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Haitian sales defied the Nanogate pandemic in 2020

Hong Kong-based Haitian International Holdings, one of the world's largest manufacturers of injection moulding machines, has revealed that it enjoyed record sales of 43,000 machines in 2020, despite the impact of the Covid-19 pandemic.

Sales increased 20.3% to RMB 11,800m. Exports were 2.1% higher at RMB 3,518m meaning most of the growth came in the Chinese market. The company credited a "rapid recovery in the domestic economic situation" thanks to "strict preventive and control measures taken by the government".

The Haitian Mars series accounted for over 37,000 of the machines sold and saw 26.8% year-on-year sales growth to RMB 8,214m. This was largely due to strong demand for mass medical products and



packaging in the first half-year.

The electric Zhafir series and the Haitian Jupiter series with two-platen technology saw increases of 6.8% to RMB 1,439m and by 3.2% to RMB 1,303m respectively. This was driven by more limited growth in the household goods and automotive markets.

Under a general overview of its five-year plan strategy

at the beginning of 2021, Haitian's main objectives are to strengthen its global market presence and consistently to expand its market share. The digitalisation of in-house manufacturing, especially in terms of R&D, intelligent production processes, digital system integration and process control, will be a key part of this, said the company.

> www.haitian.com

group splits up

Nanogate, the Germanbased specialist in multifunctional components and surfaces that went into administration in October 2020, announced on 5 March that, with the consent of its creditors' committee, the management of its Nanogate Medical Systems operations has agreed to be acquired by Walter Potthoff in Germany. This followed on from the sale of Nanogate Kierspe in Germany to its managers.

The disposals are both structured as asset deals and neither business is part of the core business of the group's restructuring strategy. Negotiations will continue with regard to the sale of core business and other subsidiaries.

> www.nanogate.com

Cell for advanced testing in Germany



Above: The cell is based at BASF's Injection Moulding & **Extrusion Pilot Plant in Ludwigshafen, Germany**

Sumitomo (SHI) Demag and BASF have developed an all-electric manufacturing cell to produce test specimens for product R&D activities in thermoplastics and compounds. This is based at BASF's Injection Moulding & Extrusion Pilot Plant at Ludwigshafen. It is claimed to deliver repeatable results on over 4,000 test settings/year.

The cell centres on an IntElect 1,000 kN injection moulding machine. A linear SDR 5-35S robot selects and places one of 12 interchangeable mould inserts, extract the moulded specimen and pass it to a small, six-axis, articulated-arm Yaskawa GP8 robot to cut it from the gate using a servo spindle drive punching machine.

The cell features an HB-Therm temperature control unit and a digital manufacturing execution system to map each test sequence.

> www.basf.com > www.sumitomo-shi-demag.eu



Compounds Made of Engineering Plastics



Plastics Engineer
www.tisan.com.tr

Nine-year battery part deal

Under a new contract, ElringKlinger will supply cell contacting systems to the German plant of a global firm which produces battery systems for the series platform of a German premium car maker from 2022. This covers a total volume in the mid-triple-digit million Euros range and will continue for about nine years.

Series production at the firm's Neuffen site is scheduled to commence within 15 months.

Cell contacting systems consist of a plastic carrier frame that accommodates the cell connectors and ensures assembly in all tolerance positions. The required voltage and temperature sensors are already included and the electronic cell supervision circuit can also be integrated.

> www.elringklinger.de

German machinery makers see order and sales growth for 2021

VDMA, the trade body that represents Germany's plastics and rubber machinery makers, says its members expect both order and turnover volumes to grow this year.

A survey of members showed that almost half of all respondents expect to see an upturn in the first six months of 2021. A similar amount expect to see market conditions strengthen further in the second half of the year.

"In the second half of 2020, the demand for plastics and rubber machinery has clearly changed across all regions," said Ulrich Reifenhäuser, Chairman of VDMA. "The situation in China and Germany is seen as particularly positive."

In addition, around half of all survey participants



Reifenhäuser: "Demand rose in the second half of 2020"

expect to take on new staff in the first half of the year.

Thorsten Kühmann,
Managing Director of
VDMA, added: "It looks like
the plastics and rubber
machinery industry can look
forward to a successful
business year. We will be
viewing the coming months
with anticipation."

The survey's findings are

in line with 2020 year-end figures, which showed a 7% increase in orders compared to 2019.

■ VDMA says that it will no longer be part of the German Pavilion at Plastico Brasil, which is scheduled to take place in Sao Paolo in November this year. The reason is the increased spread of Covid-19 in the country. However, VDMA says its decision has no influence on the participation of other companies in the pavilion.

It added that Brazil is the most important market in South America for plastics and rubber machinery - and many companies have local branches there.

VDMA is participating in Chinaplas but is not planning to send any staff there from Germany.

> http://kug.vdma.org

New Yizumi for Tacoplast in Malaysia

Malaysian firm Tacoplast Industries has implemented a Yizumi W1 Series UN680W1 injection moulding machine into the production of 18-litre deep-cavity plastic buckets. The company mainly supplies these and other products to the food and paint industries in South East Asia and India.

Tacoplast noted that the machine's clamping

structure can achieve 20% shorter cycle times of 23s. It further believes that this could be reduced to 18s if a

new mould is used.
The W1's new kir

The W1's new kind of clamping structure is based on an outward toggle that



enables it to transmit the clamping force to the mould directly and thus minimise mould deformation. In addition, the opening stroke and the machine application range can be expanded beyond the in-mould space, making it suitable for products like bins, barrels, chemical buckets, plastic stools and the outer drums of washing machines.

> www.yizumi.com



VRC grows with acquisition of Cascadia Custom Molding

VRC Engineered Solutions and its Cleveland-based private equity owner Blue Point Capital Partners, have acquired Cascadia Custom Molding. They said that this will "expand VRC's product offerings and geographic footprint while enhancing manufacturing capabilities and diversifying end markets served".

