

# Injection WORLD



**PACKAGING UPDATES: ADAPTING TO TRENDS**

**ALL CHANGE IN COLOURS AND MASTERBATCH**

**INCREASING THE USE OF RECYCLED MATERIALS**



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# Injection WORLD



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# PolyOne becomes Avient on closing Clariant deal

Global compounder PolyOne changed its name to Avient at the beginning of this month. The rebranding follows the closing of its previously-announced acquisition of the colour masterbatch businesses of Clariant and Clariant Chemicals India.

The acquired businesses become part of the Avient Colour, Additives & Inks segment. They include 46 manufacturing operations and technology centres in 29 countries and some 3,500 employees. The net purchase price amounted to \$1.44bn, with the newly combined operations posting sales of \$2.9bn and employing 9,100 employees in 2019.

"With this acquisition, Avient now expects over 85% of adjusted EBITDA to be generated from specialty applications," said Robert M Patterson, Chairman,



**Robert M Patterson, CEO of Avient (formerly PolyOne)**

President and CEO of Avient. "This is up from less than 10% when our specialty journey began over a decade ago."

■ Shortly before the completion of the deal, what was then PolyOne announced expansion of manufacturing of three of its specialty product lines. Its Nymax PIR recycled PA products and ReSound bio-based TPEs, which are

currently made only in Europe, will in future also be produced in the US. And OnFlex TPEs, currently made in the US, will be produced in Europe.

Nymex PIR grades contain 20-100% post-industrial materials and are said to offer comparable performance to virgin PA. ReSound bio-based TPEs contain 40-50% bio-renewable content from sugarcane and are said to offer hardness levels and performance comparable to standard TPEs.

OnFlex TPEs are primarily aimed at automotive applications. OnFlex LO grades meet stringent odour and fogging standards for use in HVAC seals and flaps; OnFlex AF grades are said to provide long-term sealing performance, reduced noise and vibration, and very good UV resistance and weatherability.

➤ [www.avient.com](http://www.avient.com)

## Adient amends Yanfeng JV

Automotive seating giant Adient, which employs 81,000 people at 220 plants in 34 countries worldwide, has amended its agreement to form a joint venture with China's Yanfeng Automotive Trim Systems. This was originally concluded on 31 January and is expected to be closed in the last quarter of Adient's current fiscal year.

The amount Yanfeng will pay Adient for a 30% stake in Yanfeng Global Automotive Interior Systems (YFAI) has been reduced from \$379m to \$369m, of which \$309m will be paid at closing. Adient will be paid an earnout of 30% of YFAI's distributable earnings in each of YFAI's fiscal years until the remaining \$60m is fully paid.

➤ [www.adient.com](http://www.adient.com)

➤ [www.yfai.com](http://www.yfai.com)

# Diener follows Dornscheidt at Messe Düsseldorf

Werner M. Dornscheidt stepped down from heading Messe Düsseldorf Group - home of the K Show - at the end of June. He had been with the group for 37 years, 17 of them as President and CEO.

Dornscheidt has been succeeded by Wolfram N. Diener, Managing Director of operative business since 2018. Also on the board will be Erhard Wienkamp, as Managing Director of fair management, and Bernhard J. Stempfle, Managing Director of finance and technical operations, digital strategy and communication.

As well as being the venue for the triennial K show, Messe Düsseldorf hosts multiple global shows in its four 'global portfolios' of Processing & Packaging, Plastics & Rubber, Health & Medical Technologies and Metals & Flow Technologies. These include Medica and Interpack, among many others. Last year, Messe Düsseldorf's sales grew by 28.7% to €378.5m and group earnings after tax more than doubled to €56.6m.

➤ [www.messe-duesseldorf.com](http://www.messe-duesseldorf.com)



IMAGE: MESSE DÜSSELDORF

**Werner Dornscheidt (left) has been succeeded by Wolfram Diener as President and CEO**





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## Biesterfeld opens new centre

Distributor Biesterfeld has opened an 800 m<sup>2</sup> Lab & Innovation Centre at its headquarters site in Hamburg, Germany, integrating an existing laboratory. The centre also features a conference room, as well as a presentation and meeting area. Biesterfeld has other regional laboratories in Norway, Turkey and Poland.

The centre will be used mainly for application-related laboratory activities, including the development of new formulations, and carrying out product tests and customer-specific project work. The laboratory will also be used to screen new raw materials from partners and to conduct comparative studies.

➤ [www.biesterfeld.com](http://www.biesterfeld.com)

# Techniplas completes ownership change

Techniplas has completed its transition to new ownership following a sales process under Chapter 11 bankruptcy in the US. It will continue to operate under the same name, with Ali El-Haj remaining in place as CEO. The company, which is based at Nashtotah, Wisconsin, supplies highly engineered plastic components mainly to the automotive sector, plus the general industrial, consumer, medical and other markets.

As part of the sale order, which was approved by the US Bankruptcy Court for the District of Delaware on 12 June and closed a week later, Techniplas executed a sale of its core assets to some of its existing investors. Three of them – Bay-side Capital, Amzak Capital Management and Jordan Company – have since injected \$50m in cash into



IMAGE: TECHNIPLAS

**Above: The main market for Techniplas products is automotive**

the firm, enabling it to “have significantly less debt and more liquidity to invest in sustainable future growth”.

“I am excited to lead Techniplas into our next chapter, strengthened with a right-sized balance sheet and backed by our investors, who have proven experience in supporting companies like ours through the next phase of growth,” said El-Haj. “We enter this new phase with renewed

energy and enthusiasm to meet the needs of our strategic customers.”

El-Haj added that the company continued to serve essential businesses throughout the sale process and the Covid-19 pandemic. “Now, with all of our facilities resuming operations, we are even better positioned to continue serving our customers with our high-quality solutions and service.”

➤ [www.techniplas.com](http://www.techniplas.com)

## Neste and Jokey work on renewables

**The collaboration focuses on Jokey's injection moulded packaging**



IMAGE: JOKEY

Materials group Neste and injection moulded packaging firm Jokey have started collaborating to develop rigid packaging from sustainable renewable and recycled materials for food and non-food applications. This will use Neste's biomass-based material from sources including waste and residue oils and fats, plus chemically recycled plastic waste.

The two companies said that these materials are well suited to rigid packaging applications and that the plastics produced from them are compatible with existing production and recycling infrastructures. Their quality is identical to conventional plastics and they can be used safely in healthcare and food packaging, among other sensitive applications.

Neste and Jokey, which is based at Wipperfurth, Germany, and has 15 plants in 12 countries, added that they are aiming to deepen their collaboration. However, they have also invited other value chain partners “to join in their mission to develop circular plastics value chains and more sustainable plastics solutions”.

➤ [www.neste.com](http://www.neste.com) ➤ [www.jokey.com](http://www.jokey.com)



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# BMW consolidates 3D printing on new campus

The BMW Group has opened its new €15m Additive Manufacturing Campus at Oberschleissheim near Munich in Germany. This brings together production of prototype and series parts under one roof, along with research into new 3D printing technologies and employee training for the roll-out of toolless production.

The campus currently employs up to 80 people and operates about 50 industrial systems working with metals and plastics. Another 50 systems are in operation at production sites around the world.

As well as a pre-development unit optimising new technologies and materials, a production line replicates the entire process chain. The team from the IDAM project, which involves BMW and 12 other partners, is now



**Above: Prototype, series and spare parts will be made at the campus near Munich**

preparing it for the specific requirements of series, individual and spare-part production. Output is expected to total at least 50,000 series components a year, with over 10,000 individual and spare parts.

The campus will also carry out work for the Polyline project, which focuses on digitally linking process

steps and developing a consistent QA methodology for series production of plastic parts. The aim is to develop and test a future-proof, fully linked, automated production line for plastic components at the campus and the findings could help reduce manufacturing costs by up to 50%, BMW said.

Additive manufacturing is already an integral part of BMW's worldwide production system and part of its digitalisation strategy. The group first used it in 1991 to make prototype parts for concept vehicles. Last year, it produced about 300,000 parts this way. In recent years, it has invested in and formed collaborations with multiple technology specialists to advance aspects of the technology and rapid component manufacture in general.

➤ [www.bmwgroup.com](http://www.bmwgroup.com)

## Faurecia sales suffer during H1

French automotive supplier Faurecia saw a 19.7% fall in year-on-year sales in Q1 2020 and this is expected to have worsened to around 50% in Q2, according to CEO Patrick Koller, who spoke at the company's latest shareholder meeting. Full first half results will be given on 27 July.

April was a particular low point, where Faurecia was "severely affected by the lockdowns in Europe and North America, at a time when China was only just beginning its recovery", according to Koller. Overall, it is expected that first half turnover was down by about 35% from €8.972bn in first half 2019.

Koller also reviewed Faurecia's 'transformation strategy' and presented its priorities for 2020-21.

➤ [www.faurecia.com](http://www.faurecia.com)

# Hella in automotive radome JV in China

Automotive parts supplier Hella of Germany has formed a 50-50 joint venture with China's Minth Group. This is due to begin operations in Q3, subject to regulatory approval.

Hella Minth Jiaxing Automotive Parts, as the JV will be called, will make radomes – permeable covers for radar systems – and illuminated logos at a facility in Jiaxing in Zhejiang province, near Shanghai in China. The domestic market

will be the initial target.

Both companies are already active in the field of customisable radomes,

Hella noted. Minth will contribute its existing production capacities, including series produc-

tions, to the JV, which will employ about 80 people. Capacity will be raised within the next year in order to meet the expected growth in radome demand.

"With the increasing market penetration of radar-based driver assistance systems, the demand for radomes will also continue to rise," said Frank Huber, Managing Director with responsibility for Hella's Lighting Division.

➤ [www.hella.com](http://www.hella.com)





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## Barnes Group restructures

Barnes Group has announced that it will take a severance-related charge of about \$18m in Q2 as it cuts the workforce by about 8%. The US engineering group is active in aerospace and other markets and is the parent of mould and hot runner firms Männer, Synventive, Thermoplay, Foboha plus Gammaflux and Priamus control systems firms.

The restructuring will lead to a \$10m cash impact on results in the second half of 2020, with the rest coming in 2021. The company, which is headquartered in Bristol, Connecticut, expects to make savings of about \$30m per year from the second half of 2020 onwards as a result.

It said disruption from Covid-19 in aerospace and industrial markets necessitated the cost cuts.

➤ [www.bginc.com](http://www.bginc.com)



IMAGE: PPIM

**Above: Pacific Plastics Injection Molding makes components and products for various sectors**

## PPIM unveils facility expansion in California

Pacific Plastics Injection Molding (PPIM), a maker of custom injection moulds and moulded plastic parts, has unveiled an expansion to its existing production facility at Vista, California. This had originally been announced in September 2019. It comprises about 280 m<sup>2</sup> of additional manufacturing space and a further 185 m<sup>2</sup> of office and assembly space.

"In our initial concept, we wanted this new space to facilitate an increase of our production capacity, reduce lead times and give our

team more room to operate on the floor," said Rob Gilman, general manager at PPIM. "Now that it is done, I'm pleased to report that we exceeded that target."

As well as the extra space, the company renovated the HVAC equipment in order to accommodate it and to enhance existing working environments. It also added a 165-tonne vertical injection moulding machine "to accelerate product delivery and meet expanding customer demands", and it plans to install five addition-

al presses at some point.

Minneapolis-based Diversified Plastics (DPI), a custom injection moulder, acquired PPIM in late 2018

Since then, investments have taken place in multiple production and equipment upgrades at PPIM, including a customised automated loading system in April. This uses advanced robotic technology, decreasing production times by 34% and reducing scrap material by about half, the company stated.

➤ [www.pacificplastic.com](http://www.pacificplastic.com)

## Fakuma go-ahead decision set for end-July

The organiser of the Fakuma 2020 trade fair due to take place in Friedrichshafen, Germany in October is hoping to give the go-ahead to the event by the end of July once approval is given by state authorities for its compliance with Covid-19 restrictions.

The company, PE Schall, said in a statement on 29 June: "An implementation concept is currently being worked out in close cooperation amongst the responsible authorities, venue operator Messe Friedrichshafen

and trade fair promoters PE Schall GmbH & Co KG, in order to comply with all of the requirements resulting from the corona pandemic."

