or smartphone

SCANFILL: GREENER PACKAGING

Based on a novel polymer/ mineral mix, the Scanfill range of packaging resins can minimise environmental impact by reducing polymer consumption, non-renewable energy use and greenhouse gas emissions without sacrificing barrier performance. Find out more in this brochure.

❯ CLICK HERE TO DOWNLOAD

MACCHI: FILM EXTRUSION



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.

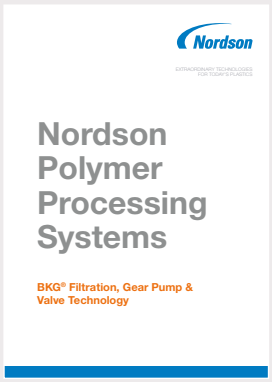
❯ CLICK HERE TO DOWNLOAD

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.

❯ CLICK HERE TO DOWNLOAD

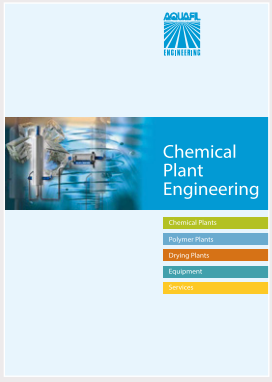
NORDSON: FILTRATION SYSTEMS



The BKG range of filtration systems and screen changers from Nordson Polymer Processing Systems are detailed in this six-page brochure which also features products from BKG's ranges in gear pump and valve technologies.

❯ CLICK HERE TO DOWNLOAD

AQUAFIL: PLANT ENGINEERING



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.

❯ CLICK HERE TO DOWNLOAD

STRUKTOL: INNOVATIVE ADDITIVES

Struktol manufactures a wide range of additives that benefit performance and processing of resins and compounds. Its portofolio includes additives for PVC, wood-plastic composites, recycling, odour control and more, as this brochure shows.

❯ CLICK HERE TO DOWNLOAD

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

NEW DATABASE AVAILABLE NOW

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By manufacturing plant, the database provides detailed information on the location, contact details, material and production capabilities of over 240 BOPP plants worldwide

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AMI

Robust research and expert data for the global plastics industry

Learn more about AMI's upcoming conferences

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

AGRICULTURAL FILM VIRTUAL SUMMIT

AMI's new Global Virtual Summit in Agricultural Film draws on years of experience serving the agricultural film industry with live conferences. This fully online event will create the ideal opportunity to find out about the latest innovations in agricultural film happening around the world, assess new markets and network with movers and shakers in those markets.

The virtual conference and exhibition will be held over four days on 26 - 29 October 2020 and will bring together all parts of the value chain from the US, Canada, Latin America, Europe, Middle East, Africa and Asia.

› CLICK HERE FOR MORE INFORMATION

PLASTICS REGULATIONS

The 4th edition of Plastics Regulations will take place as a virtual event over two days on 2-3 November 2020. The event provides advice on a range of compliance issues at one event. Find out more at the conference website by clicking here.

› CLICK HERE FOR MORE INFORMATION

CHEMICAL RECYCLING

AMI's new Chemical Recycling conference on 3-4 November 2020in Hamburg, Germany, will explore the challenges and opportunities surrounding chemical recycling of plastics and its relevance for all companies in the supply chain.

› CLICK HERE TO DOWNLOAD

WATERPROOF MEMBRANES

Taking place on 16-18 November 2020 in Bonn, Germany, Waterproof Membranes provides a global forum for discussion of the latest solutions, technology and market trends within bitumen, polymeric and liquid membranes across all waterproofing applications.

› CLICK HERE TO DOWNLOAD

SINGLE-SERVE CAPSULES

The fourth edition of AMI's international Single-Serve Capsules takes place on 24-25 November 2020 in Berlin, Germany. The event brings together members of the supply chain to discuss the trends, challenges and opportunities facing the single-serve capsules industry.