Cascadia supplies thermoplastic components to the medical, aerospace and consumer goods markets from facilities at Coeur d'Alene, ID, and Woodinville, WA. It has



particular expertise in complex, low-volume parts and other capabilities that are said to complement VRC's expertise in tooling and materials.

VRC comprises Ritus, Vanseal and Classic Molding active in the aerospace and defence, automotive, industrial, oil and gas, marine and medical Left: Cascadia moulds components for the medical, aerospace and consumer goods sectors

markets. This is its first acquisition since Blue Point acquired it in August 2019.

Blue Point Partner John LeMay said: "The Cascadia platform fits squarely within the key end markets and capabilities of our focused add-on strategy, and we are enthusiastic about the opportunities available to the combined company going forward."

> www.bluepointcapital.com

Eissmann takes over KTSN

Automotive supplier Eissmann Group has agreed to take over the plants of Minda KTSN Plastic Solutions in Germany and Poland. Talks are continuing about the site in Mexico. The firm now aims to bring together its own lamination products and services with KTSN's plastics technology.

KTSN, which filed for insolvency in June 2020, is active in injection moulding and kinematics, making gloveboxes, seat back panels, cup holders and other plastic components for the automotive industry. Before insolvency, it employed about 400 people.

Eissmann, meanwhile, has 12 sites across three continents, employs 5,000 and turns over €470m per year.

> www.eissmann.com



New investments by EMS

Engineering thermoplastics producer EMS has held the ground-breaking ceremony for a new high-rack warehouse for its EMS-Grivory operation at Domat/ Ems. Switzerland.

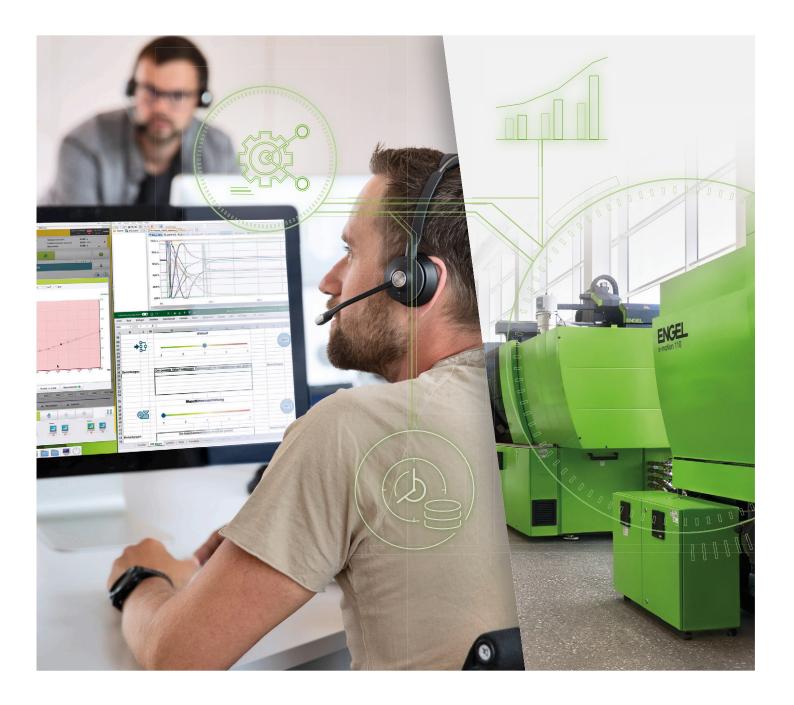
This will be the start of investments of CHF 300m at the site over the next five years. The firm will create at least 50 additional jobs and increase capacity by 70%. Most of this new production will be for export. A further CHF 60m will also be invested at other company locations in Switzerland.

The new warehouse will stand 44

metres high and replace its predecessor as the highest warehouse in the country. It is also among the five highest in Europe.

With this, said CEO Magdalena Martullo-Blocher, the firm will "achieve rapid expansion of our distribution and storage capacity before the end of this year and continue to supply markets worldwide quickly and flexibly". The warehouse will provide jobs for 13 additional logistics employees and training for 15 apprentices.

> www.emsgrivory.com



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Thermoset and reactive plastics moulding collaboration

Three German-based companies have revealed that they signed a contract for co-operation in the area of reactive plastics in December. Their stated aim is to advance technologies in the fields of thermoset injection moulding and processing of other reactive plastic materials.

The three companies are: Schwarz Plastic Solutions, a technology service provider that supports plastics processors in all matters relating to thermosets; Precupa, which produces injection moulding tools with weights of up to 3.5 tonnes and dimensions of up to 600 x 600 mm, and has experience in moulds for thermoset; and injection moulding machinery group, Wittmann Battenfeld.

"The conviction that thermosets and other reactive plastic materials are



Left to right: Andreas Schramm, Managing Director of Wittmann Battenfeld Deutschland; Thomas März, Managing Director of Precupa; Ingo Schwarz, Managing Director of Schwarz Plastic Solutions; and Gottfried Hausladen, Sales Director of Wittmann Battenfeld Deutschland

gaining more and more significance, above all in the electrical engineering sector has prompted us to pool our expertise in machine and automation technology, process technology and mould technology," the companies stated.

As part of the agreement, Precupa and Schwarz have acquired a SmartPower XL 240/3400 Unilog B8 servo-hydraulic injection moulding machine from Wittmann Battenfeld that is specially equipped for thermoset processing. This has 2,400 kN clamping force and features different plasticising systems.

These features enable it to produce small shot weights and dimensions of up to 200 cm³, but also large shot weights with volumes of up to 1,500 cm³, such as an encapsulation for electric motors, or overmoulding of inserts.