It said that, after submission of the plan to Baden-Württemberg's Ministry of Economics and Ministry of Social Affairs for approval, "Schall's stated goal is to be able to give exhibitors and cooperation partners the go-ahead for Fakuma 2020 no later than the end of July 2020."

A number of injection moulding

machinery companies, including Engel, KraussMaffei, Wittmann Battenfeld and Sumitomo Demag, have since released statements saying they will scale back their presence and have no "active participation" at this year's Fakuma. They have not withdrawn but say they will have no machinery and few, if any, staff at the event.

At Fakuma 2018, when the event last took place, there were 1,993 exhibitors and 47,650 visitors.

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# Drivers of change in global thin wall packaging sector

**The reasons behind the continuing growth of the global thin wall packaging market are examined by Martyna Fong in a new AMI Consulting report**

Fuelled by consumer demand for convenient and attractive packaging solutions, thin wall packaging is increasing its penetration versus traditional media and flexible plastics. The growth is facilitated by the expansion of centralised retail distribution, on-the-go convenience formats, and technological advancement in plastics engineering, food processing and packing.

Thin wall packaging accounts for 12% of global packaging production, equivalent to 18 million tonnes. It is a market with a clear definition in Europe, but not globally. AMI Consulting has been instrumental in aiding the process of industry segmentation, quantification and strategy development.

Each region shows different levels of market maturity, influenced by socio-economic factors. Asia is the biggest thin wall packaging region globally, equivalent to 37% of demand for all polymers. Local culture-driven applica-



tions and market idiosyncrasies have shaped formats in different regions, for example water cups in Indonesia, labneh (thick yoghurt) in Turkey or dates in Saudi Arabia. Nevertheless, there is a high level of standardisation as far as process technology and materials are concerned.

Consumer convenience has been one of the main drivers for thin wall packaging developments. Both retailers and brand owners have driven innovation to offer convenience solutions, both with regards to new product launches and their packaging functionality. Functional packaging solutions include these offering longer shelf-life, ease of use, re-sealability and microwaveability.

Consequently, functionality to deliver convenience and superior product image

have dictated the choice of material, and hence increased demand for individual polymers used for thin wall packaging production. Packaging design is being adjusted to optimise the logistics (transport, storage, stackability, waste, etc.), which brings financial benefits to both the manufacturer/brand owner and the customer/retailer.

Technology is a key driver of change, growth and reconfiguration of the global thin wall packaging industry. A drive towards sustainable formats, technologies and materials, triggered by changing regulations in Europe as well as environmental consumer initiatives in developed markets, has been a defining factor in shaping the global plastics processing landscape.

Concomitant with these

changes have been changes in the supply chain. The industry is actively consolidating and the leaders have attempted to redefine and restructure their businesses to maximise technical competence and to create a stronger negotiation platform.

Global thin wall packaging supply is very fragmented, with the top 25 producers globally accounting for just 25% of supply. Market fragmentation varies by region. North America (including Mexico) is the most consolidated region with the top 10 players accounting for 56%, while in Asia the top 10 players account for just 3%. The industry is actively consolidating, and the leaders have been restructuring their businesses to maximise technical competence and to create a stronger negotiation platform. Global giants like Berry Global (now incorporating RPC Group), Paccor and Klöckner Pentaplast have changed industry dynamics.

Only by probing into the activity of both larger and smaller producers can the size and structure of demand be properly demonstrated, and the variations by end-use application highlighted. This depth of

Unit: 000 T	2011	2015	2019	2011/2015	2015/2019
Global Thin Wall Packaging	13,216	15,421	17,906	3.9%	3.8%
Injection Moulding	1,947	2,353	2,767	4.9%	4.1%
Extrusion - thermoforming	11,269	13,068	15,139	3.8%	3.7%



analysis serves to highlight opportunities and threats by end-use application and provides insight into winning supplier strategies. A clear business definition and portfolio strategy are fundamental in exploiting the forward opportunities, based on assessing the scale of demand, understanding the growth potential, exploiting internal competences, and appreciating the competitive dynamics and degree of threat.

The search for higher margins and market positioning causes the industry to focus on improvements in material and process engineering. Advances in process technology synergistic with polymer science have enabled changes which have facilitated the emergence of new applications. Technology is a key driver of change, growth and reconfiguration of the global thin wall packaging industry.

Thermoformed packaging accounted for 85% of thin wall packaging in 2019 and injection moulding 15%. Driven by new product development, injection moulded packaging growth is faster than thermoformed packaging growth, and hence this technology has been increasing its market penetration in the past decade.

The share held by thermoforming is sustained by growth in fresh produce and pre-packaged convenience food applications, where pack selection is fit-for-purpose and cost driven. Thermoforming has highest penetration in meat/fish/poultry, fruit/vegetables and disposables, where it is

close to 100%. Thermoformed chilled dairy packaging volumes are high thanks to a well-established form-fill-seal model (in Europe in particular). The FFS technology is well developed in Europe, accounting for a quarter of the total market (but over three-quarters of chilled dairy). In North America FFS is an area of growth, coinciding with the organic growth of chilled dairy. In other regions the FFS technology remains underdeveloped.

### Injection moulding

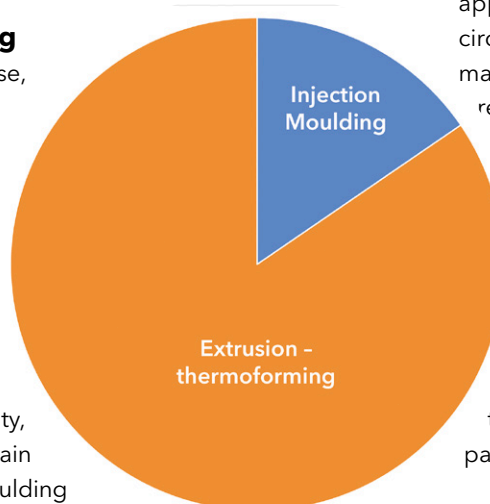
Albeit from a lower base, injection moulding is putting the market position of thermoforming under pressure as production economics can be comparable. In-mould label technology, allowing for superior label quality, has been one of the main drivers of injection moulding development. This has been particularly important for such applications as yellow fats, chilled dairy, and frozen food (ice cream). An important breakthrough in IML technology is integrating a functional gas barrier through the application of EVOH multilayer film. This technology presents an alternative solution for barrier packaging without significant investment in new technology.

IML technology has now been commercialised for thermoforming as well in Europe and America. Utilisation of the IML process goes beyond product presentation and

preservation. Verstraete IML leads on developments in interactive IML labels, which can be used to engage consumers with the brand even more or contain coded information for packaging sorting and recycling.

High barrier rigid thin wall containers is an attractive segment for all value chain participants. It is attractive for investors wanting exposure to technologically driven manufacturing with stable but growing demand and blue-chip customers.

Highest commercial returns



can be achieved with systematic development of specialism in the segment, encompassing know-how of oxygen transmission parameters and shelf-life management. Vertical integration of extrusion and thermoforming, preferably in-line, offers higher margin capture. Specialism and high barriers-to-entry in this segment results in relative market consolidation.

Single serve capsules have become the key contributor to growth of high barrier thin wall solutions, fuelling not only demand for barrier thermoforming, but also enabling

barrier co-injection projects and barrier IML. The application is more forgiving for novel barrier technologies, as the filled product is in dry form and does not require retorting. Oxygen management is not encumbered by retort shock in this case and any potential barrier failures will not compromise consumers' health and safety.

### Sustainability needs

The European Commission's sustainability agenda is spearheading the global approach to plastics in a circular economy. It is only a matter of time before other regions adopt similar legislation. As part of the European Commission's Plastics Strategy, the Single-use Plastic Directive has been produced to reduce accumulation of plastic products in the natural environment, particularly marine.

Many of the leading players in the plastic packaging industry operate on a pan-European as well as a global scale. The changing market conditions in Europe will place the global players in a strong position to quickly respond to changes in other regions of the world wanting to transition towards more sustainable packaging.

There is considerable push and pull at play within thin wall packaging; retailers and brand owners move away from established practices when there appears to be no available solution for them to meet recycling and recyclability targets outlined in the

Packaging and Packaging Waste Directive (2018). This is particularly apparent in regard to black plastic and PS packaging. Consequently industry is stimulated to innovate to find solutions or otherwise risk their products being phased out. The upshot of this has been numerous innovations and developments for the thin wall packaging market such as alternative black pigments (carbon-black-free or sorting technology that can identify carbon black), technological developments in chemical recycling of PS, commercial scalability of fibre based packaging formats trialled and adopted by retailers and increasing demand for compostable bio-resin in certain

applications such as coffee capsules as well as meat, fruit and vegetable trays.

While "every little helps", a full environmental analysis should be well thought-through before a major technological change is introduced in order to meet the targets of 100% of packaging placed on the market to be reusable, recyclable or compostable.

The industry is definitely acting to increase its eco credentials, though some activities are still based on trial and error principles. Consumers, on the other hand, form their views based on green marketing and media campaigns designed to create an emotional response, which may not always be accurate.

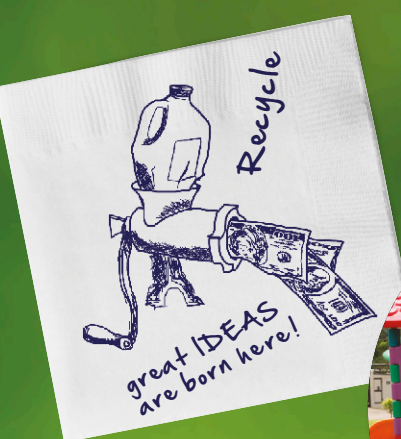
## About the report and author

The **Global Thin Wall Packaging 2020** report published by AMI aims to support the development of robust participation strategies to meet the challenges of all sectors of the thin wall packaging market in Europe, by equipping industry players with a full understanding of the source and scale of potential for future development, growth dynamics over the next five years, market drivers and competitive pressures.

The report's author Martyna Fong is Consulting Manager – Packaging and Recycling at AMI. With extensive experience in research and consultancy in FMCG and downstream plastics markets, Martyna has a comprehensive understanding of the value chain and commercial factors that influence market dynamics, all in the context of sustainability driven initiatives.

Having joined AMI in 2011, Martyna has led the development of AMI's market leading expertise in rigid packaging markets. Martyna is now actively driving the expansion of AMI's Packaging & Recycling portfolio. She can be contacted at [martyna.fong@ami.international](mailto:martyna.fong@ami.international)

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# Completing the circle in moulded packaging

**Mark Holmes reports on initiatives and new equipment from injection moulding machinery manufacturers that are helping packaging moulders meet sustainability goals**

Using reduced levels of material through lightweighting and high production efficiencies has been the mainstay of the injection moulded packaging sector for a number of years. However, moulders are now required to embrace issues of sustainability, such as greater traceability and recyclability, as well as increased use of post-consumer recyclates in their products. Although the Covid-19 global pandemic is creating additional uncertainties as to how to maintain the balance between sustainability and security going forward, the major injection moulding machinery manufacturers are stepping up to the challenge.

The circular economy and resource efficiency remains the biggest challenge for the packaging sector in the plastics injection moulding industry, as well as society in general, according to **Arburg**.

"One of the challenges of the discussions taking place at this time is that plastics is often seen only in terms of being a waste product," says Bertram Stern, Packaging and Circular Economy Manager. "Instead, plastics must be used sensibly and responsibly. In the best-case scenario, it belongs in a sealed recycling circuit. **Verstraete IML's** HolyGrail2.0 technology is such an innovative solution for single-type sorting to get high quality recyclates. Using digital watermarks, any information can be placed 'invisibly' on a label, thereby providing the product with a 'digital passport' with relevant information on recycling. Arburg has already produced IML cups with HolyGrail2.0. A circular economy can only function properly if all elements within the value-added chain work properly. Our strategy in terms of resource efficiency and circular

**Main image:**  
**The Arburg hybrid Allrounder 1020 H in packaging version producing thin-walled cups from new PP with 30% PP post-industrial recyclate**

economy and all of these related aspects and activities are grouped together in the Arburg GreenWorld programme."