› CLICK HERE TO DOWNLOAD

THIN WALL PACKAGING

AMI's Thin Wall Packaging conference on 30 November-2 December 2020, in Nuremberg, Germany, offers a meeting point for the industry to debate business trends and improvements in packaging technology, as well as legislation driving change.

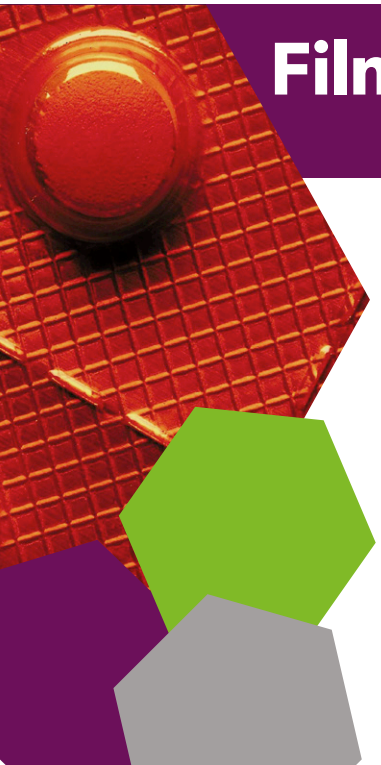
› CLICK HERE TO DOWNLOAD

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

AMB

Head office:	San Daniele del Friuli, Italy
CEO:	Bruno Marin
Founded:	1969
Ownership:	Private
Employees:	Around 430
Turnover:	Around €140 million
Profile:	AMB, founded in 1969, is an international supplier of rigid and flexible films, offering services including packaging design, toolmaking, prototype production and film production. From its beginnings as a producer of LDPE bags, it has expanded into multi-layer film, lamination and printing.
Product lines:	The company's main product lines are flexible and rigid films – made of various materials. Its rigid films include its Eco-Form line (made from recycled PET), Breakdown PET (which is biodegradable), VSP-PET (an R-PET laminate), and APET/PE films – with an EVOH option – for either freezing or hot fill/microwave applications. Its flexible films include a printed mono-film, laminated films – with or without a barrier – and PA/PE films for high/low temperatures (with EVOH option).
Factory locations:	AMB has four production facilities in Italy and one in the UK. At its UK facility in Gateshead in the north of England, it recently added 10,000 tonnes/year of R-PET capacity. The company has also been on the acquisition trail. In July, it acquired PTS, a German industrial packaging producer. A year earlier, in June 2019, it bought UK-based TDX – its UK facility, which makes PET, R-PET and laminated rigid films for the food industry.

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:

November 2020
Thin wall packaging
Sheet materials
Construction
Active/intelligent packaging

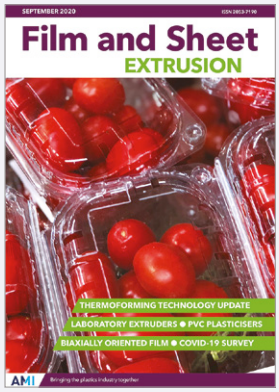
December 2020
Screenchangers/melt filtration
Foamed sheet technologies
Static control/web cleaning
Polyolefin additives

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
September 2020
The September edition of Film and Sheet Extrusion magazine takes a look at the latest innovations in the world of thermoforming. It also reviews developments in biaxial films, plasticisers and lab-scale extrusion machinery.

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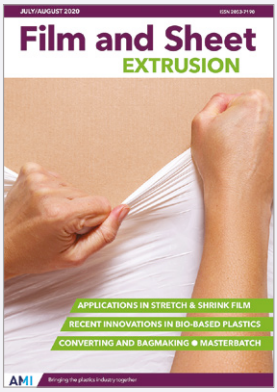

Film and Sheet
July/August 2020
The July/August 2020 edition of Film and Sheet Extrusion magazine looks at developments in shrink and stretch films. It also explores the latest in bioplastics, masterbatches, film conversion technology, and progress in European PVC recycling.