The system can process both granulated thermosets and paste materials, such as wet polyester, while an additional hydraulic unit, offers high additional compression forces for processes like injection compression or injection stamping and a modular thermoset mould facilitates extensive processing test series.

- > www.schwarz-plastic-solutions.de
- > www.wittmann-group.com





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Milacron teams up with Fanuc to offer new Roboshot machines

Milacron Injection Molding & Extrusion is partnering with Fanuc to offer Fanuc Roboshot Alpha-SiB series electric machines to injection moulders across North America. The Alpha-SiB 55, 110, 140, 165 and 240-ton models are now available. Milacron will deliver the first Alpha S140iB to a custom moulder in the Midwest in the second guarter of 2021.

The two companies have worked to adapt the Roboshot Alpha to meet the requirements of a wide variety of applications on both the clamping and injection unit. Special features have been specifically developed for applications in medical, LSR, optics, electrical connectors and packaging.

FANUC RODOSHOT COT-\$150 IB

[Mila Hot F Model FANUC FANUC MODEL FANUC FA

Milacron said its technical experts used 3D modelling to develop new high-flow capacity water systems to prevent operation without water flow.

"Over the last two years, these systems have proven to be invaluable for the medical and packaging industries," said Kent Royer, Technical Product Manager for Roboshot. "Since NPE 2018, we also have seen a high Fanuc Roboshot Alpha-SiB machines have been adapted for North American moulders

demand for the integration of [Milacron Group's] Mold-Masters
Hot Runner controllers. Using
Modbus and SPI communications,
we've developed capabilities that will
reduce human error in operation and
allowing for the creation of custom
shut-down sequences using the
Roboshot Customised I/O feature
using ADD/OR logic."

The Alpha-SiB series includes a higher resolution/performance Panel iH control and new electrical standards.

- > www.milacron.com
- > www.fanucamerica.com













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Covid-19 stimulates greater use of robots

Knowing that productivity can never be sacrificed even during a pandemic, many injection moulders have invested in robots and their cobot cousins. **Peter Mapleston** reports on developments

"Automation is getting off the starting blocks to considerably influence today's working environment." So says Statista in a new report on the global robotics market and application areas. "Smart factories are more than visions for the future." Recent events, including the Covid-19 pandemic and the China-United States trade dispute have shaped the evolution of the robotics landscape, it notes.

Smart factories are bringing more flexible production, optimised logistics, customer-focused solutions, intelligent use of data, and resource savings. Statista also points to numerous industry experts forecasting a future with increasing collaboration of humans and robots - the cobots trend.

"As with most disruptions, the pandemic has amplified the focus on productivity and forced

injection moulding decision makers to reconsider how automation and digitalised technologies can facilitate working smarter," says Nigel Flowers, UK Managing Director of **Sumitomo (SHI) Demag**, which like many injection moulding machine makers also offers automation.

At **Fanuc America**, Executive Sales Manager James Cooper, says: "Injection moulders experienced the impact from the Covid-19 pandemic in many of the same ways as other manufacturers. Some saw a significant increase in production volumes in order to support manufacturing products that address the needs of the pandemic, such as respirators and ventilators. Many injection moulders pivoted quickly to respond to this demand, and robotics played a key role to allow these injection moulders to operate with the

Right: Yushin's FRA high-end take-out robot series, launched at NPE 2018, is equipped with the company's IoT (Internet of Things) solution service, Intu Line, which the company continues to update. This app, which runs on PCs and mobile devices, allows moulders to monitor production status of their moulding machines and auxiliary equipment while away from the office. If an error occurs, a Yushin service technician can assess the robot's data and troubleshoot the issue. Al predicts possible breakdown risks so users can take early preventative action

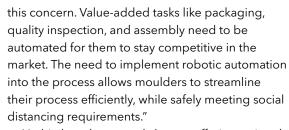
> variable workforce staffing situation brought on by the pandemic itself. Robotics allowed these companies to continue to produce while companies were short staffed, and to allow for, in some cases, to introduce the much needed social distancing into their plant production operations."

On top of this, says Cooper, more recent developments, such as cobots, allowed for quick implementation of robots into these operations. He cites Fanuc's CRX cobot, which he says has a simple and easy programming interface that allows for quick programming, "even by new users who have never programmed a robot in the past."

Chris Parrillo, National Sales Manager for Yushin in the USA, also points to how emergency production of plastic parts required to combat Covid-19 in the healthcare industry has increased the demand for robots and automation. "Many plastic injection moulding companies have turned to us for help with this need," he says. "We have been very busy with customers that were moulding everything from parts used in lifesaving medical equipment like ventilators and PPE including masks, glasses and face shields. We were also quite active with components used for testing and vaccinations."

on labour shortages, as workers could not or would not report to work. Customers are reporting problems filling open positions throughout their

He says: "The pandemic added another burden organisations and turning to automation to address



FRA YUSHIN

IMAGE: YUSHIN

Yushin has also recently begun offering a virtual runoff process for new equipment. "In the past, customers were able to come in and conduct a factory acceptance test for a new automation system running before it was delivered," says Parrillo. "Our virtual support offers our customers the opportunity to see their equipment running, interact with our engineers in real time and make necessary changes right on the spot. We will continue to improve on the process."

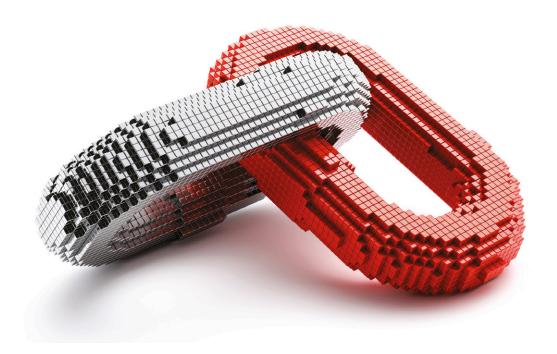
Muller Technology, which supplies moulds and automation solutions for thin-wall packaging, in March launched what it says is the industry's first self-contained cobot case packer for lids and containers. Incorporating an Omron six-axis cobot, the case packer "helps processors who struggle filling unskilled labour positions while also meeting Covid-19 social distancing requirements," says Taras Konowal, Director of Sales and Marketing for North America. He adds that moulders can re-allocate their workforce to more productive, fulfilling jobs. Muller worked together with Omron to develop a version specifically for the application.