Arburg highlights a number of significant trends driving new developments in packaging for injection moulding at present. "Important topics are the minimisation of the carbon dioxide footprint of machines, processing of recyclates and bioplastics, while maintaining high quality, improvements in production efficiency and use of innovative processes, as well as consultancy advice on all aspects of applications technology, resources and energy efficiency," says Stern. "In order to be able to improve the processing behaviour of recyclates, a consistent high quality and quantity of standardised material is required. For bioplastics and recyclates, the challenges lie in incomplete material data specific to processing, fluctuating recyclate qualities and smaller processing windows. These issues must be solved jointly by the material, mould and machine manufacturers and the processors. For this purpose, Arburg cooperates with the **Institute of Plastics and Circular Economy (IKK)** at the Leibniz University Hanover, Germany, for example."

Arburg has also recently collaborated with **Foboha** in new cube technology - a reverse cube system which currently can only be used with Arburg's Allrounder Cube injection moulding machines. The cube halves rotate by 90 degrees against each other. While injection takes place on one side of the cube, the components on the other three sides cool down to such an extent that they can finally be assembled directly in the mould. The automated process increases quality, accelerates cycle times by up to 40% compared to two separate injection moulding machines plus assembly process, and offers significant cost and space savings.

The hybrid Allrounder 1020 H Packaging version was also introduced at K2019. The company says that the largest injection moulding machine designed specifically for packaging technology has a clamping force of 6,000 kN and is equipped with the new size 7000 injection unit. It is designed for use with moulds with numerous cavities and for

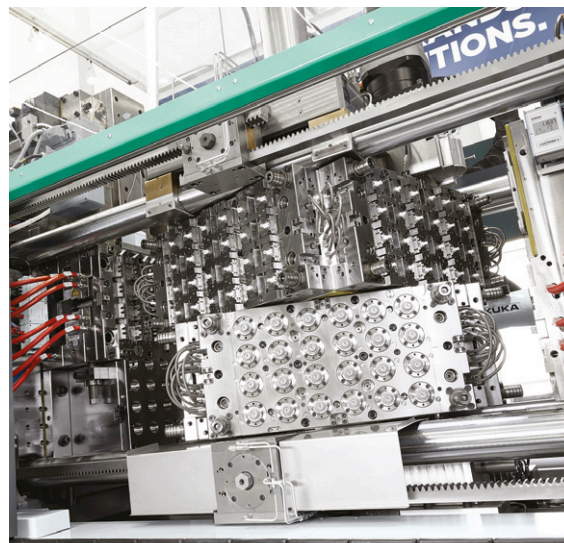


IMAGE: ARBURG

**Above: Arburg has collaborated with Foboha in new cube technology - a reverse cube system which currently can only be used with Arburg's Allrounder Cube injection moulding machines**

large packaging containers with a volume of up to 30 litres. At K2019, Arburg demonstrated its capabilities by producing thin-walled round cups in an 8+8-cavity stack mould. The machine combined the electrical speed and precision of the clamping unit with the hydraulic power of the injection unit.

The clamp-design in the Allrounder 1020 H Packaging version with Gestica control system has a distance between tie bars of 1,020 mm. The new size 7000 injection unit offers a maximum shot weight of around 4,200 g (PS) and is available for the Allrounder 1020 H Packaging, as well as for the Allrounder 1120 H. It is ready for digitalisation, equipped as standard with Arburg's four assistance packages - 4.set-up, 4.start-stop, 4.production and 4.monitoring, which get the injection moulding process up and running quickly and reliably. They provide the operator with comprehensive digital support, enabling work faster and receiving increased help from the machine. All Allrounders will in future feature basic connectivity, equipped with an Industrial Internet of Things (IIoT) gateway and can be easily networked via standard interfaces with higher-level systems.

At Arburg's K2019 stand new PP material was processed in combination with 30% single-type PP recyclate to produce thin-walled cups of consistently high quality. Austrian cooperation partner **Erema** provided the PP recyclate and recycled some of the PP cups produced at the show. Using an 8+8-cavity stack mould from Stackteck, Canada, 16 round cups

**Below: The Allrounder 1020 H in packaging version features a clamping force of 6,000 kN and a new size 7000 injection unit**

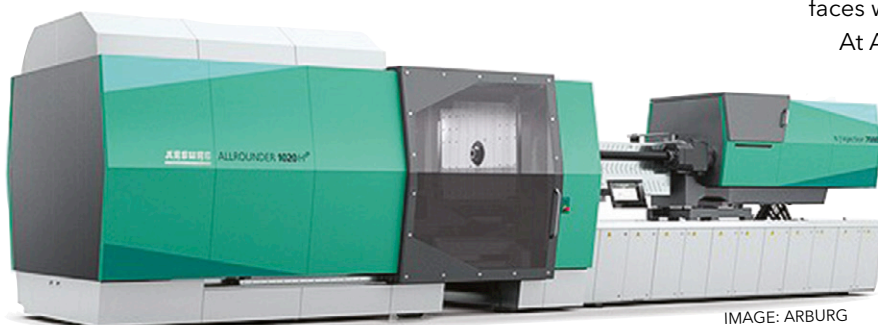


IMAGE: ARBURG



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**Right: Demand for thin walling is increasing as manufacturers look for lighter, cheaper and more sustainable packaging**

were each produced in a cycle time of around 4.3 s. Due to the two levels lying one behind the other, the mould locking force can be halved in comparison to a 16-cavity mould, and a smaller machine size can be used. The finished parts were then stacked and packed in tubular film. The automation was provided by Italian company Campetella.

A thin-walled IML application was also presented by **Roboplas** on a hybrid Allrounder 630 H in packaging version with 2,300 kN of clamping force. This exhibit used a mould from Erkoc, Turkey, to produce four rectangular cups, each with a capacity of 280 ml, in a cycle time of around 3.5 s. Another hybrid Allrounder 630 H in packaging version produced four thin-walled PP cups in a cycle time of around 3.5 s at the stand of **Ilsemann**. The system is automated with the company's own robot with carbon gripper.

The packaging version was developed by Arburg especially for the industry and is available on machines of the Hidrive and Alldrive series in sizes 520 to 1020. As standard, the package includes FEM-optimised clamping platens and heavy-duty machine bases, highly wear-resistant cylinder modules with barrier screws, servo-electric toggle-type clamping units and dosage drives, position-regulated screw and additional control functions such as start-up parameters and dosage across cycles. This adapted design ensures extremely short dry cycle times, high plasticising capacities and injection speeds as well as reduced energy consumption.

There will be a need to balance packaging safety, security and sustainability following the Covid-19 outbreak, according to **Sumitomo (SHI) Demag**. "Around the world, health has taken priority over sustainability," says Nigel Flowers, Managing Director, Sumitomo (SHI) Demag UK. "As we begin to cautiously emerge from the pandemic, there will be discussions on how brands can move forward with their sustainable packaging initiatives and consumer behaviours and attitudes towards single use packaging that may stick around in the foreseeable future."

He says: "In the early days of the Covid-19, sentiments towards sustainability diminished. Although this was anticipated to be a short-term shift, concerns around hygiene, sanitation, cross-infection and the protection of health took priority. Initiatives like bring-your-own-containers and reusable coffee cups were suspended. Substrate choices veered back to the 'perceived enemy' - plastic. The big question facing packaging producers now is how much consumers in the future will be prepared to trade off product safety, security and



IMAGE: SUMITOMO (SHI) DEMAG

hygiene against sustainability and whether there is a middle ground. For several decades now lightweighting and consumer convenience have given packaging manufacturers the strong commercial incentive to do more with less. No strangers to responding to demographic and lifestyle changes and balancing a wide range of variables, including cost, increased strength, recycle rates and functional requirements, lightweight formats have become the industry norm. Especially in food and medical packaging. More recently, the market has been moving more towards novelty solutions that improve performance, functionality and shelf impact."

He continues: "Most companies operating in this competitive arena produce millions of packaging containers, caps and closures every year. Volume, raw material waste and precision are fundamental to each packaging manufacturer's financial viability, with many facilities operating more than 20 machines to meet supplier demand. To succeed in the thin walling arena, injection moulders need to examine every potential application to ensure that the selection of materials, machine and tooling give the optimum blend of speed, quality and consistency."

Plastic is inextricably linked with energy and resource savings, adds Flowers. "Its low weight makes it both cost effective and flexible to use, adding to the sustainability score when measuring environmental, social and governance (ESG) performance. If anything, this pandemic has presented retailers, brand owners and packaging manufacturers with the opportunity to review, realign and reinforce the value of their packaging."

In terms of machinery performance, thinner wall sections lead to changes in processing requirements. Among these are higher pressures and speeds, faster cooling times, and modifications to part-ejection and gating arrangements. He says: "These process changes need to be factored into



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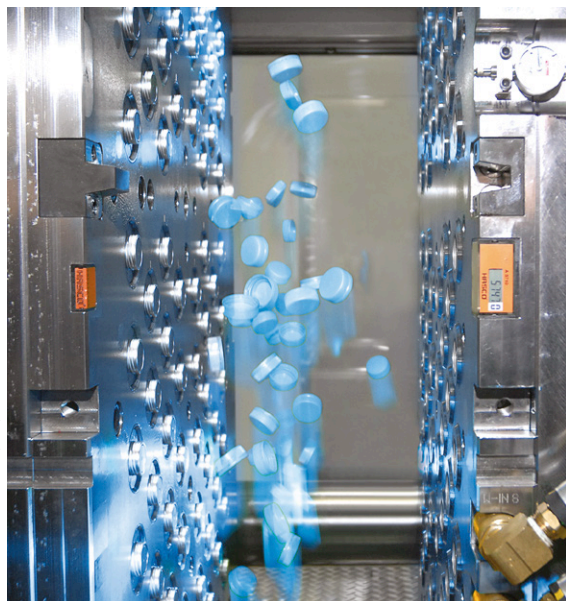


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**Right: The Sumitomo (SHI) Demag El-Exis SP 300-tonne machine produced 72 water caps (26/22mm) every 2 s at K 2019**

IMAGE: SUMITOMO (SHI) DEMAG



the mould, machinery, and packaging component design. Even when using less raw material, packaging forms the protective layer so still needs to be engineered to provide strength. Choosing the best machine for your packaging application is critical. Understanding the melt stability and how the plastic will perform as an end product should form the basis of all decisions."

In order to support these efforts, Sumitomo (SHI) Demag has developed a number of machines specifically for packaging applications. The company's El-Exis SP range now comprises ten machines, with a clamp force range of 150-1,000 tonnes. Capable of delivering dry cycle times of less than 2 s, the latest generation of EL-Exis SP machines are designed to withstand the higher stresses and injection pressures that are critical in achieving repeatability, particularly in thin walling. This range is aimed at high volume manufacturers of polymer products, including caps and closures, thin wall containers and lids.

With the introduction of a new control valve regulating the hydraulic pressure during the loading of the accumulator, the range consumes up to 15% less energy than previous generations of El-Exis machines. These savings are dependent upon the packaging application, moulding cycle time and process parameters. Additionally, the company says that all-electric drives achieve absolute processing precision, accuracy and dynamics. These are essential criteria in the quest to achieve the highest process consistency, as well as reducing scrap to a minimum during start-up and during ongoing production. The fast and precise response of these direct drives also enables special processes to be implemented with accuracy, opening up new possibilities for packaging moulders.

Like any other business, economic viability is just as important a consideration for packaging moulders. "Low unit costs, high output coupled with energy savings all need to be factored in," says Flowers. "That's why so many packaging manufacturers today are prepared to invest in new high-performance plant. Increasingly, packaging moulders are looking to injection machinery suppliers to provide turnkey solutions, including robotic product handling, advice with tooling, training and testing and all the know-how and support that underpins efficient manufacturing."

Automated vision quality control is one area where significant advances have been made, he says. At K2019, Sumitomo (SHI) Demag showed its fastest closure turnkey exhibit to date featuring the Capwatcher Q Line inspection system from **Intravis**. Comprising eight high-resolution cameras, this technology collects, visualises and provides up to 144,000 cavity-based measurements per minute. It also sources an inline temperature measurement for each closure, which allows moulders to determine the shrinkage behaviour of every closure. "From a quality control perspective, this is ground-breaking stuff and significantly reduces production waste," says Flowers.

"Another way to achieve thinner yet stronger packaging containers is to apply injection compression techniques to stack moulds. With this, packaging moulders can increase output while reducing the wall thickness of containers and lids from 0.45mm to 0.35mm. This saves around 25% in raw PP materials compared to the standard injection moulding process, while maintaining comparable mechanical properties."

