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DEVELOPMENTS IN PLASTICS FOR SOLAR CELLS

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POLYOLEFINS FOR FILM AND SHEET APPLICATIONS



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Film and Sheet EXTRUSION

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Double-digit growth for Italian machinery firms

Sales of Italian plastics and rubber processing machinery are expected to experience "double digit growth" for 2021.

Amaplast, which represents Italian machinery makers, estimates that full-year figures for 2021 will see production approach pre-pandemic levels.

"At the close of 2021, production should be a hair's breadth from pre-pandemic levels, reaching €4.35 billion (US\$4.75bn) - up 11.5% on 2020," said Dario Previero, president of Amaplast.

The main driver of recovery is the domestic market, which is forecast to close the year with growth of nearly 15 points and a value of €1.35bn (US\$1.47bn). Economic results from the first nine months of the year show an increase in orders from Italian customers - mainly for machinery and complete processing lines.

Exports are also expected to return to around €3bn (US\$3.27bn). Eight of the top



IMAGE: AMAPLAST

Previero: "Production should reach €4.35 billion in 2021 - up 11.5% on 2020"

10 Italian export markets - together accounting for nearly 60% of the total - show strong growth. Examples include a 17% rise in demand from Poland, and an 83% rise from China.

Orders received in the first three quarters of 2021, from domestic and foreign customers, cover production for the next six months - and mainly concern machinery. There is less demand for replacement parts. The highest demand is from the packaging and medical sectors, while construction and automo-

tive travel have seen more moderate demand.

Amaplast added that various instability factors - such as rising raw material and energy costs - continue to be a problem. However, the recovery recorded in 2021, give good reason to "expect performance beyond pre-crisis levels" next year, it said.

■ Amaplast was one of three Italian industrial organisations to highlight the issue of increasing production costs and raw material shortages.

In a joint statement with the association for ceramic machinery (Acimac) and the packaging machinery union (Ucima), it urged national and European leaders to address the issue - adding that the Ukraine conflict had 'further aggravated' the situation.

"High energy prices have impacted the availability of some essential raw materials for production," said the statement.

➤ www.amaplast.org

Investment boosts shrink film

Coveris has invested in its site in Montfaucon, France to increase production capacity for stretch and shrink hoods made from recycle.

The company has installed a new five-layer coextrusion line, allowing production of polyethylene shrink hoods and stretch hoods that incorporate post-consumer post-industrial recycled materials.

The technology makes it possible to offer a standard or non-stick shrink hood with optimised thickness that with 50% or more recycled material. The extruder also offers a range of thin stretch hoods featuring 30% recycled content.

"To meet the growing needs of our customers, this equipment also offers in-line printing, water-based ink, up to two colours on both sides, continuous or registered," said the company.

➤ www.coveris.com

Chinaplas 2022 postponed due to lockdown



IMAGE: ADSALE

This year's Chinaplas show has been postponed, according to the organiser, Adsale.

In a message on the show website, the company says that "further tightening of pandemic control measures in Shanghai" had led to the decision.

The show was scheduled to be held 25-28 April in Shanghai. Adsale did not specify a new date for the show, but said: "New dates and other details of the exhibition will be announced soon."

The message also said its online channels would help "connect suppliers and buyers from China and overseas".

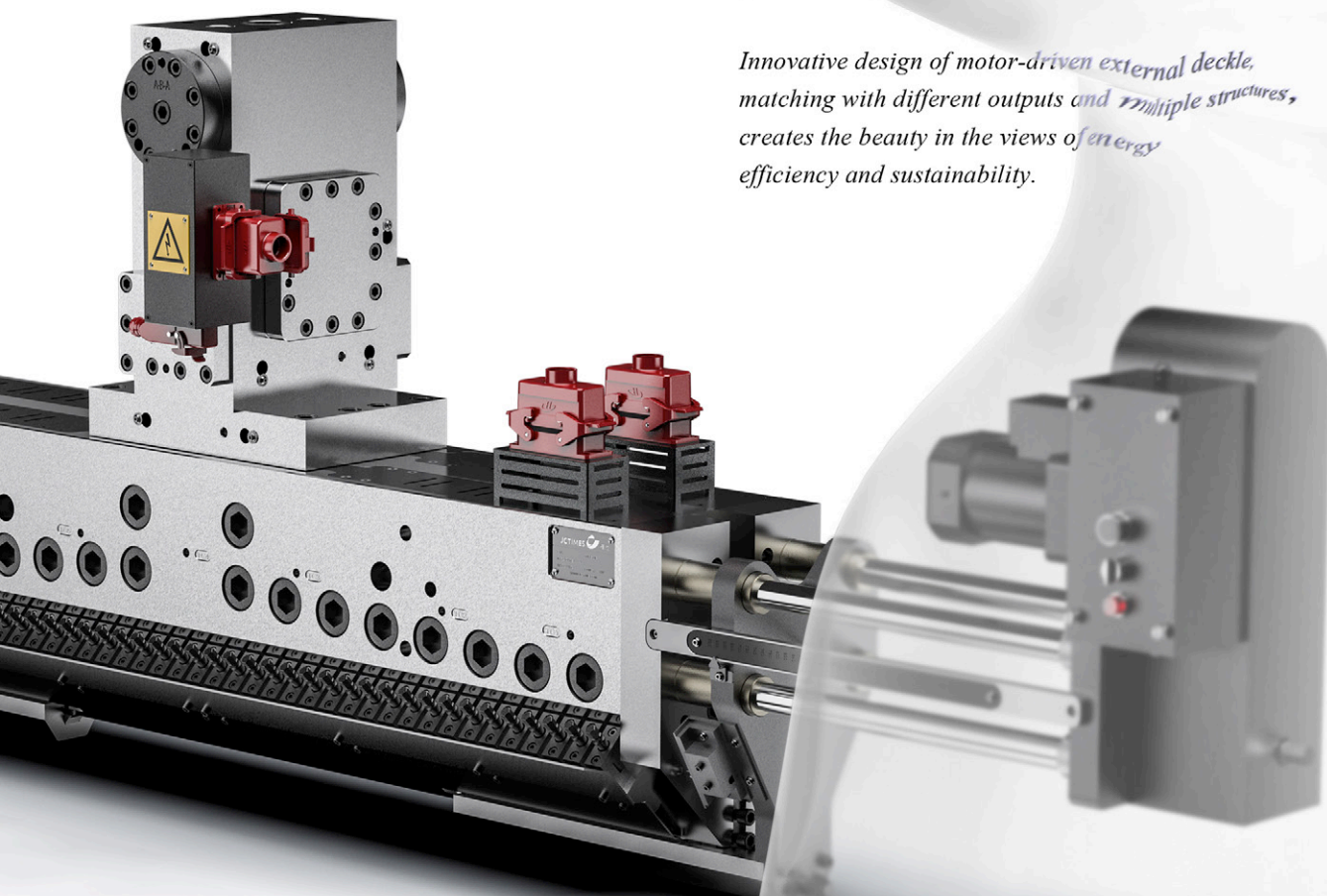
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'Sharkskin' film cuts plane fuel

BASF and Lufthansa have developed a 'sharkskin' film that helps to reduce aircraft fuel consumption.

Aeroshark is described as an 'adhesive riblet' film that reduces drag - and improves fuel efficiency. The patterns on the film are around 50 microns higher than the surface. However, this may be enough to reduce fuel consumption by around 1% if applied to a Boeing 777.

Swiss Airlines is using the film on 12 of its 777s, which it says will save around 4,800 tonnes/year of fuel - and cut carbon emissions by around 15,200 tonnes/year.

The developers say further improvements could help cut fuel use by 3%.

The film is easy to apply, and resistant to UV radiation, water, oil, and large temperature and pressure shifts.

➤ www.basf.com

Wastewater converted into plastic food trays

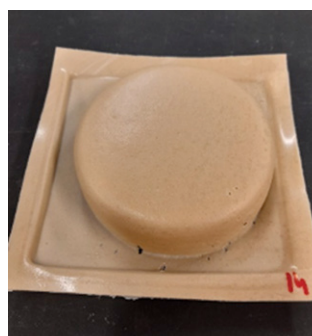
A pan-European research project has shown that organic matter from wastewater can be converted into bioplastic-based food trays.

Researchers in the Afterlife project also extracted essential oils and phenolic extracts from the water and used them as food ingredients.

The project ran four pilot plants in Belgium, processing wastewater from the confectionery, cheese and citrus fruit processing industries. The treatment capacity was one cubic metre of wastewater per day.

For production of the bioplastic (PHA), different

IMAGE: CELABOR



Above: Celabor produced this food tray from wastewater-derived PHA

alternatives were tested. These included the use of different types of bacterial cultures (pure and mixed cultures) and operation times. The results indicate the need for a fine control system in order to achieve

stable PHA production.

PHA-based materials were made by Lurederra of Spain. To improve its mechanical properties, the PHA was combined with another bio-based polymer. Celabor of Belgium used the material to make plastic trays for food packaging.

Nova Institute in Germany analysed social perceptions of the project - and found that participants were not concerned about food contact of wastewater-derived PHA.