"Applications that traditionally have been quite labour-intensive, such as box packing, are now going either to full automation or automation with cobots," Konowal says. "There were labour shortages in this sector before the pandemic, but now it has got worse. There is a really high level of absenteeism. But automation doesn't call in sick! Plus, it can handle the increased volumes we are seeing. Packaging for things like groceries has been skyrocketing. Our customers are seeing volumes up over 150% from pre-Covid."

The cobot case packer offers portability, quick part changeover for different size configurations,

Below: Collaborative robots can be quickly implemented

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Right: Muller case packer uses an Omron cobot and a return on investment of less than one year, the supplier claims. The product platform will be manufactured in Switzerland and Colorado. Muller has already sold several units for lids and containers in the US and Europe.

The cobot incorporates a standard Muller HMI, which eliminates any programming requirements and stores multiple recipes for a wide range of stack and box sizes. It can be purchased separately or integrated into an automation line such as Muller's M-Line system, introduced last year (see *Injection World* April 2020). An increasing number of M-Lines are being shipped with automated case packing, Konowal says.

The M-Line has proved to be a great success as calls for automation during the Covid pandemic have boomed. Last year, the company received 24 orders for M-Lines, which Konowal says is incredible for a single product of this type. "It's all down to it being extremely flexible. Anything that fits in a moulding machine, the M-Line can take them out and stack them. A further advantage is the high level of flexibility. Processors are getting less advance notice of what products their customers want, so the need to be able to change moulds quickly is increasing. So we need to supply systems that are extremely flexible."

Another automation specialist extending its cobot offering is **Comau**. It has just introduced the Racer-5-0.8, which it describes as a new paradigm in collaborative robotics which meets the growing demand for fast, cost-effective cobots that can be used in restricted spaces and in different application areas. The six-axis articulated robot that can move at up to 6 m/s, it has a 5 kg payload and 809 mm reach.

Furthermore, the cobot can instantly switch from a collaborative mode to full speed when operators

Right: Comau has just unveiled its Racer-5 cobot





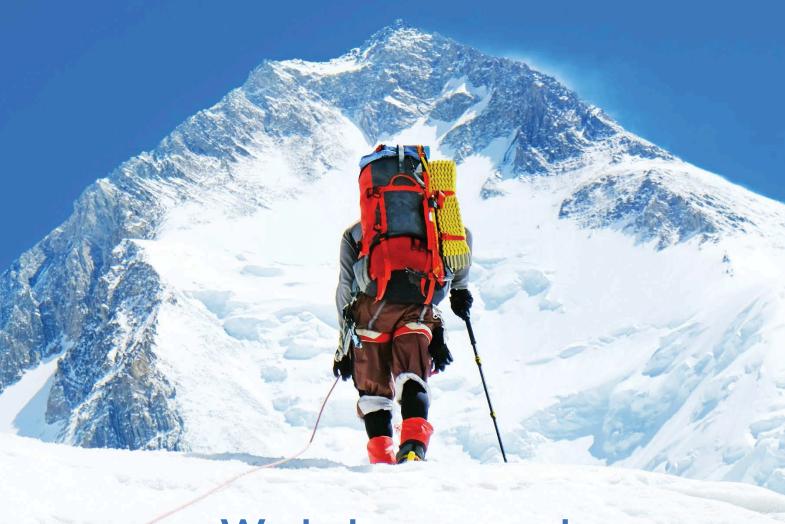
are not around, "letting its 0.03 mm repeatability and advanced movement fluidity deliver unmatched production rates," says the supplier. "Our new Racer-5 cobot delivers the speed and precision the small-payload collaborative robotics market was missing," claims Pietro Ottavis, Comau Chief Technology Officer.

Comau says the Racer-5 enables systems integrators and end users to automate even the most sophisticated manufacturing processes without sacrificing speed, precision, or collaborative intelligence. Because it operates in dual modes, customers can install a single, high-performance solution rather than having to deploy two distinct robots, the company says.

Mark Gray, UK Sales Manager at Universal Robots, one of the best-known producers of cobots, highlights another factor particular to the region that is driving automation: "The injection moulding industry is particularly reliant on cheap labour from the EU, so Brexit coupled with the UK's [covid-related] immigration quarantine policies which are making it a logistical nightmare to bring in new staff from abroad - are having a big impact on operations. Comparatively speaking, injection moulding companies have short delivery timescales for their products, meaning components produced today might be needed on another product tomorrow. In practical terms, this means any problems on the factory floor can have a wide-ranging impact across the supply chain."

Gray says the UK plastics processing industry urgently needs to strive towards more automated operations, as it will not only reduce the sector's reliance on cheap labour, but also help drive organisational efficiencies as well. "There are many areas within injection moulding that are well suited to automation - meaning companies will get a





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Senkroma S.A. www.senkroma.com.tr TURKEY Right: Kuka KR **Agilus HM** (hygiene machine) six-axis industrial robot



quick return on their investment," he says.

At Kuka UK system partner PC Moulding & Automation, Sales Director Roger Ewers says: "When Covid hit the UK, the demand for breathing devices and respirators soared. As a result, the production and manufacturing of filters intended for use in these systems increased the demand for automation, as manufacturers recognised the benefits afforded by robotic process automation."