**Engel** is collaborating with six other companies from the Austrian packaging industry in the Packaging with a Future platform. The aim of the initiative is to improve public awareness of meaningful use of packaging. The companies - Alpla, Greiner, Coca-Cola Österreich, Nestlé Österreich, Interseroh, Erema and Engel - are taking an active role in the development of a global circular



**Above: The Packaging with a Future (Verpackung mit Zukunft) platform is committed to the sensible and sustainable use of packaging. Injection moulding machine manufacturer Engel is one of the initiative's founding members**





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IMAGE: KRAUSSMAFFEI

**Above:**  
**KraussMaffei**  
**has extended**  
**its GX series**  
**upwards by**  
**adding a**  
**version with a**  
**clamping force**  
**size of 11,000**  
**kN**

economy for plastic packaging.

Reduce, replace, reuse and recycle are the tasks that must be fulfilled to ensure that packaging has the least possible impact on the environment, say the companies. They are already making important contributions towards achieving this with their own technologies, however, together they cover a large part of the value chain and are joining forces in a network. "The circular economy is an interdisciplinary challenge," says Stefan Engleder, CEO of

Engel Group. "Only together can we successfully master this challenge and quickly take the first comprehensive steps."

The focus of the joint commitment is plastic packaging, which has a particular need to make up lost ground when it comes to meaningful handling, disposal and recycling and is therefore losing consumer acceptance, say the companies. However, compared to packaging made of other materials, plastics often have a significantly better carbon dioxide footprint. "We will not be able to master many of the challenges of the future without plastics," says Engleder. "It is not the material that is the problem, but how it is handled. This is why we are increasingly leveraging our know-how and experience to ensure that plastic packaging can be produced, used, disposed of and recycled in a sustainable manner worldwide."

As an injection moulding machine manufacturer with a high level of expertise in systems solutions, Engel is involved at various levels, including process consistency. The intelligent assistance systems developed by Engel, such as iQ weight control, make it possible to consistently produce

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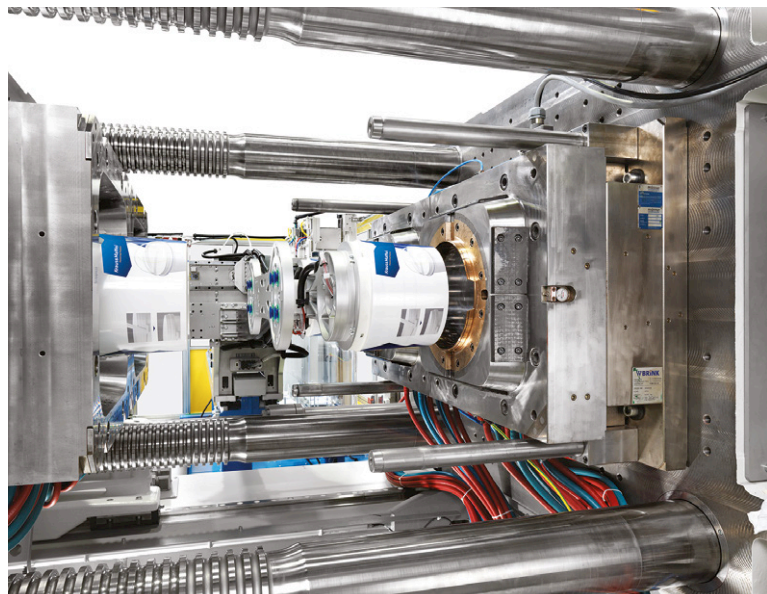
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IMAGE: KRAUSSMAFFEI



**Above: At K2019, 20 litre buckets with an IML decor were produced on the new GX 1100. The speed option ensures fast injection speeds**

high-quality plastic products despite fluctuating raw material quality. This paves the way for a far more widespread use of recycled materials. On top of this, Engel says that it is collaborating with processors as early as the product and process development phase of many projects in order to continually reduce the amount of material used and facilitate the subsequent recycling of the products.

Designed for larger packaging and logistics applications, **KraussMaffei** has developed the GX 1100 machine. This means the clamping force range of the GX series is extended and is now available from 4,000–11,000 kN. At K2019, the company demonstrated a 20 litre bucket application with IML decoration using a new 26D HPS barrier screw. "With the new clamping force size of 11,000 kN, we are expanding the range of our successful GX series with a specific target," says Hans-Ulrich Golz, President of the Injection Molding Machinery segment of KraussMaffei. "We see great opportunities particularly in the areas of packaging and logistics."

The company says that the most recent member of the GX series has the space-saving two-platen design, GearX and GuideX clamping elements, modular configuration and a wide variety of equipment options, for example the energy-saving

BluePower servo drive. At K2019, PP buckets with a capacity of 20 litres each were injected in two cavities and decorated by IML. The shot weight was about 1,500 g with a cycle time of just 14 s. The available speed option ensured fast injection speeds (up to 700 mm/s depending on the injection unit) as well as fast clamping movements. "We thus offer our customers an additional option to improve their opening and closing movements of the GX machine, especially for large packaging opening widths of more than 350 mm," adds Golz.

The dry cycle time is shortened by almost half a second. With 8,000 production hours a year, a total of almost 130,000 buckets can be produced with the speed option. The HPS barrier screw for polyolefins allows for particularly fast melting and high shot weights due to the high L/D ratio of 26. The HPS barrier screws deliver a plasticising performance up to 40% higher than conventional high-performance screws from KraussMaffei.

At K2019, digital functions controlled and monitored the entire manufacturing process of the IML buckets. The APC Plus machine function ensured extreme consistency in component weight and thus high product quality by controlling the changeover point from injection pressure to holding pressure, as well as the holding pressure level, from shot to shot. Additionally, the dwell time of the PP in the plasticising unit was monitored for the first time, which ensures a high material quality. The DataXplorer, in turn, provided a detailed view of the depth of the process by storing up to 500 signals every 5 milliseconds as continuous graphs – for instance, signals from the machine itself or special signals such as the mould cavity pressure. The digital information from the injection moulding process and the information from the automation and peripherals flows converge in a new data collection point, which enables the customer to control and monitor its production flow specifically. Connection to an MES system is also possible.

**BMB** has introduced the eKW45HP/2200 Hybrid, a high performance new concept machine customised for the production of rectangular thin-walled containers with IML and **Trexel's** MuCell

**Right: BMB has introduced the eKW45HP/2200 Hybrid, a high performance new concept machine customised for the production of rectangular thin-walled containers with IML and Trexel's MuCell technology**

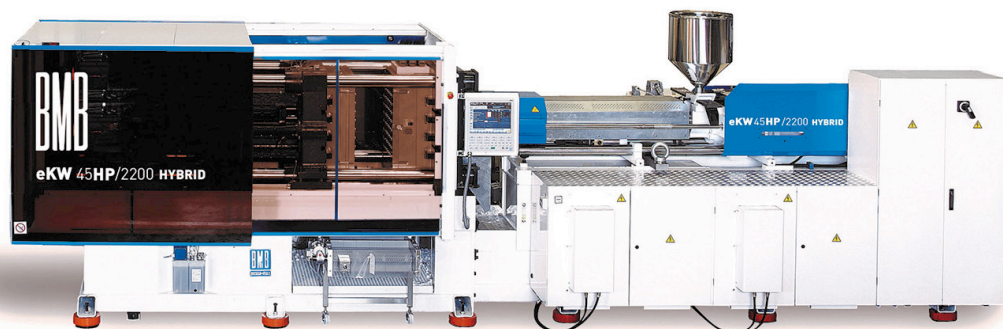


IMAGE: BMB

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IMAGE: NEGRI BOSSI



**Above: Negri Bossi has developed the Nova eT range, aimed at the packaging, closure, medical and optical moulding sectors, being precise, efficient and fast**

technology. The company says that this is the first product of a new series of faster machines with improvements in precision and speed of injection. The operator interface is also optimised through a new control panel – the new HP series has been designed to pay particular attention to integration/interconnection from an IIoT perspective. The machine shown at K2019 was a 450-tonne eK-W45HP/2200, with electric plasticisation and injection under accumulator, controlled by a double servo Moog valve and closed loop control. The special screw is designed to favour MuCell microcellular foam technology, able to reduce the amount of raw material on the product and the cycle time, without affecting aesthetic qualities.

The company says that the machine is dedicated to packaging, a sector that requires – in addition to energy savings that only electric or hybrid machines can offer – even higher performance in terms of speed and accuracy. For this reason, the HP series has movements with direct torque motors on the clamping and plasticisation units, directly coupled to the toggle and screw rotation movements, without the use of belts or gear reducers. The new injection unit features a double servo Moog valve and electric plasticising for higher speed and precision.

**Husky** introduced a range of new, flexible, versatile PET preform moulding solutions at K2019 to satisfy customers' increasingly diverse application and production needs. The new HyPET 5e systems platform is the foundation for a versatile, energy efficient family of PET preform moulding solutions capable of handling diverse output and performance needs. The HyPET 5e core system is an energy efficient platform, offering a versatile solution for standard preform designs and is upgradeable to address different business needs. The HyPET 5e+ is an evolution of the core platform and includes an upgraded options package to accommodate higher performance and production needs. In addition at K2019, Husky demonstrated the HyPET HPP5e, the company's highest level

production system, which processed 100% post-consumer recycled resin, producing a 12.1 g preform on a 96-cavity mould and running a 6.2 s cycle time.

Also debuting at K2019 was NexPET, Husky's flexible, lower cavitation system and mould for the middle output and multiple package market. Enabling the highest levels of preform quality at the lowest total cost to produce, NexPET is engineered to reduce the initial system investment and future tooling costs – making customers more competitive to capture market growth. Husky displayed a 48-cavity NexPET mould, which is designed to be part of a complete NexPET system. (Also see *Injection World* November-December 2019 issue for more on Husky's K2019 exhibits.)

**Negri Bossi** has developed the Nova eT range, aimed at the packaging, closure, medical and optical moulding sectors, being precise, efficient and fast. The Nova eT range runs from 50 to 350 tonnes clamping force and features the Smart Flex-2 clamp units that are specifically designed for electric actuation and reduced dry-cycle times. The whole range features generous tie bar spacing, high injection speeds and the Tactum multi-touch controller, with its scroll, zoom and swipe capability.

At K2019, a Nova e130T machine, fitted with a 40 mm barrier screw, ran a packaging mould manufactured by Molmasa, based in Spain. This demonstrated a new method for producing high-quality plastic blown bottles directly from the injection moulding machine. The solution offers a compact and reliable moulding system based on a horizontal injection moulding machine, coupled with simple and fast start-up, plus high quality of the final product.

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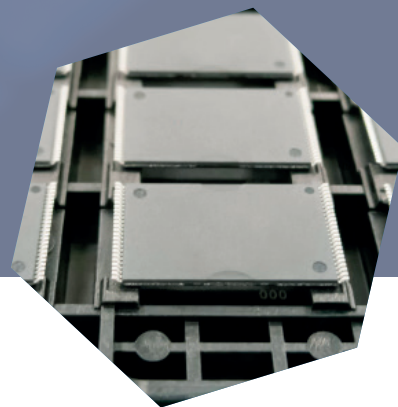
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# All change in the world of colours

IMAGE: CLARIANT

*With the merger of two leading colour masterbatch businesses plus the disruption brought about by the Covid-19 pandemic, the colours sector is giving the plastics industry plenty to think about in 2020. Peter Mapleston reports on developments*

News from the world of colour for plastics is dominated at this time by the merger of **PolyOne** and **Clariant's** masterbatches business into **Avient**. The two operations were already following parallel paths in some important areas, as we illustrate below. This is no surprise, given that calls from across end-user markets for improved sustainability and higher performance will almost inevitably lead to similar solutions. In fact, PolyOne and Clariant have not been alone in developing, for example, blacks that can be seen by automated sorting equipment in recycling operations, as well as new ways to obtain metallic effects.

Clariant and PolyOne are also among colour companies that around the turn of the year pulled out their crystal balls to see (or possibly push) what trends are in the wind for 2020 and 2021 (see [page 42](#)). There was already a hint of uncertainty in the air when some forecasts came out, which

could well have influenced how colour gurus expected to see customer choices move – but few of them were likely to have imagined the massive scale of the Covid-19 pandemic and its effect on the global economy, and on consumer mood. It will be interesting to see if and how those forecasts are blown off-track by the pandemic.