The project, coordinated by Idener of Spain, began in 2017 and ended in February 2022.

➤ www.nova-institute.eu

TricorBraun buys distributor

US-based TricorBraun is to acquire flexible packaging distributor PBFY from PWS.

The acquisition, which is expected to close later this month, will expand TricorBraun's flexible packaging division.

All PBFY employees will remain with TricorBraun, as part of its flexible packaging division.

"PBFY is an important addition to our flexible packaging offerings, enabling us to provide

customers with expanded services and supply chain options," said Court Carruthers, president and CEO of TricorBraun. "We look forward to investing in its continued growth."

➤ www.tricorbraun.com

RecyClass issues polystyrene protocol

The latest RecyClass protocol covers post-consumer polystyrene pots used for yoghurt



The RecyClass initiative in Europe has published its Recyclability Evaluation Protocol for Polystyrene Containers, covering post-consumer polystyrene pots used for yoghurt and other food and beverage products.

The protocol aims to guarantee the mechanical recyclability of polystyrene packaging, while maintaining protection properties, ensuring polystyrene recycling process efficiency and

encouraging innovation, according to RecyClass..

RecyClass said the document details laboratory testing methodology and represents - as accurately as possible - how the polystyrene mechanical recycling process should work at an industrial scale, allowing polystyrene containers to be recycled into applications with a higher value.

➤ <https://recyclass.eu>

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PLASTICS EUROPE

Plastics Europe airs plans for circularity

Plastics Europe has released a report written by UK research group Systemiq about the plastics industry's transition to circularity in Europe. It has also proposed measures including "a new and enabling policy framework that better incentivises investment and innovation by fostering a climate of creative competition".

The report, which is called "Re-Shaping Plastics: Pathways to a Circular, Climate Neutral Plastics System in Europe", was developed by Systemiq with the support of an independent Steering Committee and Expert Panel that included representatives of EU institutions, NGOs, academia and industry. The study's aim was to evaluate current progress and assess the potential of different levers to help transition towards the EU's net zero carbon emissions and circularity goals by 2050.

Plastics Europe said the report "highlights the need for all up- and downstream levers to be engaged, including mechanical and chemical recycling, the use of alternative raw materials such as

bio feedstocks, and designing products for recycling and reuse".

A new and enabling environment for the transition to circularity must make available high-quality feedstock and access to affordable renewable and low carbon energy, it said. The group's plans include:

- Developing a roadmap for Plastics Europe and its members to accelerate the industry's transition towards 2050. This will include interim targets and policy recommendations.

- Ensuring all Plastics Europe policy positions are designed to accelerate the plastics' system's transition towards higher circularity and net zero emissions by 2050. This includes the need for transformation of upstream and downstream GHG reduction and circularity levers.

- Exploring the creation of a new multi-stakeholder platform in 2022, to ensure a step-change in the intensity and effectiveness of dialogue and collaboration with policy makers and the plastics value chain.

➤ <https://plasticseurope.org>

Klöckner Pentaplast adds rPET in North America

Klöckner Pentaplast is to expand its capacity of post-consumer recycled (PCR) PET in North America.

The expansion – due to be fully operational in the first quarter of 2024 – will add an extrusion line and two thermoforming lines. It will add a total of 15,000 tonnes/year of new rPET/PET capacity. KP says more than 20% of its product volumes are made using PCR material.

The new extrusion line will support production of sustainable product lines such as its recyclable pharma-

ceutical blister films and Smartcycle recyclable label and consumer packaging films. The thermoforming lines will produce KP Elite mono-material protein trays, which are made using up to 100% recycled PET.

KP has not yet decided on the location for the expansion, which will be situated next to one of its six North American plants.

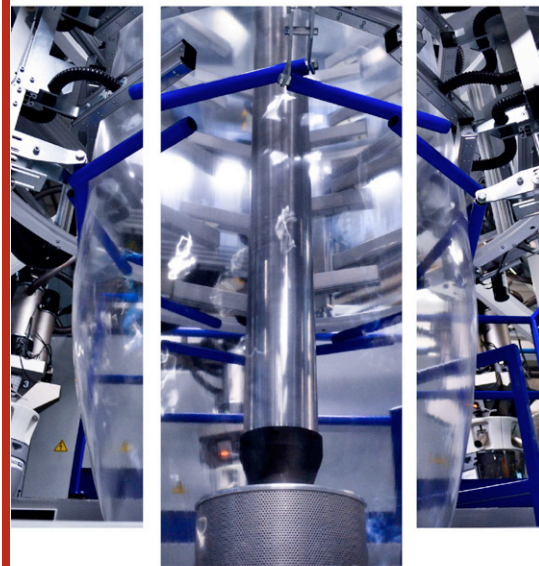
It says the expansion responds to strong demand for sustainable options among customers.

➤ www.kpfilms.com



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Sustainability is the key for polypropylene

Consumption of polypropylene in Europe reached 10 million tonnes last year.

A new **report** from AMI, *Polypropylene Markets in the EU 2022*, revises and updates the size and growth of demand for different applications and countries.

The effect of Covid-19 over the last two years has had some positive impacts - on sectors such as hygiene and packaging - and some negative impacts, especially on automotive.

"The key theme of the next five years is sustainability," said AMI.

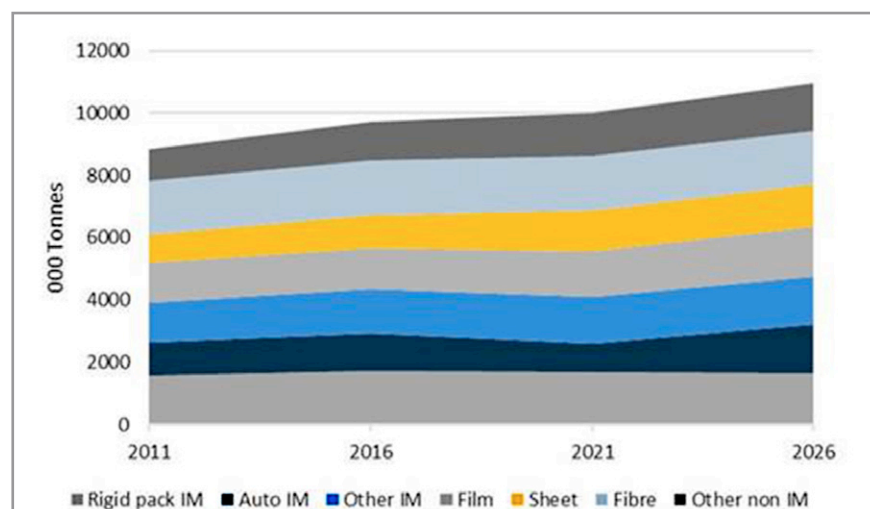
Single-use plastics legislation could affect both the rigid and flexible

packaging markets, as consumers turn away from plastic packaging. However, as there are limited alternatives, legislation may instead look to encourage redesigned packaging - such as the use of mono-materials for increased recyclability.

Recyclate should continue to take share, but impact will be relatively limited on PP over the next five years - depressing demand by less than 1% per year. The main reason for this is the availability of recyclate.

More information on polyolefins can be found in our special feature on **page 13**.

➤ www.ami.international



PP demand by process in EU, 2011-2026

Source: AMI

Sigma adds Vanish output

US-based Sigma Stretch Film is expanding production of its Vanish film to all five of its production facilities across North America.

The film is made using Smart Plastic Technology's 'bio-assimilation' technology - meaning that it breaks down completely after two years.

The film, first launched in 2021, can help brand owners to work towards

sustainability goals, said the company.

"Expanding Vanish production and taking our partnership with Smart Plastic to new levels will be a highlight of 2022 for Sigma Plastics as we continue striving for environmentally responsible products and practices," said Mark Teo, CEO and president of Sigma Plastics.

➤ www.sigmastretchtools.com

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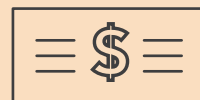
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Polyolefins ease the job of recycling

Polyolefins are the most commonly used packaging material – and are likely to cement that position with the creation of mono-material solutions that are easier to recycle



Polyethylene (PE) and polypropylene are the most common types of packaging material – for everything from stretch-wrap film and pallet wrap to modified atmosphere packaging and stand-up pouches.

Their market share is likely to keep increasing, due to the need to improve recycling rates. Many developers are developing mono-material packaging solutions, containing only PE, for instance. Other solutions make greater use of PE-derived feedstocks.

For instance, **SABIC** has teamed up with flexfilm manufacturer **Polivouga** and seafood producer Nueva Pescanova to develop frozen food packaging using post-consumer plastic waste.

The plastic, recovered from areas up to 50km inland from waterways, is converted into an alternative feedstock. This is then used to make linear low-density polyethylene (LLDPE) and low density polyethylene (LDPE), which Polivouga converts into flexible packaging film to package frozen seafood.

"This demonstrates how used plastic can be brought back into a circular material stream to be converted into high quality food packaging," said Sami Al-Osaimi, vice president of PE and sales at SABIC.

The certified circular polymers form part of SABIC's Trucircle portfolio.