PC Moulding & Automation produced an automated filter production line which comprised three Kuka KR Agilus HM (hygiene machine) six-axis industrial robots and ultrasonic cutting tooling for the filter medium, applying similar principles to the execution of the application of those which had been undertaken for automotive clients.

"Automation enquiry levels continued to rise throughout 2020, a large majority of which we found were intended to address reduced staff levels whilst increasing output," says Ewers. "Medical was our primary sector focus in 2020, and into 2021."

The pandemic is causing many companies to rethink their supply routes. "Especially for packaging, a disrupted supply chain can have a massive impact on a company's sales," says Nino Zehnder, Marketing and Sales Manager at in-mould labelling (IML) technology specialist **Beck Automation**. He says this is why it offers its IML technology from factory stock to supply customers in less than 10 weeks.

"We found increasingly that many companies are looking for alternatives to realise their IML projects in a very short time. On the one hand, companies are interested in getting to market as quickly as possible, and on the other hand, they are looking to make the supply chain more crisis-proof in the future, and we offer solutions for this. With the Basic-IML machine [for labelling buckets], we have developed a high-performance line of machines that we can deliver and commission on

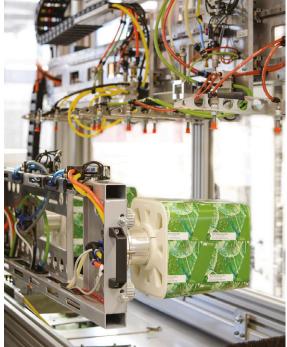
site in less than 10 weeks. Our systems can be easily expanded to meet customer-specific needs. We can manufacture the machine for stock ahead of time and then eventually adapt it to the customer's requirement, where necessary."

In late March, Beck Automation announced that it had rebuilt and expanded its site in Barcelos, Portugal, to increase its international production capacities. The company has built an industrial hall with 1,800 m² of floor space for over 60 employees, up from 20. All the systems that are manufactured at the headquarters in Switzerland are also built at the plant in Portugal.

Star Automation Europe is another specialist in the field that has been experiencing an order boom during the pandemic. "This tendency started moderately in August 2020 and really took off from last autumn, starting from +25% when compared to the previous year and reaching a +120% figure last February," it says. "Prompt delivery machines have also sold out, forcing Star to review from zero its production planning to better answer requests coming from all corners of Europe."

The new MED Series of three-, five-, and six-axis robots from **Sepro** is aimed at meeting growing demand for automation in clean rooms and other sensitive environments in medical and pharmaceutical moulding plants. "Within the clean room market, our robots can be used across the entire production line - from assembly to inspection, traceability and packaging," says Claude Bernard, Product Marketing Director.

MED robots include FDA-approved lubrication on all linear guiding surfaces and gearing. Cables



systems off the shelf

Right: Beck can

deliver basic automatic IML

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Optional five-axis operation

Having demonstrated a prototype of a general-purpose five-axis robot, the Success 22X, at K 2019, Sepro has now finished the redesign of the entire range, for machines up to 700 US tons. Some can be optionally equipped with a two-axis servo wrist co-developed with Yaskawa Motoman.

Sepro engineers also have returned to the use of cam follower bearings for linear motions of all the new robots. The company says the technology provides more even weight distribution and smoother operation compared to linear bearings and also is more tolerant of dust and other contaminants.

"The all-servo wrist can be easily adapted with simple digital commands, guaranteeing greater flexibility and faster production changeovers - approaching Single-Minute Exchange of Die methodology," says Claude Bernard, Product Marketing Director. "We believe this represents the future of Cartesian robots."

IMAGE: SEPRO

Success 22X is one of three completely redesigned robots in Sepro's product range

can be protected in conduits and all robot surfaces are smooth, painted medical white with limited decoration so that dust does not accumulate, making cleaning easier. Places where grease or other lubrication is used are enclosed so that none can escape into the moulding area. 5X MED robots include a two-axis servo wrist to provide a total of five numerically controlled axes of motion. S5 Line MED robots have three servo-driven axes and a pneumatic wrist. All robots can be optionally equipped with pneumatic filtration to 0.3 micron.

The 5X MED and S5 Line MED ranges each include robots in three different sizes to allow them to serve moulding machines with clamp forces from 30 to 800 US tons. Nominal payload capacity (part plus end-of-arm tooling) ranges from 5 to 20 kg. The robots can be installed in a conventional transverse or space-saving axial layout.

Sepro 6X MED six-axis servo articulated-arm robots are offered in collaboration with Stäubli Robotics. The standard Stäubli arms are certified for ISO 5 (Class 100) clean rooms without modification. "However, the smooth, clean white surfaces

make keeping them clean just that much easier," says Sepro. "In fact, the 6X MED robots can exceed the level of cleanliness possible with injection moulding

processes." Four models are available to serve moulding machines from 20 to 1,300 US tons.

SEPRO ME

Six-axis robots are normally typically floormounted (but can be ceiling-mounted) and usually enter the moulding machine from the side. Laminar air flow allows these installations to meet the requirements of ISO 7 and 8.

Engel says its integrated system solutions play a key role in medical technology company Ypsomed's new platform strategy. Ypsomed is a leading developer and manufacturer of injection and infusion systems for self-medication. It recently opened a new plant with 13,500m² of production space for injection moulding and assembly in Schwerin, Germany.

Ypsomed has traditionally used various types and brands of injection moulding machinery. "This was no longer compatible with our expansion strategy," says Frank Mengis, COO of Ypsomed. It now has a more standardised approach. "The aim of the new platform strategy is to further improve efficiency, safety and quality while simplifying our processes," he says.

Ypsomed is not alone in this strategy. Standardisation is becoming a trend in the medical technology industry, and not only for the big players, says Christoph Lhota, Vice President of Engel's Medical Business Unit.