PolyOne completed its purchase of Clariant Masterbatches – announced last December – at the beginning of July and at the same time changed its name to Avient. The word was apparently chosen to echo words in French meaning the future, life, and perform. Robert M. Patterson, Chairman, President and CEO of Avient, says the merger brings together two global leaders to create a specialty company focused on sustainable solutions.

The Clariant Masterbatch business includes 46 manufacturing operations and technology centres in 29 countries and approximately 3,500 employ-

**Main image:**  
**Clariant has developed colour masterbatches for use in producing new FAKRA high-speed data connectors for next-generation automobiles**





IMAGE: POLYONE

**Above:**  
PolyOne and other masterbatch producers have developed black colourants that can be detected by NIR sorting systems used in plastics recycling

ees, who will join Avient's Color, Additives and Inks segment. PolyOne has historically not publicly said how many operations it has per business, but sales in this segment last year just tipped \$1bn.

#### Sorting out black

There is a fair amount of complementarity in the two parties' offerings as far as colour is concerned, if recent announcements are to go by. Both have launched products that facilitate use and reuse of blacks, and both have new additives that provide metallic finishes without the need for parts to be painted.

Back in September, for example, PolyOne unveiled OnColor RC Environmental Black, a concentrate that makes use of Bolder Black, a carbon black from Bolder Industries derived from end-of-life tyres. Production requires use of 90% less water and 61% less electricity than conventional carbon black, and CO<sub>2</sub> emissions are 90% less.

"OnColor RC Environmental Black maintains expected performance levels in plastics," said PolyOne at the time. "It passes REACH and RoHS requirements and is available for use in multiple resins across a variety of industries and applications, such as automotive, appliances, electronics, and office furniture."

Staying in the black colour space, PolyOne also last year launched a new portfolio of black colourants for plastic packaging that can be detected by near-infrared (NIR) sorting equipment. It says these will allow black waste plastic to be properly sorted at recycling facilities, something that until recently has proven very difficult to do using just NIR equipment. This is because the carbon black pigments typically used to make black and other deeply dark colours absorb all or most of the NIR light shone at them, so the sensors cannot see the black packaging.

OnColor Infrared Sortable Blacks for Recyclable Packaging contain no carbon black pigment, which PolyOne said permits the automatic optical sorting sensors used in many waste management plants to detect black polymers and sort waste into the correct recycling streams. They are available in both liquid and solid form in a range of eight black shades as well as custom colours.

In June, Clariant made a similar announcement. It said new Clariant colour concepts, developed in its ColorWorks design and technology centre near Milan in Italy, "now makes it possible to explore a

darker and more mysterious colour space entirely without the use of carbon black. Development is progressing in polyester (PET), high-density polyethylene (HDPE) and polypropylene (PP) in both virgin and post-consumer recycled (PCR) forms."

Late last year, Clariant introduced CESA IR, a masterbatch range that makes black plastics visible to NIR radiation. This effect was confirmed by testing conducted by Tomra Sorting Recycling, a leader in the field of sortation technology. "But designers want more choices than pure black," said Clariant.

The ColorWorks team undertook a project to use CESA-IR technology to develop colours that could be dark without the use of carbon black. Three colours – a dark umber, a deep velvety green, and a regal dark blue – have been created initially. "All three are really saturated so they are almost black, but the colours come through," says the company.

The range is suitable for all major packaging polymers including PET, PE and PP (including PCR resin) in all the various packaging applications, including trays, bottles, and caps.

Carbon black producer Cabot has been working with partners developing sorting technologies for post-consumer plastics to enable identification even of material containing "regular" carbon black. Cabot is also working on the inclusion of recycled carbon black. At K2019, it announced the Techblak 85 series of masterbatches, which includes formulations based on reclaimed carbons, post-industrial carbon black materials as well as recycled polymers tailored for compounding, injection moulding and non-critical film applications for use in industrial, packaging and consumer markets.

Other masterbatch companies are pursuing alternatives to carbon black. **AF-Color** has begun offering carbon-free masterbatches – these are called AF-Color IR – for NIR-detectable packaging.



IMAGE: CLARIANT

**Right: Clariant has introduced CESA IR, a masterbatch range that makes black plastics visible to NIR sorting technology**

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**Right: Bottle designers have begun focusing on silver and chrome with a liquid feel, says Clariant**

And at **Rowa Masterbatch**, Rowalid-IR masterbatches perform a similar role. Both companies are based in Germany.

Swiss masterbatch specialist **Sukano** says it has been at the forefront of efforts to create NIR-detectable black. It says its Sukano NIR-Black detectable and certified masterbatch has been tested by various authorised sorting equipment manufacturing companies.

Alessandra Funcia, Head of Sales and Marketing for Sukano, points out that it is not only carbon black colourants that are unable to be detected under NIR, but some other dark colorants as well. She says Sukano is using its analytical labs and colourist expertise to broaden the NIR detectability concept to ensure that any coloured product can be designed for NIR detectability.

**Ampacet** has introduced the Silky Bliss collection, designed to provide an elegant silky surface treatment as well as NIR sortability to PET and rPET packaging applications. "Silky Bliss offers a sophisticated, modern look, enabling brand owners to increase product shelf appeal and consumer interaction with the packaging," the company says.

The Silky Bliss collection features a very low light reflection for better readability of packaging graphics and text and includes six shades: Diablo, Akoya, Crushed Ice, Mint Breeze, Alaska and Sakura. This product range can be customised with an unlimited number of colours.

### Metallics

PolyOne and Clariant have also separately been working on metallic effects. In February, Clariant Masterbatches said it had developed a novel chrome colour that opens new opportunities for designers and manufacturers of high-end products, bottles, and packaging.

Targeted especially at PET containers (which are mostly made in two-stage operations that involve injection moulding the preform and later stretch-



IMAGE: CLARIANT

blow moulding the bottle), the colour is slightly translucent, so it is ideal for applications where it is necessary or desirable for the contents in the bottle to be visible. "Yet it has the power to overcome slightly off-colour resins, including PCR PET," said Clariant.

Bottle designers, especially in the technology sector, have recently begun focusing on silver and chrome with a liquid feel, says Judith van Vliet, ColorWorks Senior Designer, and a recognised colour expert. "Clariant's new chrome masterbatch develops a look that is the closest I've seen to a true metallized effect."

The secret to achieving the brilliant chrome effect lies in the pigment particle-size distribution and the way it is incorporated into the masterbatch, Clariant said. Reflectivity is dramatically increased compared to more conventional silver or chrome colours.

In May, PolyOne announced that it had been collaborating with a leading global automotive OEM and its injection moulder to eliminate paint from a new vehicle's interior. To support the transition to moulded-in-colour (MIC) parts, PolyOne provided metallic-effect Smartbatch FX masterbatch colourants for two PC/ABS side panels on the centre console of a compact SUV now entering commercial production. Painting always adds cost, time, and additional logistics requirements to the production of a part. PolyOne said Smartbatch FX reduces the cost per part by 30% or more compared to painted parts.

Gary Fielding, Vice President and General Manager, Color and Additives EMEA at PolyOne, said in May: "We have successfully helped carmakers transition from paint to MIC for many exterior applications such as skid plates and trims. This recent project is a significant step forward in reducing the cost to manufacture highly visible interior applications."

**Below: Paint for metallic effects can be avoided with Smartbatch FX masterbatch, says PolyOne**



IMAGE: POLYONE/THINKSTOCK



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## Liquid colours

There are numerous ways of obtaining metallic effects in parts through the use of additives. Special-effect liquid colours from **Riverdale Global** enable manufacturers of packaging and consumer products to enhance shelf appeal and add value while using lower let-downs of colourant than with pellet masterbatch, the company claims.

Specialty colours include pearlescents, metallics, and colours that can be used at loadings of only 0.1% to tint clear resins. Riverdale says the increased colouring efficiency of liquid colour is attributable to a higher pigment loading per pound of colourant and enhanced dispersion as a result of the liquid carrier.

Last October, at the K2019 exhibition in Germany, Riverdale unveiled a patent-pending colour metering control system for injection moulding, which it says ensures colour uniformity and saves costs by dosing colourant during the injection phase, when conventional colour and additive metering systems are inactive.

"During the injection moulding cycle, about 75% of virgin resin enters the screw during the screw recovery phase and 25% during injection," the company says. "Because conventional metering systems add colour only during recovery, insufficient mixing can occur, which is particularly problematic when shot size approaches screw capacity or when the end product is translucent. In the new 100% Injection Coloring system, a special controller receives signals from the processing machine for both phases, ensuring that colour is added throughout the cycle. Metering takes place at a faster rate during injection because of the rapid screw movement during that phase."

Riverdale says that with 100% Injection Coloring technology, there is no need for an upstream pre-mixer, or over-colouring to compensate for insufficient mixing. A controller outfitted with 100% Injection Coloring technology is available to liquid colour users at no cost from Riverdale Global, which supplies metering equipment as part of its

service to customers.

"100% Injection Coloring technology saves colour costs and ensures product uniformity in many moulding applications and is particularly valuable when shot size is close to barrel capacity," says Paul Maguire, President of Riverdale Global. "With conventional colour metering systems, there simply is not enough mixing time in the barrel to colour the 25% of barrel content to which colourant has not been added. Over-colouring can usually fix the problem, but not always, and especially not with translucent parts. For these you need to use either a larger machine or an upstream pre-mixer."

## PET colouring

Bidding against not only conventional pelletised colourants but liquid colourants as well is **Chroma Color Corporation** in the US. It says its G-series patented pelletised colorant technology is, for example, ideal for eliminating instability of some colorants, and inefficient let-down rates.

Chroma Color serves diverse markets that include packaging, wire and cable, building/construction, consumer, medical, healthcare, lawn/garden, durables, sanitation, recreation and leisure, and transportation.

Discussing colouring applications in PET processing, the company claims that using conventional PET resin-based pellet concentrates can be disadvantageous, primarily because of the low pigment/dye loadings compared to liquid colour. "In addition, PET carrier systems often require the color concentrate to be dried prior to moulding," it says. The company's UltraPET is said to overcome these challenges with a proprietary carrier system that has high compatibility with PET polymers.

UltraPET is based on Chroma Color's G3 technology, which the company says processes at a much lower temperature than conventional PET pellet concentrates, significantly reducing thermal heat stress on the colourant. In addition, the concentrates have "exceptionally high" loadings of pigments and dyes, it says. The low let-down rates eliminate the need for

drying and recrystallisation that is common with conventional PET pellet concentrates.

UltraPET is available in mini-beads that provide a high surface-to-volume ratio, promoting a high incorporation rate. "This feature is especially useful for tints as the rheology and larger surface area of the mini-beads promote a faster incorporation rate," says the supplier. A

Plaques from Riverdale. Metallics above and pearlescents on the right



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new version of UltraPET is specifically for use with recycled material.

As with Avient, Chroma Color has been involved in M&A activity in recent months: in June, it acquired Epolin Chemicals, a supplier of near-infrared absorbing dyes and thermoplastic compounds headquartered in New Jersey, US. Epolin serves customers developing products in sensors, security inks, light filters, touch screens, night vision products, and eyewear. This move followed the January purchase of Plastics Color Corporation (PCC), which has facilities in North Carolina and Illinois producing colour concentrates, functional additives and custom masterbatch; the Illinois plant is being closed however. Tom Bolger, CEO of Chroma Color, highlighted PCC's presence in medical and pharmaceutical products, food packaging and construction applications.

### Hot colours

Earlier this year, Clariant announced availability of colour masterbatches for use in producing new FAKRA high-speed data connectors for next-generation automobiles. The new masterbatches, available in 14 standard colours, were developed by Clariant in cooperation with major global polymer producers. UL-Yellow Card listed, change controlled, and globally available, the colour concentrates help ensure performance and colour stability in high-temperature engineering plastics – including PA 66, polybutylene terephthalate (PBT) and polyphenylene amides (PPA) – used to make the FAKRA connectors.

This new application – FAKRA connectors are slated to begin appearing in 2021 model cars – poses a number of challenges, says Clariant. “The connectors are colour coded, so faithful reproduction of the standard hues is essential. They must be physically tough, electrically and fire safe. Additionally, they must tolerate not only the thermal stresses of injection moulding and lead-free hot-air reflow soldering during assembly, but also the long-term mechanical and weathering stresses of

**Right: Trays coloured using Chroma Color's UltraPET**



IMAGE: CHROMA COLOR



under-hood, under-body, or outdoor automotive applications.”