Tiago Barros, CEO of Polivouga, added: "Besides delivering a food-contact approved polyolefin

product, these PE films ensure the same tear- and puncture-resistance as competing PE packaging structures made from virgin fossil PE resins."

In a separate project, Mars Petcare and **Huhtamaki** have developed cat food packaging using polypropylene (PP) from the Trucircle portfolio.

Huhtamaki produces a multi-layer flexible film structure – using PP BCT18F impact copolymer – to make retort pouches, which is then used to package wet pet food products for Sheba, a Mars brand.

"The fact we are now able to introduce recycled content into our Sheba pouches helps us accelerate our journey to achieve 30% average recycled content in our plastic packaging, and to reduce by 25% our use of virgin plastic," said Barry Parkin, chief procurement and sustainability officer at Mars.

Marco Hilty, president of Huhtamaki's flexible packaging division, added: "Processing recycled polymers into easy-tear films for wet retort packaging at an industrial scale is a significant milestone in delivering on our ambition to have more than 80% of our raw materials renewable or recycled."

Software update

Nova Chemicals has launched version 5.0 of its proprietary Bonfire film development platform, for modelling and simulating multilayer films.

The free tool for Nova Chemicals customers and value chain collaborators helps designers and

Main image:
SABIC has used post-consumer plastic waste to develop food packaging for frozen seafood



Above: The latest version of Nova's Bonfire film development platform helps developers to incorporate more PCRs in formulations

engineers shortlist film formulations and reduce the number of physical trials. It can also help converters achieve sustainability goals through downgauging, moving away from multi-material laminates and allowing post-consumer resin (PCR) incorporation.

The latest version adds several new modules and enhancements: a laminations structure builder; a sealant dashboard; a molecular architecture dashboard; and the addition of post-consumer resins (PCRs).

The laminations structure builder predicts properties for adhesive laminations made from a print web and a sealant web. In the past, these were most commonly made from mixed materials, such as a metallised PET print web with a PE sealant web. Designers are increasingly looking to use mono-material structures.

"Many of our customers rely on Bonfire when they're developing new film structures," said Dan Ward, technical service specialist at Nova. "Adding the laminations module helps them simplify the process of designing films for recyclable packaging."

Two new resin information dashboards provide data to help select the best resins for a given application. In the sealant dashboard, users can compare seal properties of up to five resins, with results presented in table and visual chart formats. The molecular architecture dashboard provides differential scanning calorimetry (DSC) results, which quantify the thermal properties of a resin. Up to five resins can be compared, and are presented in table and chart formats.

Separately, Nova has collaborated with Charter Next Generation (CNG) to increase the availability of PCR in flexible films. Nova recently delivered "railcar quantities" of PCR to CNG's manufacturing facilities.

"Incorporating PCR into products and packaging is an essential component to eliminating plastic waste," said Luis Sierra, president and CEO of Nova.

The recycled LLDPE supplied by Nova can be used in a range of non-food film applications

including e-commerce packaging, heavy duty sacks, collation shrink and industrial films.

Pouch printing

A multi-partner project has demonstrated a concept for recycling digitally printed pouches.

Dow and **Reifenhäuser** – along with **HP**, **Cadel Deinking**, and **Karlville** – have joined forces to recycle PE-based barrier pouches into new PE pouches that are suitable for repeat recycling.

Starting with a PE-based barrier food pouch, the team used mechanical recycling and de-inking to create a dishwasher MDO-PE 1 pouch containing 30% recycled content that was itself suitable for recycling. In a next step, the team is working on a digital product passport pilot to record recycling-relevant packaging properties and make the pouch identifiable for recycling within post-consumer waste management.

"We applied our full expertise and testing capabilities to make our resins work in this proof of concept," said Laura Evangelio, senior technical service and development specialist at Dow Packaging & Specialty Plastics. "The first PE-rich pouch was designed for recyclability with up to 5% EVOH in the total structure for barrier functionality."

The resins provided a high stiffness-toughness balance, low-temperature sealability, adhesion to extruded barrier layers and high bubble stability, she said.

For a second PE-based pouch, a solventless adhesive was used to enable the lamination of the MDO-PE film to the PE-film containing recycled resins from the first pouch.

The new resins have been co-extruded on an Evo 9-layer blown film line from Reifenhäuser, to produce PE-based packaging films at fast line speeds.

"We have modified and enhanced our production lines to enable films and packages not just to be economical and functional, but to meet the demand for recyclable packaging based on mono-material structures," said Ralf Wiechmann, head of film innovation at Reifenhäuser.

Red meat

Profol Americas, a manufacturer of cast PP and PE films, has introduced a breathable vacuum packaging film.

CPVac is a PP-based coextruded film that is designed to maintain the appearance of fresh red meat and produce. The film has the correct oxygen transmission rate to ensure that fresh meat and vegetables retain their colour on the shelf.

Other key features include low haze, customised

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Right: Innovia's Propacast KF is a clear PP film designed as a lamination solution to help improve PP recycling

films, recycle-ready solutions and options of either lock seal or peel seal compositions.

"Consumers are gauging their fresh meat and produce selections based on appearance, so it's critical to utilise breathable, low haze film that highlights the food product inside," said Mark VanSumeren, director of new business development at Profol.

Cast PP for lamination

Propacast KF, from **Innovia Films**, is a clear cast PP film that has been specifically designed as a lamination solution for HFFS, VFFS and lidding applications.

It is available as a 30-, 50- and 70-micron film with a wide heat seal range. It offers good coefficient of friction and anti-block properties, for easy processing on a range of packaging machines. KF has also been corona-treated on one side, to ensure suitable adhesion during lamination.

"With the drive towards simplified packaging



formats, and the need to develop mono-material structures, we developed this cast PP film to act as an inner sealing layer," said Stephen Langstaff, business development manager for packaging at Innovia Films.

When laminated to other PP films, such as its Propafilm CHS BOPP film, it can create an ideal structure for pouches, he added. Propacast KF is fully recyclable, says Innovia - especially in countries that already have the infrastructure to recycle PP films.

Shrink labelling

Taghleef Industries has developed a range of polyolefin-based shrink label films, which it says can ease the task of recycling.

Shape360 TDS is a high TD shrink clear label film that claims to improve PET bottle recycling quality and efficiency - by ensuring the separation of floatable printed sleeves from rigid PET flakes. Thanks to its low density, the weight of the label is



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60
1961-2021

IMAGE: MONDI



Above:
Mondi has developed a mono-material PP packaging solution for sliced cheese, allowing it to be recycled in its entirety

reduced. TDS is compatible with polyolefin sorting streams, so is ideal to pair with PP and HDPE containers.

TDS guarantees up to 65% shrinkage, enabling a gradual labelling of empty and thin-wall containers with no squeezing risk or air- and moisture-trapping. Its negligible MD shrink prevents undesired 'smile effect' at bottle extremities, says the company.

Say cheese

Mondi has developed a PP mono-material packaging solution for sliced cheese.

Most sliced cheese in the Netherlands is still packaged in mixed material film, which is difficult to recycle. The new packaging – developed with cheese packaging company Hazeleger Kaas and brand owner Westland Kaas – has a PP thermoformed top and bottom web, and a PP label, allowing it to be recycled in its entirety.

"The mono-material film is recyclable, performs well on Hazeleger's machines and keeps the cheese slices fresh on shelves," said Peter Jagt, regional sales for Benelux consumer flexibles at Mondri.

The solution has been certified as recyclable by the German institute Cyclos-HTP.

"Ultimately, the lighter film and improved product-to-packaging ratio meant we could reduce the amount of plastic used by 23%," said Andre Roeterdink, procurement manager at Hazeleger Kaas. "This made it possible to save 9.2 tonnes of plastic per year."

Market development

Asia and Australasia is still the largest production hub for PE film – with China the single largest manufacturing nation.

A report from **AMI**, called *Polyethylene Film – The Global Market*, says that developing markets offer the most growth potential for PE film. In mature Western markets, growth rates are lower

and producers are more focused on customised technical innovation to increase the range of end-use applications.

"Sustainability and environmental concerns are also shaping production trends and influencing material innovation in all regions, including MDO-PE and BOPE for mono-material, recycle-ready packaging," says the report.

The report maps the worldwide landscape of production and trade flows in PE film, and provides insight on resin usage and demand trends in key consumer and industrial applications.

Food packaging still accounts for the largest production volume globally, spurred by changing consumer lifestyles that require more convenience products. This category has also benefited from increased demand during the pandemic. In contrast, PE film for retail carrier bags is declining as a result of taxes and bans. As a consequence, HDPE's share of overall polymer use is declining.

Film improvement

ExxonMobil has developed a new range of LLDPE resins that it says combine stiffness, toughness and processability.

The company says that its Exceed S range can help converters reduce the complexity of film formulations and designs while improving performance, conversion efficiency and packaging durability.

It has launched three commercial grades, which are designed to ensure low melt pressure and high output on blown film lines. Further grades will be added later. The materials have already been sampled in around 100 applications with 75 customers.

Multi-layer film typically combines several materials – such as different types of PE – in order to maximise mechanical properties. A key attribute of Exceed S is its higher stiffness/toughness performance, which can add strength without the need for extra materials. This can allow superior performance – or downgauging.