"We can now order injection moulding machines virtually off the peg at all locations world-

> wide," says Mengis. "But the biggest advantage is fast industrialisation. The qualification plans are identical for all new machines. This means we can integrate new machines and new processes into series production far faster."

Right: With its high degree of automation, the production of injection pens places high demands on the precision of the injection moulding and assembly process



Above: Photo shows an innovative system from Sytrama that provides an alternative to the standard solutions of cup vibrators used for loading inserts into the mould (in this case, filters for respiratory masks). It consists of a rotating bowl that distributes the inserts and SCARA robot with a vision system that sends the coordinates of the piece to be picked up by the robot

Engel all-electric E-motion high-performance machines help Ypsomed ensure high-precision, zero-defect production. An injector pen, for example, consists of between 11 and 15 parts - depending on the model - and they are assembled fully automatically. Ypsomed has also started to standardise the automation of injection moulding processes.

"We have had very good experience with Engel for the [injection] machines," says Mengis. "That's why we chose Engel as our partner for automation of injection moulding processes too."

Moulding machines are now being equipped with Engel Viper linear robots. Engel says its new compact cell, unveiled at K2019, also plays a key role. It says the standardised design makes it particularly easy to integrate a wide variety of automation components and other downstream process units. "It encapsulates all the components while remaining significantly narrower than standard safety guarding," the company says.

"In terms of footprint, the compact cell is unbeatable," says Marlon Trachsel, Process Manager Production Technology at Ypsomed in Switzerland.



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All the compact cells use an identical design to achieve maximum flexibility. To avoid having to change the auxiliaries during every mould set-up, they integrate all components needed for both free-falling parts and for soft depositing using Viper robots.

Engel says another advantage of standardisation with its systems solutions is uniform control logic across the entire production cell. Robots and other automation units by Engel are fully integrated into the injection moulding machine's CC300 control unit. Production staff do not need to familiarise themselves with a different control philosophy for the automation. "Given the trend towards ever greater complexity in production processes, this feature is becoming increasingly important," it says.

At Sytrama Robotics, which is part of Negri Bossi, CEO Domenico Ghilardi highlights the shift of robot manufacturers in recent years away from products towards solutions. "Instead of it being the robot that drives the solution, it has become the solution that decides the type of robot; and as manufacturers we have increasingly expanded the range of products in order to offer the best possible solution," he says.

"In any case, the supply of plastics automation is showing continuous growth, regardless of market trends, especially for those who have adapted the dedicated hardware and software architectures of the control systems," he says. "The adaptation to the demands for flexibility, Industry 4.0, new safety regulations, and in this last year the problem of Covid 19, has radically transformed ways of designing and producing. All our products enable communication between various devices using various protocols, including OPC-UA, to create interconnected systems, remotely controllable, and designed to minimise the presence of specialized technicians, with significant reduction in movement of people as well as costs. We are also supplying systems with surveillance cameras with software capable of detecting process anomalies."

The Hannover Messe Digital Edition 2021 in mid-April saw **Arburg** present a new turnkey system that it said would raise the bar in aspects of digitalisation, automation, and the circular economy in plastics processing. A networked injection moulding machine produced digitally decorated drinking cups marked with recycling information that is specific to them. Not only that, but they are also 100% traceable.

The exhibit used a hot runner mould from Haidlmair. Part handling was the responsibility of a new vertical robotic system, the Multilift V 20, with a 20kg load capacity and a transverse design. Once



removed from the mould, the cups were sent for plasma treatment and then to a digital printing station. "This means that the product enhancement stage is integrated directly into the production cell," says Arburg. "It is possible to choose from three different images on a tablet in order to print the surface of the cup. Once polished, the cup's surface is also adorned with two DM codes: one containing the process data for traceability purposes and the other containing the material information with recycling in mind."

The Allrounder is equipped with an Industrial IoT gateway as standard, providing a standardised form of networking. In this application, the Arburg Turnkey Control Module (ATCM) SCADA system visualises all relevant process and quality data and merges it for specific parts. To achieve this, the injection moulding machine, automation systems and the digital printer each send the relevant data to the ATCM. This makes every individual cup 100% traceable.

Above: Arburg networked machine produces digitally decorated cups with two DM codes

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An increasing array of compounds containing higher amounts of recycled content are now on offer for injection moulders and other processors helping to meet sustainability targets. Mark Holmes reports on recent developments

Producers ramp up recycled compound offerings

Manufacturers of plastic compounds are rising to the circular economy challenge and developing new materials that are incorporating increasing proportions of post-consumer recycled and post-industrial recycled plastics. While meeting sustainability goals, these compounds can match virgin materials in terms of mechanical properties. Industry bodies are providing support and tools to assist converters to switch to recycled materials, while brand owners and end-users continue to drive the change to meet their own sustainability targets.

EuPC, the European Plastics Converters Association, has partnered with the Circularise Plastics **Group** - currently composed of Covestro, Domo Chemicals and Circularise - to cooperate in the development of a tool to monitor the use of recycled plastics by converters in Europe. In the context of the EU Plastics Strategy, the European Commission has launched a pledge to increase the use of recycled content to 10m tonnes by 2025. To address this, Circularise Plastics Group launched an Open Standard for Sustainability and Transparency based on blockchain technology and zero-knowledge proofs.

EuPC set up a tool to collect the use of recyclates by converters based on their production. The tool is called MORE - Monitoring Recyclates for Europe. MORE is designed to ensure that faithful and consistent data collection, through a common approach, on the use of recyclates is achieved by converters that will feed the surveys contained in MORE. The volumes reported in MORE are steadily growing every month and new plastic converting companies will join the system in the years to come.