According to Peter Dufour, Global Segment Head and Business Development for Consumer Electronics, Electricals and Electronics at Clariant Masterbatches, “The market for FAKRA-compliant coloured resins is in flux, with connector makers seeking reliable, colour-stable supplies but in relatively low quantities. Moulders are typically not yet able to commit to the large volumes that resin makers supply, especially in the initial stages of production or for the smaller colours’ production. Clariant’s masterbatches enable the creation of colour-stable ‘natural-plus-masterbatch’ resin mixes of any volume, with any of a range of high-temperature engineering polymers, and in any of the 14 FAKRA standard colours.”

AF-Color is following a similar path. It says it has created masterbatches that are colour-intensive yet heat-stable. They are designed for use in a wide variety of carriers. For example, PPA, PPS or PEEK. The colourants contained have a temperature stability of up to 350° C.

### Colour creation

An in-depth research and colour-finding project recently completed in partnership with Clariant ColorWorks has given **Francesco Franceschetti Elastomeri** (FFE), an Italian supplier of thermoplastic elastomer (TPE) compounds, what could be an invaluable competitive edge in one of its primary markets: ski boots.

Beginning in June 2019, Clariant and FFE pooled their resources to conduct an exhaustive study of the Italian ski boot marketplace and the colours that boot makers use in their products. Resulting in a comprehensive report and guide, including five colours proposed for the 2021-2022 ski season, it started with fact-finding visits to numerous boot dealers, ski shops and sports chain stores that gave

**Below: Colours developed in a ski boot project between Clariant ColorWorks and Francesco Franceschetti Elastomeri**



IMAGE: CLARIANT

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IMAGE: KAFRIT



**Above: New product (left) shows the colour contrast compared to an old product that was exposed to sunlight over a long period**

the companies a thorough understanding of the needs of the different types of skiers.

The team also visited the websites of 11 ski boot manufacturers, collecting a total of 499 images of individual boots presented in online catalogues. They focused on colours used in key areas of each boot, and created a 3D colour map of nearly 2,000 colour data points. This analysis gave the Clariant colour experts a solid baseline and understanding of the colours present in the market.

"Based on the demographic information we gathered in our interviews with ski shop owners, and our colour map, we created three mood boards to define the different target personalities and match them with colours to be used as a design guide for boots being developed for the 2021-2022 ski season," said Roberto Romanin, Designer at Clariant ColorWorks EMEA.

Each mood board featured lifestyle photos and colours to capture the spirit of the target personalities. Five colours were presented. The same two base neutrals - a warm white and a dark silver grey with a greenish metallic effect - filled the colour space currently occupied by black and white. These were matched with a vibrant pure red, a tactile soft green and a tech-inspired metallic petrol blue to appeal to the three target skier profiles.

### For all weathers

Also looking at the outdoor life is **Kafrit** in Israel (which owns Constab Polyolefin Additives in Germany). Weather is the greatest challenge to an outdoor product, says Nadav Goldstein, VP Business Development and Innovation: "Wind, sand, humidity, rain, air pollution and exposure to

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# Predicting colour trends in a time of Covid

Every year, leading companies involved in colour put out their views on trends for the coming months. In the plastics field, at least three – Ampacet, Clariant, and PolyOne – put their heads above the parapet around the turn of this year. It will be especially interesting, given the current crisis, to see how well their crystal balls worked this time.

In December, Clariant said that its ColorForward 2021 palette “yearns for human contact and searches for authenticity.” Judith van Vliet, ColorWorks Senior Designer and leader of the ColorForward team, said: “Where greens ruled 2020, warm oranges and yellows seem to be taking over in 2021. Blues and greens remain important,

ranging from deep nightly hues to softer aquatic tones. Brights have an artificial feel and are juxtaposed with enchanting darks.”

In January, in Color Inspiration 2021+, PolyOne delivered four palettes that it said “reflect evolving global shifts and human fascinations.” These palettes “represent mindsets that draw from health and well-being, sustainable living, inspired playfulness, and a theatrical spirit”. One palette is called Real Reality. “As a growing number of consumers begin to opt out of technology, human interaction rises on the priority list,” said PolyOne at the time.

Linda Carroll is Ampacet Global Insight and Innovation Director.

Discussing colour trends earlier this year, she said: “Prevailing, regional socio-economic conditions have

always been a primary influencer of colour direction. This current pandemic however will influence colour preference on a global scale in four areas. The desire for health and wellness will be reflected in the desire for clean, aquatic blues and lifted, organic green palettes. Our personal sanctuaries have been threatened during this period of unrest, which will result in consumers gravitating to the global colour of trust and integrity, blue.

“The pandemic infused a pervasive feeling of gloom and futility. Fortunately, human resiliency will prevail, and many will gravitate to colours of optimism and hope found in vibrant oranges (colour of fierce independence) and bright, sunshine yellow values.

“Our desire for balance will be tempered by a sense of trepidation. As a result, earthy browns, and their clear association with physical and intellectual grounding, and the enriched purples – the colour of mystery and spirituality – will find devotees.”

IMAGE: AMPACET

chemicals and, of course, sunrays are causes of product damage. Sunlight, and particularly ultraviolet (UV) radiation, is the most harmful to plastic.”

Two terms relate to a pigment’s resistance to UV radiation, light fastness and weather resistance. These pigment properties may be tested in two ways: Full Shade – when the pigment is tested with only a binder and without additives; and Tint/Reduction – test of the pigment at a lower concentration and usually with the addition of TiO<sub>2</sub>. Another property that is important to test is the pigment’s chemical resistance and how it responds chemically to other materials incorporated in the final product.

Goldstein says: “Kafrit asks each customer to complete a colour matching questionnaire that specifies the requirements the concentrate must meet in terms of hue, use, mechanical and thermal properties, regulatory requirements and more.”

In addition to pigments, Kafrit prepares various types of UV additives tailored specifically to client requirements. “Integrating the UV protection system into the pigments is a complex process and

requires considerable knowledge and many years of experience, particularly for complex applications under harsh outdoor conditions,” says Goldstein.

A special and specific colour adjustment is then performed to ensure compliance with the requirements specified by the customer. The most prevalent test for concentrates intended for outdoor use is the “accelerated weathering” test, which simulates outdoor conditions in terms of radiation, moisture, and heat. The tests are carried out in compliance with ISO 4892-2 international standard.

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- > [www.clariant.com](http://www.clariant.com)
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# Smoothing the way for greater use of recyclates

*Collaboration across the plastics industry is facilitating the increased use of recycled materials in injection moulding. Mark Holmes finds out more about joint projects and new products*

The expansion of the circular economy is driving further use of recycled plastics in the injection moulding industry. However, many issues need to be considered and collaboration throughout the value chain is essential. This extends from effective collection and characterisation of recyclates to plastic resin manufacturers working closely with their customers to ensure that materials can meet the needs of the application. Compounds containing recyclates are being developed that can enhance the performance of recycled plastics in injection moulded objects and innovation in technology is also making the use of recycled materials more effective and widespread.

New guidelines for benchmarking of high-quality recycled plastics and the characterisation of recyclates have been published to help boost the use of recycled materials. The scientifically grounded guidance from **Plastics Recyclers Europe** is a benchmark for the quality of recycled plastics. The documents' over-arching aim is to advance the quality and enhance the demand for recyclates. It also addresses the issues of lack of harmonisation and transparency in the recycling market. Quality of a recyclate is defined and impacted at each stage of the value chain starting with production, use, col-

lection, sorting and finishing with recycling. Recyclates characterisation guidance serves as an evaluation tool for recycled materials by providing a basis for assessing their quality in accordance with best practices, as well as the well-established European and international standards. This assessment is geared to benefitting the whole value chain by firstly promoting high standards among recyclers and subsequently increasing the confidence in the quality of these materials among converters and brand owners.

"As the industry works towards establishing a strong secondary raw materials market, standardised and reliable practices in the supply of input and output recycled materials is a must," says Ton Emans, President of Plastics Recyclers Europe. "Recyclates characterisation guidelines are the first step in this process and we encourage the industry players to apply the principles laid down in these documents to build trust among their consumers."

The guidelines apply to the biggest recycling streams in Europe: HDPE flakes and pellets, LDPE pellets, PP flakes and pellets, PET flakes and pellets, PS flakes and pellets, micronised soft and rigid PVC particles, as well as soft and rigid PVC pellets. The documents will be continuously updated in

**Main image:**  
The use of recycled plastics in new products poses a number of challenges



**Right: Axion Polymers says its recycled polymers can be tailored to suit clients' specifications for use in a wide range of new products**



IMAGE: AXION

accordance with market evolution and will rely on the collective efforts of the value chain.

Collaboration between injection moulders, manufacturers and plastic recyclers is key to creating new end markets for recycled polymers, according to **Axion Polymers** in the UK, which says it will help meet rising demand for recycled content and improve the overall economics of recycling. The company adds that with more manufacturers, especially those in the automotive and electrical sectors, looking to increase recycled content in new goods, this presents opportunities for injection moulders to consider alternatives to virgin material.

Axion says that at its two processing sites, plastics recovered from end-of-life vehicles (auto shredder waste) and waste electrical goods are refined into high-quality engineering polymers that match virgin material quality. Recycled Axpoly and Axplas polymers can be tailored to suit customers' specifications for use in a wide range of new products.

The company adds that the economic feasibility of recycling depends on stable end markets that justify the cost of processing. Moulders working with recyclers on understanding physical polymer properties, and crucially, engaging in practical trials to understand the suitability of a recycled polymer in new applications can gain a competitive advantage in emerging circular economy markets.

Some closed loop recycling exists, primarily in PET and HDPE packaging, says Axion. Although closed loop recycling is not vital, if it can be achieved it allows for the same grade of polymer to be reused in the same application. This removes some of the technical barriers of using recycled content. However, in many cases, closed loop cannot be achieved because products may be collected in a mixed stream, where separation of different polymer grades is not technically or economically possible. In this case, manufacturers

need to consider using alternative polymer types or blends if they want to increase recycled content.

This brings a potential technical barrier. In many cases, a moulded product is designed to use a specific grade of polymer with very specific properties. The company that produces the moulded product may not be involved in specifying the material, and so will be reluctant to use any polymer that does not conform to the exact original specification. The potential technical barrier then becomes a "resistance" to use recycled content due to perceptions about its ability to meet virgin material specifications.

However, in many cases products do not need such rigid specifications, and in reality, a wide range of different grades of a polymer or even different blends of polymers may work well in certain applications. Blending PE and PP from plastic film to use in injection moulding of PP products is a prime example of what can work successfully. Products such as crates, bins and buckets can even benefit from a PE/PP blend as the properties can complement each other, says the company.

"Moulders should work with recyclers to ensure that the recycled polymer is as suitable as possible for an application," says Mark Keenan, Business Development Manager. "At Axion Polymers, we work with our customers to get recycled content into their products or help them use a different polymer formulation altogether. Practical trials are the only way to truly understand the suitability of a recycled polymer."

Collaborators in the ChemCycling project – **BASF**, Jaguar Land Rover, Storopack, Südpack and Schneider Electric – used K2019 to showcase prototypes made from chemically recycled material. At the end of 2018, BASF first used pilot volumes of a pyrolysis oil derived from plastic waste as a feedstock in its own production. At K2019, the first



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prototypes that were created during the pilot phase of the project were highlighted.

**Jaguar Land Rover** has developed a plastic front-end carrier prototype for its first electric SUV, the I-Pace, out of Ultramid B3WG6 Ccycled Black

00564. "As part of our commitment to accelerate closed loop manufacturing across our operations, we are always looking for advances in technology that will help to reduce waste," says Craig Woodburn, Global Environmental Compliance Manager. "The ability to convert consumer waste into safe, quality parts for premium products through the ChemCycling process is an important step in advancing our ambition to deliver a zero-waste future."

**Storopack** has used Styropor P

Ccycled to make insulation packaging for temperature sensitive pharmaceutical products as well as boxes for transporting fresh fish and protective packaging for electronic devices. "We were particularly impressed by the fact that Styropor P Ccycled can be used in food packaging," says Hermann Reichenecker, Chairman of the Management Board. "There are already various recycling options for Styropor, and ChemCycling helps raise the recycling share even further."