The material can be used either as a core layer or a skin layer. When used as a core layer, it can typically replace a blend of LLDPE and HDPE – such as in stand-up pouches. In this type of structure, HDPE might account for around 20% of the blend – and could all be removed if using Exceed S. Applications include sacks, and laminated and non-laminated pillows.

"We're looking to get back more simplicity in the design," said Olivier Adam, head of market development for primary packaging in Europe at ExxonMobil.

The material can also be used for skin layers.

MacroCool D10

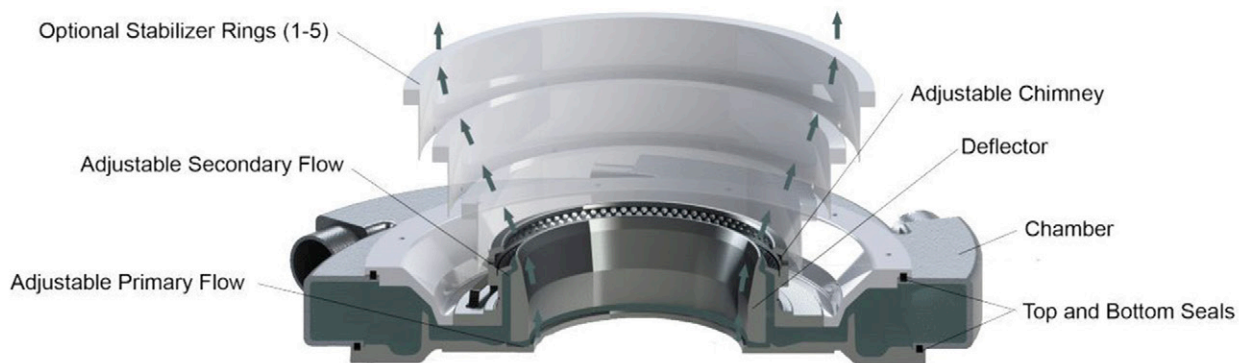
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IMAGE: EXXONMOBIL



Above: Heavy duty sacks for industrial use are one potential application of ExxonMobil's new Exceed S range of LLDPEs

This would be used in cases where the core layer is made from recyclate – which has less consistency than virgin resin. In these examples, the Exceed S skin would add stiffness – and reduce blocking – in applications such as industrial packaging.

In one example of downgauging, ExxonMobil has investigated freezer film. Historically, this has been around 70 microns thick, and is typically 50-60 microns now.

“We could easily reduce this to 35 or 40 microns using Exceed S,” said Adam.

Typical applications for the grades include heavy-duty sacks for industrial and agricultural use and silo bags for farming – taking advantage of increased puncture, impact and tear resistance. In primary packaging, non-laminated coextruded films used in pouches and bags containing liquid, food or other goods benefit from improved toughness – and are less likely to break when transported or dropped.

Improved attributes

Previous to this, ExxonMobil launched two new Exceed XP grades of PE that combine mechanical performance with features such as low density and fractional melt index (MI).

It says that Exceed XP 7021 and XP 7052 offer “a combination of attributes” not currently available in a single resin – such as high elasticity and holding force, puncture energy and dart impact resistance.

The grades also offer a combination of fractional MI and low density (0.911-0.912 g/cm³) not currently available, it said. This leads to films with enhanced bubble stability, while could help converters to increase output.

The materials can be used to make films for stretch hood packaging, collation shrink, primary packaging, and greenhouse applications.

“They are designed to help create innovative solutions to meet specific applications needs,” said Michael Vinck, global polyethylene new products marketing manager at ExxonMobil.

Producers of stretch hood packaging films, for example, can benefit from high elastic recovery and high holding force. Collation shrink films can be made with high shrink speeds at temperatures as low as 120°C. The films can also be sealed at low temperatures.

Capacitor film

Borealis and **Topas Advanced Polymers** are developing a new class of material for capacitor film – combining PP and cyclic olefin copolymers (COCs).

The companies say that EPN (ethylene-propylene-norbornene) will bridge the current performance gap between standard polymers and high-end plastics. By enabling higher film capacitor temperature resistance at lower cost, the material – when commercialised – will help improve power transformation and transmission, they added.

When commercially available, the first applications will be in traction inverters for electric mobility and inverters for solar and wind power.

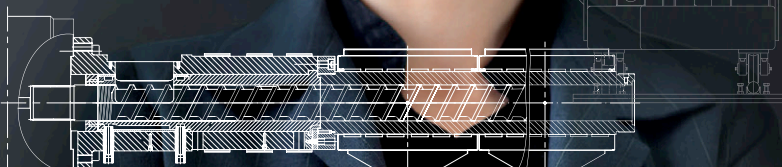
EPN will increase the temperature resistance of film capacitors by an estimated 20-35°C, compared to capacitors made of standard polymers. This will

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Right: Borealis and Topas are teaming up to develop a new material for capacitor film, combining PP and COCs

close the gap between conventional and high-temperature plastics – by allowing the use of polymeric film capacitors at endurance temperatures up to 140°C. EPN is targeted to be suitable for use on biaxially oriented polypropylene (BOPP) film-processing machines.

“Energy transformation and transmission must become more efficient and affordable. Meeting this challenge is the goal of our co-operation with Topas,” said Anton Wolfsberger, director of strategic polyolefins business projects at Borealis.

EPN will be used in electric mobility units, particularly when higher endurance temperature resistance and consistent frequency control are needed – such as in electric vehicles and high-speed trains.

Keisuke Goto, general manager of corporate strategy at Polyplastics – the main shareholder of Topas – added: “It is exciting to develop a solution that will become a cornerstone for the transition of the energy supply system.”

BOPP barrier

Cosmo Films has developed a metallised BOPP film with a high moisture and oxygen barrier.

With a thickness range of 15 and 18 microns, the film is suitable for adhesive lamination, which provides a good heat seal strength and allows cold seal adhesive reception on the non-metallic side.

The film can also be used as a sandwich layer in multi-layer laminate structures. Packaging made from the film can be used for food and personal care applications that require a high moisture barrier.

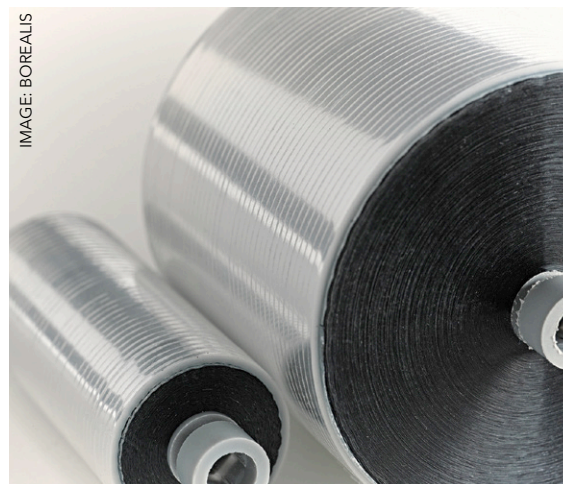
It is aimed at applications such as flexible packaging for lamination, packaging of biscuits, snacks, bakery products, chocolates and personal care products such as shampoo sachets.

“This addition to our range of barrier films improves the shelf life of the packaged product and helps create mono-material, eco-friendly structures,” said Pankaj Poddar, CEO of Cosmo Films.

In addition, Cosmo has modified its BOPP-based direct thermal printable (DTP) top-coated film. Adding a proprietary coating enables the formation of an image or impression on the film upon contact with the heated print head of a thermal printer.

The film is designed for niche applications including information labelling (such as airport baggage tags), inventory tracking and frozen food labelling. The non-tearable, cost effective, and film offers a matte finish.

With no need for extra expensive equipment, the film is available in thicknesses of 70, 75 and 95 microns.



Polar research

Researchers in Germany have used polar groups to modify the structure of polyethylene – making it more degradable without affecting physical properties.

A team at the **University of Konstanz** has managed to incorporate keto groups – a carbon and an oxygen molecule – into the PE chain. This is by using a catalyst that is “compatible with the carbon monoxide that is used as a reagent for producing keto groups”, said the researchers.

A key factor was to limit the number of keto groups that are introduced, in order to retain physical properties. However, the number of groups is enough to improve degradability: when exposed to simulated sunlight, the material displayed a slow chain degradation, said the researchers.

The work was published in the journal *Science*.

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Shining a light: advances in plastic photovoltaics

Organic solar cells rely heavily on plastics – and ongoing research that enhances their conversion efficiencies could one day see them compete head-on with silicon devices

Plastics are commonly used in solar cells – in components such as frames and backplates. This is due to the relative low density of plastic materials, allowing the creation of more lightweight designs.

However, away from conventional silicon-based solar cells, there is also a growing attention on so-called ‘organics’ solar cells, or organic photovoltaics (OPVs).

These rely on special types of plastic to replace the silicon element. These plastics are typically deposited onto a plastic matrix – which means OPVs are potentially far cheaper and more flexible than traditional solar cells.

One downside is that they are typically less robust and have lower conversion efficiencies. However, many research teams are trying to overcome these shortcomings.