"With the development of the MORE platform, EuPC emphasised the importance of creating an efficient infrastructure for monitoring the flow of data about the use of recycled plastics," says Jordi de Vos, Circularise's co-founder. "We are happy to support its development with our technology and are looking forward to this collaboration."

The EuPC strategy aligns with Circularise's mission to enable transparency of material flows while safeguarding data privacy and confidentiality. As a part of the broader objective of this collaboration, signatories specifically aim to facilitate the development of a digital platform to monitor the rate of plastics recycling activities in Europe and

Main image: **Polyolefin** compounds are increasingly incorporating post-consumer and post-industrial recycled materials

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Above:
Borealis says
its Bornewables polyolefins portfolio is
suitable for the
production of
the most
demanding
applications,
including
hygiene and
food-contact

test how the Open Standard for Sustainability and Transparency can be applied for this.

"With the rise of new technologies, such as blockchain, we look to incorporate them in our monitoring system to ensure that the MORE platform is future-proof," says EuPC Managing Director Alexandre Dangis. "Circularise has the technology and vision that aligns with ours and we look forward to cooperating on the development of the recyclates monitoring system."

The organisations behind this cooperation acknowledge that it is an important element of a broader scope to create a standard for the industry: a secure, open-source, shared data exchange system for the global value chains to enable traceability of materials throughout the lifecycle across all stakeholders and value-chains.

"The collaboration between Circularise Plastics Group and EuPC has the potential to provide a remote yet detailed monitoring and audit opportunity for companies," says Dr. Burkhard Zimmermann, Head of Resin, Digital Transformation & Sustainability, Covestro Polycarbonates. "The system could enable a more trustworthy and less expensive way to become and remain qualified, while providing the necessary speed and flexibility."

EuPC, Circularise, Covestro and Domo Chemicals aim to bring together stakeholders that can contribute to the development of the MORE and Circularise platforms. In the context of this co-operation, they aim to test a prototype with a list of target companies.

Borealis has introduced Bornewables, a new portfolio of circular polyolefin products. Produced with renewable feedstock derived entirely from waste and residue streams, the company says that these polyolefins offer the same material performance as virgin materials, yet with a reduced carbon footprint. The introduction of the Bornewables portfolio is part of the company's EverMinds

strategy for developing technologies and products for the transition from a linear to a circular economy.

The company adds that Bornewables are suitable for the most demanding applications, including hygiene and food-contact. Unlike renewable feedstocks produced with agricultural crops grown for food and livestock feed, Bornewables are made of renewably sourced feedstocks derived solely from waste and residue streams. These include vegetable oil production as well as oil waste and residues, the timber industry, and the food industry – for instance, used cooking oil. The Bornewables portfolio has been ISCC Plus (International Sustainability & Carbon Certification) certified. This certification system ensures the traceability of the renewable, sustainably produced feedstock from its point of origin through the entire chain of custody.

Borealis has also developed recycled PP compounds for rigid packaging. These Borcycle compounds have applications in caps and closures, thin wall packaging containers and lids. Recycled PP compounds are available with 25-50% recycling content, which can reduce CO_2 emissions by up to 15%. The company says that the materials combine its expertise in recycling and specialised compounding with its Borstar multi-modal and nucleation technology.

Borealis and **Borouge** have developed two new low-density additions to the Fibremod Carbon PP range based on second-use carbon fibre, offering improved surface appearance and better dimensional stability. Originally developed in 2016, these second-generation Fibremod Carbon grades retain the stiffness and durability of the original compounds. Fibremod CG210SY has a 20% carbon fibre content, while Fibremod CD211SY is a hybrid concept made with 10% talc and 10% carbon fibre. Other advantages offered by the two new grades include good paint adhesion and high flowability.



MAGE: AVIENT

Right: Injection-mouldable
ReSound R VX
TPEs from
Avient utilise
25% PCR and
up to 40% PIR
recycled
content. The
PCR grade is
formulated with
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Both are intended for use in automotive structural parts and body panel applications, including fenders and tailgate skins.

Avient has developed several new post-consumer recycled (PCR) and post-industrial recycled (PIR) portfolios under the ReSound R brand name. The company says that as consumer demand for more sustainable, eco-friendly products grows along with regulatory pressure, ReSound R recycled content formulations can help brand owners deliver on their sustainability goals. The range includes ReSound R VX TPEs, ReSound R ND polyamides, and ReSound R PC polycarbonates.

Injection-mouldable ReSound R VX TPEs utilise 25% PCR and up to 40% PIR content, and both grades can be overmoulded onto polypropylene. The PCR grade is formulated with recycled ocean plastics from Oceanworks, an accelerator programme participant within the Alliance to End Plastic Waste, a non-profit group that includes Avient as a founding member. These TPE grades, formulated for consumer applications, can be used in personal care products, lawn and garden tools, outdoor goods, office supplies, footwear and houseware durables.

In addition, Avient is expanding its polyamide portfolio to include ReSound R ND with PCR content. These PA formulations contain 100% PCR resin and are available in both PA 6 and PA 66 grades with various levels of glass fibre and mineral reinforcements. These products are targeted at applications in the consumer, automotive and powersports markets. The TPEs, as well as recycled PA 6 and 66, are commercially available in North America. Global availability is under evaluation and will depend on regional sourcing capabilities.

For the Asian market, Avient now offers ReSound R PC, a range of polycarbonates with glass fibre reinforcement levels from 10-30% and recycled content ranging from 25-75%. Several grades in this portfolio perform on par with virgin PC in terms of tensile elongation, tensile strength, notched Izod impact, flexural modulus and flexural strength. Available currently in Asia only, global availability is under evaluation, again dependent on regional sourcing capabilities.

In addition, Avient has launched Rejoin PCR masterbatch for polyolefin packaging applications. Made with PCR polyolefin as a carrier resin, Rejoin PCR masterbatch can enable a bottle or part to be manufactured from 100% PCR.