**Schneider Electric** manufactured a circuit breaker from chemically recycled Ultramid. "We actively assess the ability of secondary raw materials, such as recycled plastics, to meet our demanding quality standards, and stringent industry

regulations and norms," says Xavier Houot, Senior Vice President Group Environment, Safety, Real Estate. "We are hopeful this experimentation with BASF will open room for more circular innovations in Energy Management and Distribution."

**Südpack** produced a PA film and a PE film that were processed into specially sealed flexible packaging for mozzarella.

BASF adds that the pilot projects with customers from various industries show that products made with chemically recycled raw materials exhibit the same high quality and performance as products made from primary materials. "ChemCycling, which uses a mass balance approach to mathematically allocate a share of the recycled material to the final product, can help our customers to achieve their sustainability goals," says Jürgen Becky, Senior Vice President Performance Materials. The certified products are indicated with the addition of Ccycled to their name.

In order for ChemCycling to move from the pilot phase to market roll-out, BASF says that various technological, economic and regulatory issues will need to be resolved. The existing technologies for transforming waste plastics into recycled raw materials must be advanced and adapted for the use at industrial scale, in order to ensure the consistently high quality of the pyrolysis oil. BASF is currently investigating various options for supplying the company's Production Verbund with commercial volumes of pyrolysis oil in the long term.

Producers of engineering polymers are now joining commodity plastics producers in creating materials for injection moulders that include recycle and have other environmental advantages. ➤



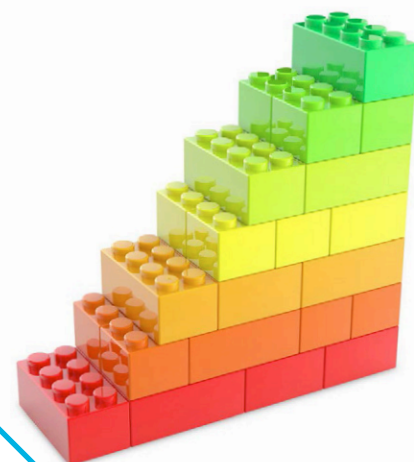
**Above:**  
**Storopack has used Styropor P Ccycled from BASF to make insulation packaging for temperature sensitive pharmaceutical products**

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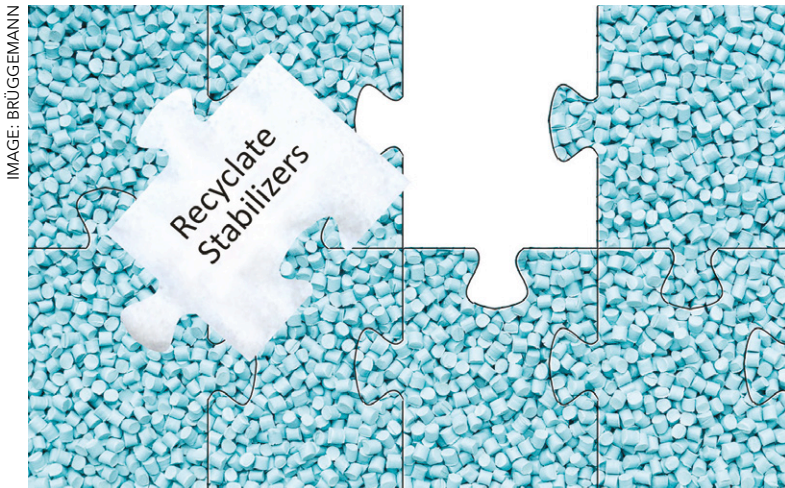


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**Above:**  
**Fraunhofer**  
**LBF and**  
**Brüggemann**  
**have collaborated to**  
**develop new**  
**stabilisers for**  
**high-quality**  
**polyolefin**  
**recyclates**

**Tisan Engineering Plastics** has developed EcoStar plastics from recyclates to obtain high quality engineering plastics such as PA 6, PA 6.6, PP homopolymer and PP copolymer. The company says that EcoStar products are customised to offer ecologic and economic solutions for different markets. EcoStar recovers the most prevalent and valuable materials, often in multiple grades and colours.

Tisan says modification of the plastics by reprocessing with fillers, reinforcements and modifiers produces a substantial change in the properties of the base material to achieve good mechanical properties, high quality consistency and cost reductions. The grades are suitable for applications in automotive, electric and electronics, home appliances, construction, industrial applications, defence, safety equipment, transportation, office furniture, sports and energy, says the company.

**Celanese** has developed a number of engineering materials that contain a percentage of recycled resins as an environmentally-friendly alternative to prime resin grades. The company says that its sourcing and manufacturing process enable resins with high consistency and performance. These materials include PA, PP and PBT/PET which allow manufacturers in industries such as automotive, consumer appliances and electrical/electronics, to achieve recyclability goals while meeting performance requirements. In addition, Celanese Ecomid recycled PA 66 compounds contain high-quality recycled PA fibres and textiles for an environmentally-friendly alternative to standard grades. These compounds, given their sourcing and manufacturing process, provide high lot-to-lot consistency to customers, says the company.

Improving the quality of materials with recycled content is helped not just by control of sourcing but also by developments in additives used to restore or improve properties. **Fraunhofer LBF** and

**Brüggemann** in Germany have collaborated to develop new stabilisers to improve the properties of polyolefin recyclates. The stabilisers are claimed to be capable of reducing the effects of damage from the materials' processing and use due to thermal oxidation and photo-oxidation that can prevent them from being recycled into high quality moulded products.

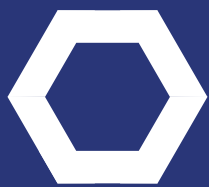
"With its many years of comprehensive experience in the field of polymer additives and its worldwide market penetration, Brüggemann is the right partner to bring our ideas for the upcycling of plastics to market quickly," says Dr. Rudolf Pfaendner, Head of the Plastics Division at Fraunhofer LBF. Building on the work of Fraunhofer LBF, Brüggemann will use its know-how and technical potential to optimise formulations. The company will adapt the stabilisers to the requirements of customers and markets, provide technical application advice and will take over large-scale production, quality assurance and worldwide marketing.

Brüggemann traditionally focuses on high-performance additives for polyamides, including heat, processing and light stabilisers, process auxiliaries and modifiers. Marketed under the Bruggolen brand, the company says that these additives ensure processing efficiency, extended component service life and high quality under economically favourable conditions, in both injection moulding and extrusion. The company is currently going through significant expansion and its new, highly automated facility will also produce the new additives for polyolefin recycling.

"We are very pleased to have entered into a cooperation agreement with the Fraunhofer LBF to expand our portfolio of recycling additives to polyolefins," says Dr. Klaus Bergmann, Head of Polymer Additives. "Ultimately, our goal is to significantly improve the quality of recyclates with the help of innovative additives, thereby making an important contribution to the upcycling of plastic waste."

**Songwon** has developed Songxtend 2721 to enable recycled PP to be reused and achieve high durability in automotive applications. The company says that this high-performance stabilisation system improves the long-term heat stability of both vehicle-interior and under-the-hood recycled parts, extending their service life. Concentration levels can be adjusted to meet the long-term heat stability requirements of applications such as engine covers, cable ducts and battery housings, for example. As well as increasing durability, Songxtend 2721 helps to minimise the negative effect of acid residues from battery case recycling.

Improved recyclability is also a goal of additives



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**Right: With the manufacture of thin-walled sample parts, Engel presented the iQ weight control smart assistance system at K 2019, with a recyclate application for the first time**

companies. Millad NX 8000 clarifier for PP from **Milliken** has received Critical Guidance Recognition from the **Association of Plastic Recyclers (APR)** in the US. This recognition validates that the clarifier is compatible with plastic packaging recycling. To date, the Millad NX 8000 additive is the only PP clarifying agent to receive Critical Guidance Recognition from APR. As a result, Milliken is investing in a new manufacturing plant that will boost clarifier capacity by 50%.

Test results showed that the Millad NX 8000 clarifier met or exceeded the most stringent guidance of the APR Critical Guidance Documents, indicating that the clarifier does not adversely affect the recyclability of PP parts. Milliken says that this can be attributed to a quality control regimen and the clarifier's high product purity.

Machinery companies are also active in adapting and developing technology that facilitate injection moulding of materials with recycled content. Smart assistance systems are paving the way for self-optimising production and automatic correction of quality-relevant parameters is already

a reality for individual phases of the injection moulding process. At K2019, **Engel** presented the iQ weight control with the example of a recyclate application for the first time. The company says that extensive tests performed jointly with recycling line manufacturer Erema confirm that the system has great potential for the circular economy. Transport and storage boxes were the application for the use of recycled raw materials. Engel reports that several customers have already processed recyclates in large quantities to produce various containers, with iQ weight control used to improve the process repeatability.

The software detects fluctuations in the raw material and in the ambient conditions, and adjusts the injection profile, switchover point and holding pressure, individually for each shot to suit the current production conditions. "We can process recyclates from different sources and, thanks to iQ

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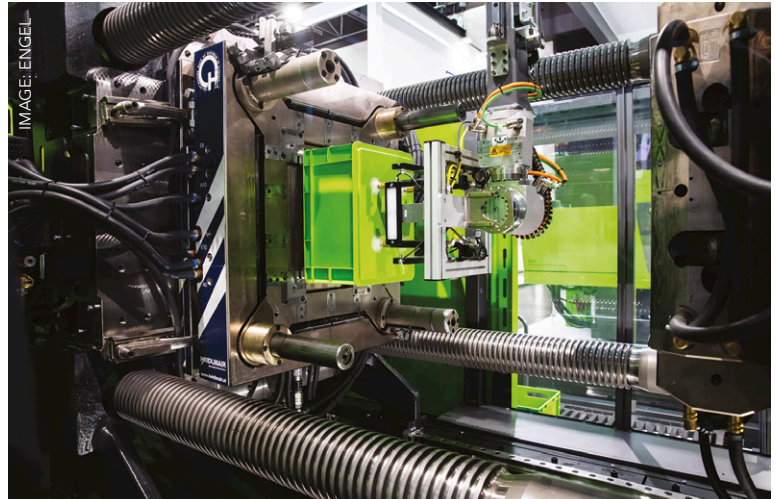
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weight control, minimise the reject rate," says an internationally active processor. "This makes it substantially easier to use recycled materials."

Engel adds that fluctuations in the material properties pose a significant challenge for the processing of recyclates. Even homogeneously collected and treated plastic wastes are subject to greater fluctuations than virgin material, since the recycle properties are also influenced by circumstances such as how heavily the wastes are polluted and the process used to wash, shred and repelletise the wastes. In recycle processing, such materials are generally sourced from different suppliers. Since recycling companies use different technologies, the variance is particularly high when a batch is changed. At K2019, an Engel Victory 120 machine processed fully recycled ABS into elongated sample parts. The recycle batches came from two suppliers using different treatment technologies and raw materials from different sources.

Engel says that with the injection of plastic melt into the cavity, the filling quantity is influenced by a diverse range of factors, which can have a negative effect on the part quality. Besides fluctuations in the raw material batch, they also include changing ambient temperature and atmospheric humidity, fluctuations in the closing behaviour of the non-return valve and operating fluid supply, as well as a long run-in phase, for example, after production downtime. The iQ weight control assistance system from Engel analyses the pressure change in real time during injection and compares the measured values with a predetermined reference cycle. If the software detects deviations, it adapts the injection profile, the changeover point and the holding pressure profile to current process conditions in the same shot. In the case of parts that are filled in a cascade via multiple gates, iQ weight control additionally corrects the opening and closing of the individual shut-off valves according to the progress of filling. In this way, the software ensures high process constancy and maximises the production of acceptable parts.

Engel is also using its Skinmelt sandwich process for increased use of recycled materials. The company says that process technologies for manufacturing multi-layer and multi-component products offer great potential for using reprocessed plastic wastes even for plastic parts that are subject to strict requirements for surface quality, product protection or consumer safety. The key is to place the recycled material in the interior while the surface is made of virgin material. Engel has developed a variant of sandwich injection moulding that allows high proportions of recycled material to



be used even with complex part geometries.