Molecular interactions

Researchers at **Karlstad University** in Sweden are to study the interactions between different molecules in an organic solar cell – in an attempt to raise efficiency.

“We will study interactions between the electron-donating and the electron-accepting molecules,” said Ellen Moons, professor of physics at the university, who leads the research project.

She believes that these interactions affect the efficiency of the solar cells.

“We have previously investigated internal nanostructure, but now we want to manipulate this structure and the properties through molecular interaction,” she said.

Organic solar cells are typically made by mixing specific reactants in a solvent, spreading this onto a

Main image:
Linköping University researchers have used a ‘green’ solvent to make long-lasting organic solar cells

Right: Ellen Moons of Karlstad University leads a project to raise the efficiency of organic solar cells

polymer surface, and letting it dry.

"To improve efficiency, we need to better understand how these new molecules distribute in the layer - and how both donor and acceptor contribute to the absorption of the sunlight and the generation of electric current," she said.

The research team includes a range of disciplines. Some will create computer models of the molecules, and simulation tools to optimise structures and properties. Others will optimise the molecules, to build specific structures into each layer.

The research is supported by a grant from the Swedish Research Council.

Quantum boost

Also in Sweden, Karl Börjesson of the **University of Gothenburg** is applying quantum mechanics to organic solar cells - in an attempt to make them more cost-effective.

"There are excellent opportunities to use quantum efficiencies to change different chemical and material characteristics," he said.

In the study, the researchers present a way to increase energy diffusion in organic materials.

"This allows us to create organic solar cells with simpler structure," he said.

Quantum physics sounds a long way from plastic formulation, but the project could help to simplify the manufacturing process. Börjesson says that transferring energy within the cell is always in danger of being lost as heat. To overcome this, formulators typically blend two key materials together - but this makes cells less durable.

By 'coupling' materials at the quantum level, there is no need to physically blend them together, he says. According to Börjesson, the discovery could allow cells to be made with a simple layered structure - increasing their durability.

He also noted that the research is an extension of a concept already found in nature.

"Nature uses strong coupling between molecules to effectively transfer solar energy in photosynthesis," he said. "In principle, we have shown that the same basic concept can be applied to organic solar cells." The research was published in *Nature Communications*.

Better solvents

Meanwhile, researchers at **Linköping University** - also in Sweden - have managed to manufacture long-lasting organic solar cells using 'green' solvents.

According to Feng Gao, professor in the department of physics, chemistry and biology at the university, cells are typically made using "toxic solvents, with a relatively low boiling point". The low



IMAGE: KARLSTAD UNIVERSITY

boiling point can cause problems during manufacture, as the solution evaporates too rapidly.

In a paper published in *Nature*, Gao and colleagues describe the manufacture a solar cell - using a solution with a high boiling point and without toxic ingredients - that has an energy efficiency above 17%.

"This is a major step towards large-scale industrial manufacture of efficient and stable organic solar cells," said Gao.

In addition, the research identified a 'guest' molecule that boosts efficiency. It builds on work from a few years ago, when Chinese researchers developed a new acceptor material - called Y6 - which can raise cell efficiency. Now, Gao's team - with co-researchers from Soochow University in China - have identified a 'guest molecule' called BTO, which keeps Y6 molecules packed closely together, allowing a photocurrent to be generated efficiently. Adding BTO also enables larger areas of the solar cells to be manufactured with high efficiency, said the researchers.

Raising efficiency

Researchers from nine research institutions have identified a key mechanism that reduces efficiencies in organic solar cells - and suggested a possible solution.

The teams - from institutions including **Cambridge University** in the UK and **UC Santa Barbara** in the USA - published their findings in a recent issue of *Nature*.

The researchers identified a pathway in organic solar cells where current is lost - making them less efficient than silicon-based cells at converting sunlight into electricity. They discovered a way to suppress this - by manipulating molecules inside the solar cell.

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IMAGE: KAUNAS UNIVERSITY OF TECHNOLOGY



Above: A self-assembly technique to create a thin surface layer has been applied to OPVs

"Organic solar cells can do lots of things that inorganic solar cells can't, but their commercial development has plateaued in recent years - in part due to their inferior efficiency," said Alexander Gillett, of the Cavendish Laboratory at Cambridge University.

While a typical silicon-based solar cell has an efficiency of 20-25%, organic solar cells reach efficiencies of less than 19% under laboratory conditions - and real-world efficiencies of 10-12%.

Solar cells work because a photon of light excites an electron - leaving behind a 'hole'. These electrons and holes can be harvested as electricity if they can be kept apart. In organic solar cells, the electron and hole are more likely to recombine than in a silicon-based solar cell - hence their lower efficiency.

Researchers use two components to prevent this recombination: a donor material, which contributes electrons; and an acceptor material, which takes up electrons to generate and transport charges.

Using a combination of spectroscopy and computer modelling, the researchers tracked the mechanisms within organic solar cells, and identified a key loss mechanism.

They found that, by engineering strong molecular interactions between the donor and acceptor materials, it was possible to keep the electron and hole further apart - preventing them from recombining.

The researchers say their method provides a clear strategy for achieving organic solar cells with efficiencies of 20% or more.

The next hurdle is to improve the lifetime of organic solar cells - which the team is currently working to solve.

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Indoor performance

Researchers in Scotland have demonstrated a plastic solar panel that works indoors – while performing high-speed optical data communication.

The research – led by Professor Harald Haas from **Strathclyde University**, and Ifor Samuel and Graham Turnbull at **St Andrews University** – takes a step towards self-powered data-connected devices.

The team showed that organic photovoltaics (OPVs) – solar cells made from plastics – are suitable for high-speed optical data receivers that can also harvest power. An optimised combination of organic semiconductor materials created stable OPVs that converted indoor lighting into electricity.

“OPVs offer an excellent platform for indoor power harvesting for mobile devices,” said Turnbull. “Their advantage over silicon is that the materials can be designed to achieve maximum quantum efficiency for typical LED lighting wavelengths.”

OPVs are easy to make, allowing mass integration into internet-connected devices, said Haas. Compared to inorganic devices, they could be much cheaper – which could allow their large-scale commercial adoption.

Self-assembly

Technology that was used to improve the performance of silicon and perovskite solar cells has now been applied to organic solar cells.

Researchers at **Kaunas University of Technology** (KTU) in Lithuania – who earlier a technique called self-assembling molecular-thin layer (SAM) – have now applied it to OPVs, in collaboration with scientists from **KAUST** in Saudi Arabia.

“We made some modifications to the material used in SAM formation to tailor it for organic solar elements,” said Artiom Magomedov, who co-developed the technique.

The technology – which he says is cheap, efficient and versatile – involves dipping the surface into a solution, which forms a molecule-thick semiconductor layer.

As the materials have already been commercialised – and are freely – the discovery continues to advance the development of photovoltaic technologies, said the researchers.

The technology was first applied to OPVs by the group of researchers headed by Thomas Anthopoulos at KAUST, which led to further cooperation.

“We sent synthesised materials by post, and our

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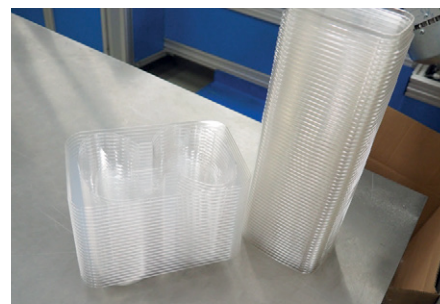
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Top: Partly coated with anti-fog



Bottom: Stacked packaging, coated with anti-block

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colleagues in Saudi Arabia built the organic solar cells and measured their properties,” said Mago-medov.

Herbicide boost

Anthopoulos was also involved in developing an unlikely sounding way of boosting solar cell efficiency – by adding small amounts of a well-known herbicide as an impurity.

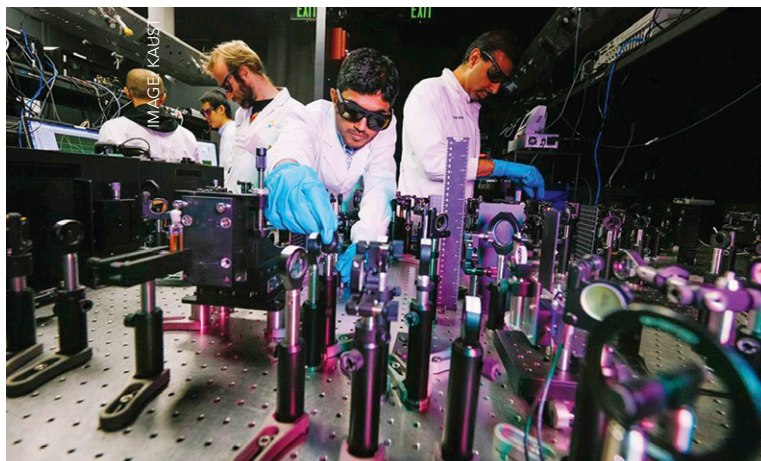
He and his team – including Yuanbao Lin -- used diquat as a molecular donor dopant to enhance conversion efficiency of OPVs.

Photovoltaic devices typically have an n-type region and a p-region – which have a net negative and positive electric charge, respectively. These charges can be achieved by adding impurities.