› CLICK HERE TO VIEW

Compounding World
October 2020
The October edition of Compounding World looks at how additives can enable the use of recycled plastics, explores alternatives to twin-screw compounders, and investigates the state of the TiO_2 market.

› CLICK HERE TO VIEW

Plastics Recycling World
September/October 2020
The September/October 2020 issue of Plastics Recycling World magazine explores how better processing and smarter design is improving rigid plastics recycling, plus a review of the latest innovations in sorting technology and extruders for re-compounding.

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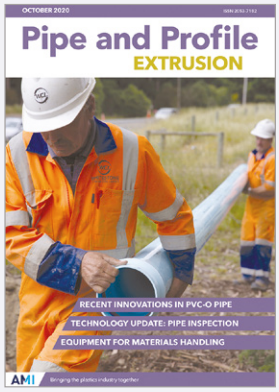

Pipe and Profile
October 2020
The October 2020 edition of Pipe and Profile Extrusion magazine explores the latest developments in oriented PVC pipes (PVC-O). It also takes a look at some new applications of pipe inspection technology and materials handling equipment.

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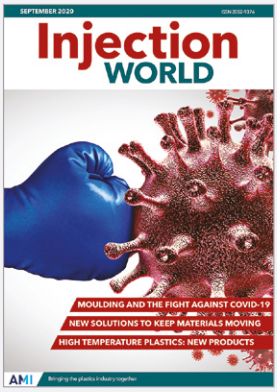

Injection World
September 2020
The September issue of Injection World has an in-depth feature on medical technology, and how injection moulders and machinery groups are contributing to the fight against Covid-19. Plus new products in temperature-resistant polymers and the latest in materials handling.

› CLICK HERE TO VIEW

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	**29-31 October**	MECSPE, Parma, Italy	www.mecspe.com
	2-4 December	Plastic Expo, Tokyo, Japan	www.plas.jp/en-gb.html
	2-5 December	Plasteurasia, Istanbul, Turkey	www.plasteurasia.com/en
2021	**25 February-3 March**	Interpack, Dusseldorf, Germany	www.interpack.com
	9-11 March	Plastimagen, Mexico City, Mexico	www.plastimagen.com.mx
	7-9 April	Plastics Printing Packaging, Dar-es-Salaam, Tanzania	www.expogr.com/tanzania/pppexpo
	13-16 April	Chinaplas, Shenzhen, China	www.chinaplasonline.com
	4-7 May	Plast 2021, Milan, Italy	www.plastonline.org/en
	17-21 May	NPE 2021, Orlando, USA	www.npe.org
	1-2 June	Plastics Extrusion World Expo Europe **NEW DATE**	https://eu.extrusion-expo.com
	15-18 June	FIP, Lyon, France	www.f-i-p.com
	22-25 June	Colombiaplast **NEW DATE**	www.colombiaplast.org
	29 June-1 July	Interplas, Birmingham, UK	www.interplasuk.com
	14-18 September	Equiplast, Barcelona, Spain **NEW DATE**	www.equiplast.com
	12-16 October	Fakuma, Friedrichshafen, Germany	www.fakuma-messe.de
	3-4 November	Plastics Extrusion World Expo USA **NEW DATE**	https://na.extrusion-expo.com

AMI CONFERENCES

26-29 October 2020	Agricultural Film Virtual Global Summit
3-4 November 2020	Chemical Recycling Europe, Hamburg, Germany
16-18 November 2020	Waterproof Membranes Europe, Bonn, Germany
24-25 November 2020	Single-Serve Capsules Europe, Berlin, Germany
30 Nov-2 Dec 2020	Stretch & Shrink Film North America, New Orleans, USA
2-3 December 2020	Thin Wall Packaging Europe, Nuremberg, Germany
2-4 February 2021	Polyethylene Films North America, Coral Springs, USA
4-5 March 2021	Chemical Recycling North America, Houston, USA

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

www.ami.international