Multi-component injection moulding, such as Engel Skinmelt, offers the possibility of increasing the use of recycled material even in products with strict requirements for their optical appearance and surface functions. Since the skin material can be modified as required, even food applications are possible. With careful choice of process and mould design, the part surface can be made entirely of virgin material and thereby over 50% recycled material employed. Some properties of the reprocessed recycled material in the part core, such as colour or surface hardness, can be completely covered by those of the skin material. At the same time, other properties of the core, such as a possibly higher stiffness or strength, have a beneficial effect on the product performance in the sandwich laminate. Engel adds that for very sophisticated purposes, with more complex load profiles, teamwork in the development organisations is important for mastering the challenges that occur there, in a similar way to the suitable choice and coordination of the skin and core components.

**Above: Engel's Skinmelt sandwich technology can enclose recycled material beneath a virgin material surface, for example in transport boxes**

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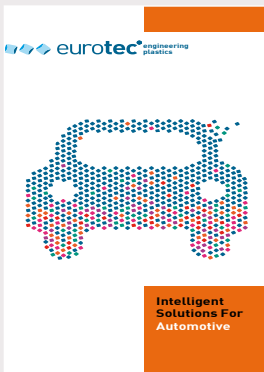
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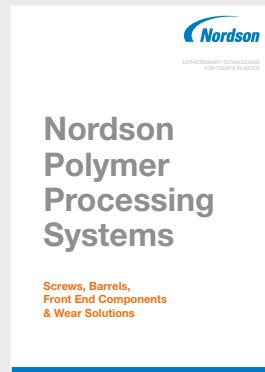
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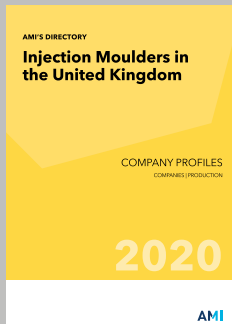
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Germany is the leading country for injection moulding in Europe. Gain access to this market with profiles of 2162 injection moulding sites in Germany. Access in-depth contact and production data equipped with extensive search capabilities. Alternatively, the pdf version supplies basic company profiles.

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## Injection Moulders in France



Get an updated picture on the injection moulding industry in France with instant access to 884 production sites. Get managerial contact names, polymer consumption, market and machinery data for each site. Access manufacturers supplying plastic products to the automotive, medical, building and packaging sectors amongst others.

[CLICK HERE](#)

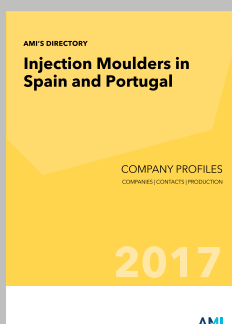
## Injection Moulders in Italy



Get a key insight into the fragmented Italian market with managerial contact names, polymer consumption, market and machinery data for 1128 sites. Identify companies of interest for your business by receiving an updated overview on their production activities.

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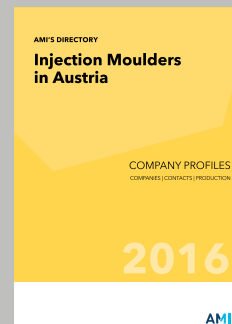
## Injection Moulders in Spain and Portugal



A unique insight into the production of 1011 injection moulders in the Iberian peninsula. This directory gives you access to managerial contacts and production information on 790 manufacturing sites in Spain and 221 in Portugal serving a number of markets such as medical, automotive, electronics as well as food and non-food packaging.

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## Injection Moulders in Austria



This directory identifies 189 injection moulders in Austria serving the electronic and electrical markets as well as other industry segments. The data is available in pdf format or as a database which enables you to search companies by polymers processed, markets served or number and make of machines operated.

[CLICK HERE](#)



# Learn more about AMI's upcoming conferences

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

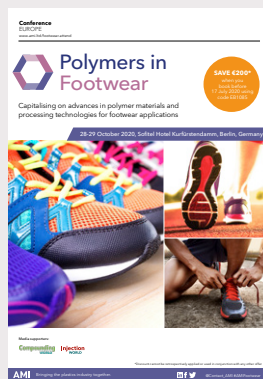
## PLASTIC CLOSURE INNOVATIONS



Barcelona in Spain hosts AMI's 8th Plastic Closure Innovations conference on 26-28 October 2020. This leading industry event brings together brand owners, packaging producers and closure makers to discuss regulatory and technical challenges.

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## POLYMERS IN FOOTWEAR



The fourth edition of the Polymers in Footwear conference returns to Berlin from 28-29 October 2020. This international conference brings together forward-thinking experts from the polymers and footwear supply chain to discuss solutions and opportunities for this fast-moving industry.

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## PLASTICS REGULATIONS



The 4th edition of Plastics Regulations provides advice on a range of compliance issues at one event. The event takes place on 2-4 November 2020 in Cologne, Germany. The conference provides an ideal environment for regulatory updates.

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## PERFORMANCE POLYAMIDES



Get your annual update on the global polyamide industry at our popular Performance Polyamides USA conference taking place on 3 November 2020 in Cleveland, Ohio. The fourth edition of this event will bring together the international supply chain for a full-day of high level presentations.

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## FIRE RESISTANCE IN PLASTICS



The 15th edition of AMI's global conference on flame retardancy will take place in Düsseldorf, Germany on 30 November - 2 December 2020. Expert speakers will deliver papers discussing developments in markets, materials, technology, applications, testing and regulatory framework.

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## CONDUCTIVE PLASTICS



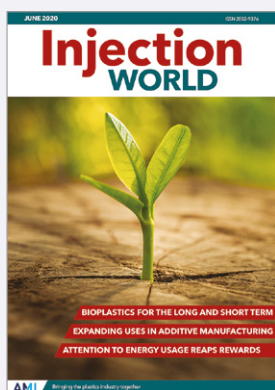
AMI's Conductive Plastics conference in Munich on 1-2 December is the place to learn about technologies and applications for electrically and thermally conductive plastics, and to meet OEM engineers, product designers, processors, compounders and additive producers.

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

# Keep informed: read our latest editions

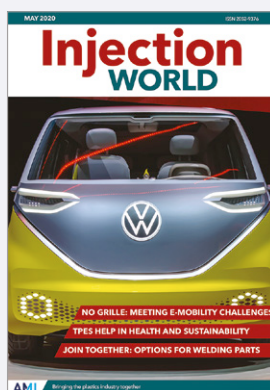
AMI publishes five process-specific FREE plastics industry magazines. Simply click on the cover below to read each magazine. Or download the issue in the relevant Apple or Android app



## Injection World June 2020

The June issue of Injection World has features on the diversification of uses for bio-sourced polymers, new developments in 3D printing and the benefits of good energy management, plus news on the industry impact of Covid-19.

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## Injection World May 2020

The May 2020 edition of Injection World magazine explores how the shift to electric and hybrid vehicles is placing new demands on producers of injection moulded parts. We also take a look at the latest developments in plastics welding and TPE applications.

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## Compounding World July 2020

The July edition of Compounding World magazine finds out what the Covid-19 pandemic has meant for the antimicrobials sector. It also looks at developments in colour measurement, liquid feeding and melt filtration.

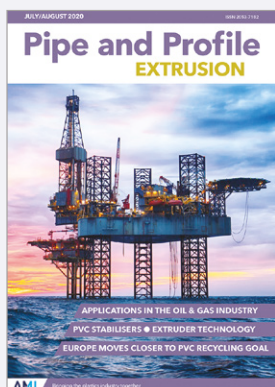
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## Plastics Recycling World May/June 2020

The May/June edition of Plastics Recycling World looks at the industry's lingering problem of bad odours. It also reviews the latest developments in high performance shredders and explores the world of polymer compatibilisers.

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## Pipe and Profile July/August 2020

The July/August issue of Pipe and Profile Extrusion examines the technical advances in pipelines for the offshore oil and gas industry. Features also cover the PVC sector in its use of stabiliser additives and its achievements in recycling; plus the latest from extrusion technology suppliers.

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## Film and Sheet June 2020

The June edition of Film and Sheet Extrusion magazine takes a look at some of the latest developments in printing systems. It also explores new ideas in pouch packaging, blown film control technology and downstream equipment.

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WORLD

**Plastics Recycling**  
WORLD



## GLOBAL EXHIBITION GUIDE

2020	<b>3-6 August</b>	Chinaplas, Shanghai, China <b>CANCELLED</b>	<a href="http://www.chinaplasonline.com">www.chinaplasonline.com</a>
	<b>9-11 September</b>	Plastics, Printing & Packaging, Dar-es-Salaam, Tanzania <b>POSTPONED</b>	<a href="http://www.expogr.com/tanzania/pppexpo">www.expogr.com/tanzania/pppexpo</a>
	<b>9-13 September</b>	Taipei Plas, Taipei, Taiwan <b>POSTPONED</b>	<a href="http://www.taipeiplas.com.tw">www.taipeiplas.com.tw</a>
	<b>21-25 September</b>	Colombiaplast, Bogota, Colombia <b>POSTPONED</b>	<a href="http://www.colombiaplast.org">www.colombiaplast.org</a>
	<b>29 Sep-1 Oct</b>	Interplas, Birmingham, UK <b>POSTPONED</b>	<a href="http://www.interplasuk.com">www.interplasuk.com</a>
	<b>6-9 October</b>	Plastpol, Kielce, Poland	<a href="http://www.targikielce.pl">www.targikielce.pl</a>
	<b>6-10 October</b>	IPF Japan, Tokyo, Japan <b>CANCELLED</b>	<a href="http://www.ipfjapan.jp">www.ipfjapan.jp</a>
	<b>7-8 October</b>	Compounding World Expo Europe, Essen, Germany	<a href="http://www.compoundingworldexpo.com/eu/">www.compoundingworldexpo.com/eu/</a>
	<b>13-17 October</b>	Fakuma, Friedrichshafen, Germany	<a href="http://www.fakuma-messe.de">www.fakuma-messe.de</a>
	<b>4-5 November</b>	Compounding World Expo USA, Cleveland, OH, USA	<a href="http://www.compoundingworldexpo.com/na/">www.compoundingworldexpo.com/na/</a>
	<b>10-13 November</b>	Plastimagen, Mexico City <b>POSTPONED</b>	<a href="http://www.plastimagen.com.mx">www.plastimagen.com.mx</a>
	<b>1-5 December</b>	Equiplast, Barcelona, Spain <b>CANCELLED</b>	<a href="http://www.equiplast.com">www.equiplast.com</a>
2021	<b>5-8 December</b>	Plast Eurasia, Istanbul, Turkey	<a href="http://www.plasteurasia.com/en">www.plasteurasia.com/en</a>
	<b>9-12 January</b>	Arabplast 2021, Dubai, UAE	<a href="http://www.arabplast.info">www.arabplast.info</a>
	<b>11-14 January</b>	Plastimagen, Mexico City <b>NEW DATE</b>	<a href="http://www.plastimagen.com.mx">www.plastimagen.com.mx</a>
	<b>13-16 April</b>	Chinaplas 2021, Shenzhen, China	<a href="http://www.chinaplasonline.com">www.chinaplasonline.com</a>
	<b>4-7 May</b>	Plast 2021, Milan, Italy	<a href="http://www.plastonline.org/en">www.plastonline.org/en</a>
	<b>17-21 May</b>	NPE 2021	<a href="http://www.npe.org">www.npe.org</a>

## AMI CONFERENCES

<b>5-6 October</b>	Polymer Foam, Hamburg, Germany
<b>26-28 October</b>	Plastic Closure Innovations, Barcelona, Spain
<b>28-29 October</b>	Polymers in Footwear Europe, Berlin, Germany
<b>17-18 November</b>	Plastic: Design for Sustainability, Berlin, Germany
<b>3 November 2020</b>	Performance Polyamides, Cleveland, OH, US
<b>30 November - 2 December</b>	Thin Wall Packaging, Nuremberg, Germany
<b>1-2 December</b>	Conductive Plastics, Munich, Germany

For information on all these events and other conferences on film, sheet, pipe and packaging applications, see [www.ami.international](http://www.ami.international)

**PLASTICS RECYCLING**  
WORLD EXPO

**POLYMER TESTING**  
WORLD EXPO

**7 - 8 October, 2020**  
**ESSEN, GERMANY**

**PLASTICS EXTRUSION**  
WORLD EXPO

**COMPOUNDING**  
WORLD EXPO

**4 - 5 November, 2020**  
**CLEVELAND, OHIO**

[www.ami.international/exhibitions](http://www.ami.international/exhibitions)