The dopant was added to two organic material systems that have previously shown high photovoltaic performance. In one case, the power conversion efficiency was improved from 16.7 to 17.4%, while they attained a maximum efficiency of 18.3% in the other. This was possible because the dopant increased both the materials’ optical absorption. It makes diquat a promising choice for the next generation of organic solar cells, said the researchers.

“The predicted maximum efficiency of the organic solar cell is around 20%,” said Lin.

Separate to this, other KAUST researchers have studied ‘heterojunctions’ – blends of light-responsive electron donor and acceptor materials. Here, the researchers discovered several reasons why non-fullerene acceptors (NFAs) work so well. It did this by monitoring the photophysical processes that influence charge generation in 23 different NFA-based systems. The team plans to design new



materials combining enhanced charge-generation efficiencies with lower energy losses.

Silicon-based solar cells continue to dominate the field, as they continue to outstrip OPVs in terms of efficiency and longevity. However – as can be seen from these examples – research teams are chipping away at these advantages, and are confident that they can help to develop commercial OPVs that will find their own niches – as well as competing head-on with traditional photovoltaic devices.

Above: KAUST researchers have studied why non-fullerene acceptors (NFAs) work so effectively

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Roll play: slitters and rewinders

Recent advances in slitting and rewinding include shafts that cut the cost of cardboard cores, a winder allowing faster reel change and increased use of cloud-based platforms

Slitting and rewinding is critical when converting finished rolls of film into saleable – and valuable – end products. Doing these jobs effectively helps to raise overall production efficiency.

Hosokawa Alpine has developed the AW winder, which it says offers high performance in demanding applications.

The model combines and expands the advantages of two existing models: the 700 winder and the AWD winder.

The AW winder allows working widths of 1,000 to 3,000mm and a roll diameter of up to 1,500mm. The winding speed is up to 300 m/min with a maximum tensile force of 250N. Winding shaft diameter is detected automatically. Winding shafts are available in 3, 6 and 8in versions. Existing shafts from the Kolb 700 series, which are widely used by Alpine customers, can also be used. The pre-nip can be integrated into the winding station or used separately, depending on customer needs.

In addition – in case of a telescoped reel blocking the reel change – there is now an operating function allowing its release and completion of the reel change. In this way, production can continue without interruption.

“With the AW winder, customers benefit from maximum flexibility and high reel quality,” said

Holger Niemeier, managing director and head of blown film extrusion at Hosokawa Alpine. “The effective reel change time is now less than 45 seconds, saves valuable time.”

The new model also includes the interface to the company’s ExVis 5 process visualisation system, so that operating and process data can be visualised in a user-friendly way and optimally managed, he added.

The AW winder can wind in both directions (right and left) thanks to its reverse function.

“Clever software functions are also available,” said Niemeier. “An initiated reel change can be stopped again without disturbing the process – such as if a winding core was prepared incorrectly.”

In addition, trends of tensile stresses can be displayed and monitored to boost the quality of the end product. Other options include: oscillating longitudinal slitting units; additional spreader rollers; winding shaft lifting devices; winding shaft magazines; and edge trim management.

Stretch winding

Colines of Italy has made further improvements to its AllRollex cast lines for stretch film production, with a new winding system.

With high speed and quality in production, the

Main image:
LAEM IMS
presented its
Riboslit and
TR4 machines
at ICE recently

IMAGE: SHUTTERSTOCK

IMAGE: COLINES



Above: Colines has enhanced its AllRollex stretch film lines with a new winding system

winders help to raise performance, which improves the quality of rolls while maintaining high production speed, said the company.

"Our latest developments are related to the use of special expanding shafts," said Nicola Lombardini, R&D manager at Colines. "They can guarantee the highest quality when winding machine rolls using 800g cardboard cores, which are 20% lighter than the common 1kg cardboard cores used on our lines since 2013."

For manual rolls, the company set its new standard to 220g for the cardboard cores – around

25% lighter than typical 280g cores.

"We also improved performance in term of flexibility," he added. "Our customers don't need to stop or slow down the line when they want to change roll parameters (width or diameter) – thanks to the fully automatic core-loading system."

In addition, the 'soft' roll-unloading system ensures high-speed unloading of each roll with no damage to the roll itself, he said.

Embrace the cloud

In a recent blog post **Davis-Standard** explained how a cloud-based platform can support unwind splicing and transfers on continuous web substrate processing lines.

Consistent unwind splicing and winder transfers are crucial to high productivity, said the company – especially for flexible packaging applications that are moving towards thinner web materials and faster production speeds.

"There is little room for error when trying to achieve profitability and output goals," said the company. "Each time an unwind or winder transfer failure occurs on a roll-to-roll web processing line, the line must be stopped – and you're looking at an

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Film and Sheet
EXTRUSION

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Right:
Hosokawa
Alpine's AW
winder
combines the
advantages of
its 700 and
AWD models



IMAGE: HOSOKAWA ALPINE

hour or more of lost production time."

Cloud-based platforms can provide the digital tools needed to diagnose and predict when degradation of a critical element reaches a certain level. An example is DS Activ-Check – a customisable, cloud-based platform that uses sensors, predictive analytics and control programs to supply real-time data about critical parameters and key performance indicators (KPIs).

Davis-Standard has created several examples of how analytics – using a cloud-based platform – can support operations based on typical challenges in roll-to-roll web processing.

The first is to continually monitor roll diameter and the concentricity of incoming rolls of material to the unwind. A laser or other advanced sensor can accurately measure the roll and provide feedback to ensure that concentricity is within an acceptable range. If the measurement is out of range, an operator is immediately warned. The line can be automatically slowed down or stopped to adjust and avoid a poor or missed splice.

Secondly, predict issues that impact roll change performance. Sensors on the unwind and winder can highlight pressure issues beyond the acceptable variation for consistent transfers and quality winding.

This can include monitoring the transfer paste nips and the programmed nip force for the pressure roll while winding. Variation in unwinding and winding web tensions – during and after a transfer – can be observed and compared to setpoints.

And thirdly, make sure that cut-off knives on both the unwind and winder are sharp enough for clean cutting of the web. The timing of knife replacement will vary depending on the abrasiveness of the web material and the speed and diameter of rolls being processed. Smart technology tracks the number of times the knife has been fired in order to predict sharpness, maintenance, and potential replacement.

"Our industry has reached a point where scrap, downtime, and lost production due to missed splices during the unwinding and web transfer process can be prevented," said the company.

"Implementing tools that increase the productivity and profitability is absolutely essential in the years ahead."

ICE breaker

Several slit and winder manufacturers presented their latest developments at the **ICE** converting exhibition, which was held recently in Munich in Germany.

One of them, **LAEM IMS**, presented two of its machines. Riboslit is its new, compact slit-re-winder designed for flexible packaging converters – requiring minimum operating space and investments; and TR4, a robust, automated slit-re-winder designed for high productivity and efficiency requirements.

CLICK ON THE LINKS FOR MORE INFORMATION:

➤ www.hosokawa-alpine.com

➤ www.colines.it

➤ www.davis-standard.com

➤ www.ice-x.com

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RECYCLING

Additives add performance to various recycled plastics

BASF has developed IrgaCycle, a range of additives that improve the properties of mechanically recycled plastics.

Many areas of the plastics industry – including film and sheet – are looking to use more recycle in their products. To do this effectively, converters need to ensure that plastics that have been through the heat and mechanical stress of recycling retain their physical properties. These properties can also be affected by impurities and polymer contaminants that accelerate degradation.

"The production of plastics from mechanical recycling is expected to almost triple by 2030, driven by improved technologies and regulation," said Thomas Kloster,

president of BASF's performance chemicals division. "This corresponds to a growth of 10% per year."

The IrgaCycle range includes additives that can increase the percentage of recycled content in end-use applications including those in packaging. They address specific quality issues of recycled resins, such as limited processability, poor long-term thermal stability and insufficient protection from outdoor weathering.

The company has begun with five grades, but this will be expanded in future. One is of particular interest to film and sheet manufacturers: IrgaCycle PS 031 G improves processing and long-term thermal stability of recycled LDPE and LLDPE – for incorporation into films and related flexible packaging applications.

Other grades also have potential use in film and sheet – such as IrgaCycle PS 032 G, which provides "processing stability and long-term thermal protection for recycled PP and polyolefin blends containing impurities".

An advantage of the blends is in their ready-to-use product forms, which are easy to apply in the recycling steps. The granulated, non-dusting product form ensures safe and easy dosage during converting or compounding.

Volker Bach, global lead innovation at BASF plastic additives, added: "With our global setup, we can engage across the entire value chain of the recycling industry – be it with brand owners or converters alike, and in all regions."

➤ www.basf.com

ADDITIVES

Omya's recycled CaCO₃

Omya has introduced a range of certified recycled calcium carbonate (CaCO₃) fillers.

The Omyaloo grades are made at its site in Avenza in Italy from selected waste material from other mineral processing industries.

Applications are seen in areas such as recycled PE for PE refuse sacks, where it can improve the dispersion of polymer components.

"To use the semantics of the plastics industry, Omyaloo is a post-industrial recycled material," according to Omya's Olivier Seyvet.

Omya says that the carbon footprint is comparable to that of conventional grades of calcium carbonate.

➤ www.omya.com

ADDITIVES

Graphene for polymer composites



UK-based masterbatch manufacturer Colloids is developing a new facility to make bespoke polymer composites using its graphene masterbatch technology – called Graphanced.

Colloids has been working on its graphene R&D for more than seven years, through a number of collaborations with leading graphene producers. This work has led to the formulation of novel polymer composites. As a result, Colloids can now offer bespoke solutions to its customers.

"We are proud to have achieved

some remarkable developments in this field and are now working with major customers in the commercialisation of these products," said Marios Michailidis, new product development manager at Colloids, who was instrumental in developing the Graphanced masterbatches.

In addition to its bespoke service, Colloids plans to commercialise new products with enhanced functionality based on graphene and other 2D materials and nanomaterials.

➤ www.colloids.com

SHRINK FILM

Preventing corrosion and ESD

Cortec says that its latest shrink film can protect against damage from both corrosion and electrostatic discharge (ESD).

Its EcoSonic VpCI-125 ESD shrink film (HP-UV) combines multi-metal corrosion protection with static dissipative properties. Users of the film can shrink-wrap small or large components as normal, to conform to the shape of the object.

The film can replace conventional rust preventatives such as oils and desiccants, allowing products to be used immediately without cleaning or degreasing. Sealing products in the film will protect against rust, tarnish, stains and oxidation.

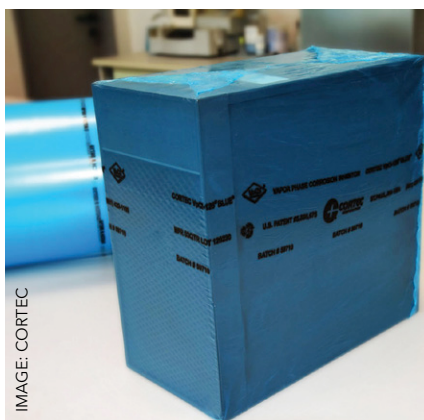


IMAGE: CORTEC

The film also protects components from electrostatic discharge, and conforms to the surface resistivity and static decay requirements of MIL-PRF-81705 D (Static Dissipative

Packaging Materials). It is safe to use and does not contain any harmful Prop 65 ingredients, says the company.

The film has been tested and found to be effective for up to two years of corrosion protection and one year of ESD protection. The corrosion inhibitors vapourise and condense on all metal surfaces within the enclosed space and diffuse to every area of the part – protecting the exterior as well as void spaces and recessed areas.

The recyclable, non-toxic film prevents ESD damage, and has no effect on optical properties – or on plastics that are used in the electronics industry.

➤ www.ecocortec.hr

SHRINK FILM

Helping bananas to ripen

Ineos Styrolution's DK11 K-Resin has been used to make packaging film for better fruit preservation.

It says that Chinese banana farmers have used it to control the ripening of bananas during transportation from Yunnan to other coastal regions in China.

The tough, high clarity film preserves the freshness, colour and integrity of the fruit while allowing to ripen organically ripen, without the use of preservatives or ripener during transportation.

It combines good thermal stability with high gas permeability.

➤ www.ineos-styrolution.com

BARRIER FILM

Oxygen coating allows mono-material packaging

Printing ink specialist Huber has developed a surface coating that can improve the barrier properties of flexible packaging.

Its Hydro-Lac GA oxygen barrier coating is an alternative to multi-material barrier packaging, which makes recycling easier.

"Conventional flexible food packaging often consists of several laminated film layers of different chemical natures," said Ralf Büscher, senior expert projects for flexible packaging at Huber.

However, packaging that consists of several plastics cannot be recycled at all – or only with great effort."

The new coating is



IMAGE: HUBER GROUP

applied between laminates of the same polymer – typically polypropylene (PP) or polyethylene (PE) – to create mono-material barrier packaging. An OTR (oxygen transmission rate) of less than 10 cubic centimetres of oxygen per square metre and day can be achieved under industrial conditions

using PP, says Huber.

"Through innovative solutions such as our new barrier coating, we can contribute to a circular economy together with our customers," according to Lutz Frischmann, global product director flexible packaging at Huber.

➤ www.hubergroup.com

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www.ami.ltd/Polymer-Sourcing-event

PRINTING

Curing module emits two different wavelengths

US-based Baldwin Technology Company introduced several new technologies at last month's ICE show in Munich, Germany.

One was its XP Quatro LED-UV curing module, with one head and two frequencies for broader applications. It is designed to cure LED-formulated printing inks and coatings on sheet-fed and web offset printing presses, as well as on larger-format flexo presses and digital print engines.

It provides high system flexibility and reliability, says Baldwin. Hosting two large, high-performance LED-UV arrays, the new module delivers twice the dose of a standard LED solution in a size only slightly larger than Baldwin's standard compact XP module. The XP Quatro can emit two different



wavelengths from the same head, which has several advantages.

One example is applications that require simultaneous powerful curing of deep-layered substrates and surface-curing for inks. This is because longer wavelengths penetrate more deeply, while the shorter waves achieve surface curing. Also, in applications with dual chemistry on one substrate – such as two ink colours that cure better with different frequencies – both can be cured simultaneously.

The XP Quatro allows

easy integration of LED-UV technology into virtually any analogue or digital printing press, to enhance print quality while operating at high speed.

In addition, Baldwin featured its automated Film Cylinder Cleaner at ICE, which cleans debris from the surface of process cylinders – removing the need for hand-cleaning. By automating this process, film extruders do not need to stop the line to remove debris build-up from the cylinder surface.

"Customers don't want to clean these large cylinders by hand," said Peter Hultberg, chief commercial officer at Baldwin. "Our Film Cylinder Cleaner offers the benefit of reducing the risk of damaging cylinder surfaces."

➤ www.baldwintech.com

RECYCLING

Oben adds a BOPP line

Oben Holding Group, based in Lima in Peru, has ordered another machine from its regular supplier, Brückner Maschinenbau of Germany.

The company has commissioned a second high-speed BOPP line for OPP Film Colombia, based in Barranquilla. The site has an annual production of 70,500 tonnes of film. The new 10.6m line has a production speed of 625 m/min and an output of 8.8 tonnes/hour.

Brückner previously supplied Oben with a 10.4m BOPP line in November 2020 and a 10.5m BOPET line in March 2022.

"This highlights Oben's confidence in our stretching line technology," said Helmut Huber, COO for sales and project management at Brückner.

➤ www.brueckner.com

CONTROL

Modular engineering for web processing

Baumüller has developed a new template – called Web & Foil – that can be used specifically for web processing machines.

Its software templates can save developers lots of time. They contain many of the required functions – as well as motion modules and templates – for operations such as alarm handling and prepared visualizations. This means that machine programmers no longer have to worry about the basics during

development – and can focus on process programming.

With Web & Foil, Baumüller is expanding its machine templates to include web processing machines. Web processing machines usually have a virtual master axis, to which other drives of the individual process steps are synchronised.

Many automation providers deliver individual libraries for each respective software project. However, the Web &

Foil template contains the necessary libraries as well as general templates for implementation of visualisation or fault management.

The developer does not have to set up the basic functions from scratch, as these are selected and parameterised directly. Routine tasks, such as the instancing of motion modules or linking variables with the modules, are no longer necessary.

➤ www.baumueller.com

CAPACITOR FILM

Dielectric film from cast line

Davis-Standard has supplied a cast film line to US-based Peak Nano Films – a specialist in dielectric film for capacitor applications.

With the equipment, Peak Nano Films will move into production with a new film for the automotive, military, electrical grid and industrial markets. The company says the nanolayered film is the first major materials improvement for solid-state film capacitors “in decades”.

Davis-Standard helped validate the process and tailor machinery based on the company’s needs.

“Davis-Standard’s technical expertise enabled us to collaborate on new processes, and define machinery features prior to purchase,” said Mike Hus, senior vice president of engineering at Peak Nano.

Peak Nano says that its dielectric film structure overcomes current technology challenges to provide longer capacitor life, higher temperature resistance, greater breakdown strength, and a smaller footprint for capacitor designs.

The new line includes a custom feedscrew, which was designed specifically to adapt to the process requirements for this dielectric film.

➤ www.davis-standard.com

➤ www.peaknano.com

RECYCLING

Removing recyclate smells

Kreyenborg has developed a new technology to help reduce the odour of recycled plastic waste.

Its IR-Fresh is a modular system that removes strong-smelling substances from recyclate.

In the first process step, an infrared module – installed above the material bed – heats the material to its optimum temperature. Continuous rotation of a drum ensures homogeneous mass flow with a defined dwell time. Due to the rotation and mixing elements being integrated in the spirals, the material is continuously mixed in the drum with constant surface exchange. Com-



IMAGE: KREYENBORG

bined with controlled heating, this ensures considerable odour elimination, even in a short time.

In the second process step, any remaining odorous substances in the regrind or granules are removed by a thermal-physical cleaning process in the IR-Fresh Conditioner – an insulated

hopper that keeps the material at a temperature that is matched to the decontamination process, by means of a hot purge-gas.

The IR-Fresh process can be used continuously in two stages both, for regrind (before extrusion) and for granules (after extrusion).

➤ www.kreyenborg.com

BLOWN FILM

Making heavy-duty bags fast

Reifenhäuser says that a high-performance cooling system has allowed it to make heavy-duty bag at rates of more than 600 kg/h.

The Ultra Cool 2.0 FFS system, for its Evo FFS blown film line, manages to boost throughput while maintaining optimum film properties thanks to

high-precision, flow-optimized components, says Reifenhäuser.

By running at 600 kg/h, Reifenhäuser says it exceeds typically high outputs by 50-100kg. Evo Ultra Cool 2.0 FFS is suitable for all common formulations and applications (such as consumer goods and agricultural film).

“With an output exceeding 600 kg/h, we provide our customers with an attractive return on investment – and the potential prospect of long-term success on the market,” according to Eugen Friedel, sales director at Reifenhäuser Blown Film.

For its Evo FFS lines, Reifenhäuser offers the premium version (Ultra Cool 2.0 FFS) and standard version (Evo Cool FFS). All Evo FFS lines are equipped with Reifenhäuser Eo extruders and die heads for optimised melt quality at low melt temperatures, says the company.

➤ www.reifenhäuser.com



IMAGE: REIFENHAUSER

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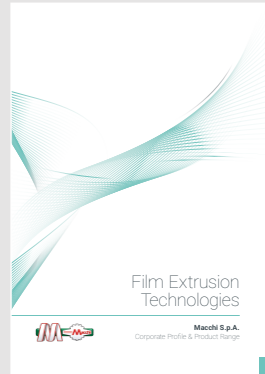
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Based on a novel polymer/mineral mix, the Scanfill range of packaging resins can minimise environmental impact by reducing polymer consumption, non-renewable energy use and greenhouse gas emissions without sacrificing barrier performance. Find out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

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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.

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COLINES: BARRIER FILMS



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

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CHEMOURS: PROCESSING AIDS



In this brochure, Improving the Efficiency and Quality of Polyolefin Extrusion, Chemours explains how issues including melt fracture and extrusion instabilities can be addressed with its Viton FreeFlow products, the next generation of polymer processing aids.

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POLYSTAR: PLASTICS RECYCLING



Recycling Made Simple is the brochure from Polystar where you can find information about all of the company's plastics recycling systems. Its Repro Flex lines can recycle post-industrial and post-consumer PE/PP packaging and PP raffia/woven materials.

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GLOBAL COLORS GROUP



Find out about Global Colors Group in this brochure showcasing the group companies, their vision and focus on quality, R&D, technology and sustainability. Its portfolio includes colour, white and black masterbatches.

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

Revolution

Head office:	Little Rock, Arkansas, USA
CEO:	Sean Whiteley
Founded:	1986
Ownership:	Private
Profile:	Revolution was founded in 1986 as Delta Plastics in Stuttgart, Arkansas, with a focus on providing efficient irrigation to local farmers. It later expanded to Little Rock and - in 2009 - began its first recycling facility and introduced garbage bags made largely from recycle. Its range of products now includes agricultural films and bags, plastic sheeting, carryout bags and stretch film. Since 2019, it has been owned by private equity firm Arsenal Capital Partners.
Product lines:	The company has a particular focus on using recycle to make its products. Its agricultural products include grow bags, grain bags, silage bags, ground cover film and greenhouse film. Its carryout bags include tamper-evident bags - to ensure that food arrives safely. Food preparation products include pan liners and sanitation barriers. Its Eco Pro plastic sheeting is made with up to 30% PCR material and is typically used in construction applications. Its stretch film is available in both manual and machine versions, with high puncture resistance. It also has a range of garbage bags made from post-industrial recycle.
Factory locations:	The company has various locations across North America, due partly to the number of acquisitions it has made. Last year, it acquired Indiana-based Jadcore - which has an output of around 100m pounds (45,000 tonnes) per year. It also produces film in locations including St. Paul, Minnesota, Little Rock, Arkansas and Kilgore, Texas.

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:

May 2022

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Materials handling
Converting & bag making

June 2022

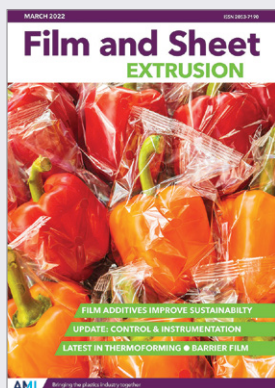
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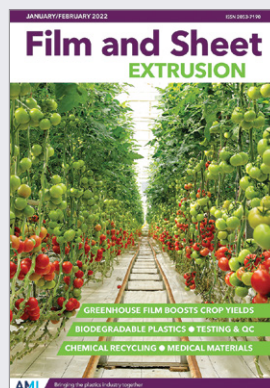
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Film and Sheet March 2022

The March 2022 edition of Film and Sheet Extrusion explores the latest innovations in additives for packaging films. It also looks at developments in process control and instrumentation, barrier film technology, and thermoforming.

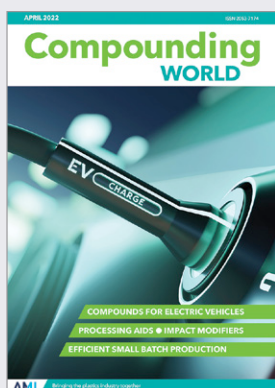
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Film and Sheet January/February 2022

The first edition of Film and Sheet Extrusion magazine in 2022 explores innovations in the agricultural film industry. It also looks at how enzymes may be used as plastics additives, and reviews developments in bioplastics, quality testing, and medical applications.

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Compounding World April 2022

The April issue of Compounding World has a cover feature on how demands on plastics from electric vehicle applications in terms of electrical performance are intensifying. Plus features on impact modifiers, small batch compounding and process aids.

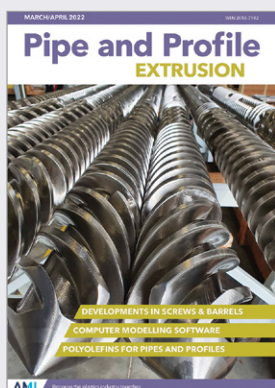
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Plastics Recycling World January/February 2022

The January-February issue of Plastics Recycling World looks at how PVC recycling is spreading around the world and the growing momentum in flexible packaging recycling, plus new developments in pelletisers.

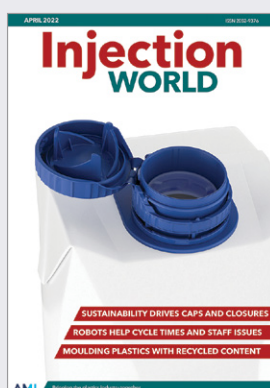
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Pipe and Profile March/April 2022

The March/April edition of Pipe and Profile Extrusion looks at how optimised screw designs can lift production efficiency. This issue also explores some new highly demanding application areas for PO pipes and reviews the latest in computer simulation tools.

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Injection World April 2022

The April issue of Injection World has an in-depth feature on tethering and recycled content in the caps and closures sector, plus other features covering moulding compounds with recycled content, and the latest injection moulding robots.

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GLOBAL EXHIBITION GUIDE

2022	25-28 April	Chinaplas, Shanghai, China POSTPONED	www.chinaplasonline.com
	3-6 May	GreenPlast, Milan, Italy	www.greenplast.org
	16-18 May	PlastAlger	www.plastalger.com
	24-27 May	Plastpol, Kielce, Poland	www.targikielce.pl/en/plastpol
	26-30 September	Colombiaplast, Bogota, Colombia	www.colombiaplast.org
	27-29 September	Fachpack, Nuremberg, Germany	www.fachpack.de
	4-7 October	Plastex, Brno, Czech Republic	www.bvv.cz/en/plastex
	19-26 October	K2022, Dusseldorf, Germany	www.k-online.com
2023	9-10 November	Plastics Extrusion World Expo North America	https://na.extrusion-expo.com/
	29 Nov-1 Dec	Plastic Print Pack West Africa, Accra, Ghana	www.ppp-westafrica.com
	17-19 January	Swiss Plastics Expo, Lucerne, Switzerland	www.visit.swissplastics-expo.ch
	1-5 February	PlastIndia, New Delhi, India	www.plastindia.org
	4-10 May	Interpack, Dusseldorf, Germany	www.interpack.com
	5-8 September	Plast 2023, Milan, Italy	www.plastonline.org/en
	17-21 October	Fakuma, Friedrichshafen, German	www.fakuma-messe.de


AMI CONFERENCES

12-14 April 2022	Stretch & Shrink Film Europe, Barcelona, Spain
10-12 May 2022	Plastic Pouches, Barcelona, Spain
13-15 June 2022	Thin Wall Packaging North America, Chicago, USA
14-15 June 2022	Chemical Recycling Europe, Cologne, Germany
16-17 June 2022	Multilayer Flexible Packaging North America, Chicago, USA
16-17 August 2022	Agricultural Film North America, San Diego, USA
30 Nov-1 Dec 2022	Breathable Films Europe, Berlin, Germany

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

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