The company adds that until now masterbatch has generally been made using virgin material as a carrier resin. This means that at typical let-down ratios, the finished product would contain 3-5% non-recycled plastic. With major consumer goods



companies actively defining sustainability goals of 100% PCR polyolefin packaging, Avient has responded by developing Rejoin PCR Masterbatch in customisable colours and special effects.

"We understand that many consider the use of colorants and additives that rely on virgin resin carriers to nullify the claim of 100% PCR, so we worked to develop a solution that could help our customers deliver fully on their sustainability commitments," says Bob Lee, Marketing Director, Color & Additives Asia. "This leading-edge product answers a growing industry need and demand."

Rejoin PCR masterbatch combines pigments and functional additives into a single solution without negatively affecting colour or mechanical properties. It can be added during production using standard equipment with little to no impact on processing and allows for full recyclability of the end product. Rejoin PCR masterbatch is commercially available in major global markets.

Avient also opened its new CycleWorks facility in Pogliano, Italy at the end of 2020. The new laboratory and plant will conduct testing and evaluations to help customers tackle and overcome the challenge of plastics recycling and the goal of a circular economy. The demonstration plant mimics real world recycling in a research environment.

"We have established CycleWorks to study and meet the challenges of plastic recycling while furthering its viability," says Dr. Jan Sültemeyer, Global Head of Innovation & Sustainability. "This high-tech facility will allow our dedicated team to understand the chemistry of polymers in the mechanical recycling process, and to see how and where problems occur. For example, why and where are polymer chains degrading? What role do colour and additives play in recyclability? It is our goal to find answers to these questions and to understand the science behind recycling."

CycleWorks has already started producing

Above: Avient has opened its new Cycle-**Works facility** in Pogliano, Italy

Right: SABIC
has expanded
its portfolio of
Cycoloy and
Lexan resins
containing high
levels of PCR
material for
applications
including
consumer
electronics and
accessories

useful data. Avient will use this data to develop new masterbatch formulations with proven science behind how they perform during recycling processes, offering customers a portfolio that is essentially field-tested for recycling. Avient expects to introduce solutions throughout 2021 as new data is generated.

SABIC has expanded its portfolio of Cycoloy PC/ABS and Lexan PC resins containing high levels of PCR material. Typical applications include consumer electronics and accessories, such as chargers and adapters, printers, copiers and laptop housing. The new PCR material is blended with virgin material to create compounds with PCR levels of initially up to 30%. According to an internal SABIC LCA study, these compounds offer potentially significant reductions in carbon footprint of up to 25% and in energy consumption of up to 30% compared to virgin material.

SABIC hopes to be able to offer materials with PCR content of up to 60% during 2021. The compounds and their properties will be tailored according to different industry requirements. "The initiative to produce a broader portfolio of engineering thermoplastics with PCR content complements our existing efforts in making base resins from certified renewable feedstock," says Sergi Monros, Vice President of Performance Polymers & Industry Solutions for Petrochemicals. "Together, our circular solutions from our Trucircle portfolio and services can help to improve plastic recyclability, lower emissions and drive towards closing the loop on used plastic. Our vision of a circular economy requires collaboration across the value chain, and we are committed to working with downstream and upstream partners to drive the transformation needed."

The extended range of materials will contain PCR polycarbonate coming from applications such as five-gallon water bottles and optical media. "Such products are made with clear polycarbonate, and they are easy to obtain, sort and clean," adds

Monros. "We are also investigating use of PCR polycarbonate from end-of-life automotive applications, such as head-lights and dashboards."

IMAGE: SABIC

Within the expanded portfolio, SABIC says that it will also develop materials to meet the various needs of different players in the market, grades with different levels of flame retardance, reaching up to 5VB@1.5mm, targeting various business equipment applications and electrical applications such as internal components. The company will also offer grades with PCR content for applications that require good clarity. The new portfolio will therefore encompass both unfilled and filled grades.

SABIC adds that it has set strict requirements on the quality of the incoming PCR material, which it will acquire by partnering with approved suppliers sourcing feedstock from around the world. SABIC will obtain the PCR material in ready-to-process granular form, to be compliant with China's policies on plastics waste.

SABIC says its Trucircle offering aims to help manufacturers give the end-consumer more confidence about buying products with the knowledge that the material can be recycled and repurposed, or that it has been produced in a way that can help protect natural resources. The Trucircle portfolio spans design for recyclability, mechanically recycled products, certified circular products from feedstock

Right: SABIC is involved with Plastic Energy to construct a first commercial unit to produce Trucircle circular polymers in Geleen, The Netherlands



IAGE: SABIC









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Mass balance approach explained

The mass balance approach is employed by companies around the world, including a number of plastic producers, for chemical recycling of post-industrial and post-consumer waste. With this approach, recycled raw materials are incorporated into production together with the petrochemical or mineral feedstocks commonly used normally and then

arithmetically allocated to the end-product.

The basic principle is similar to the way in which environmentally friendly electricity or gas is fed into the electricity grid or gas network. The amount of sustainably produced energy in the electricity grid rises with demand, although it is not possible to make any physical distinction be-

tween the sources of energy at single-household level.

One point in the mass balance method's favour is that the characteristics of the finished product - such as a polyamide compound reinforced with recycled waste glass fibres - are identical to those of virgin quality material, so the method sidesteps performance concerns.

recycling of used plastic and certified renewables products from bio-based feedstock. Typical applications for the portfolio will include consumer electronics and accessories such as chargers and adapters, printers, copiers and laptop housing.

SABIC is also involved with **Plastic Energy** to construct a first commercial unit to produce Trucircle polymers. The facility will be based in Geleen, The Netherlands and is expected to become operational in the second half of 2022. The project will be realised under a 50-50 joint venture called SPEAR (SABIC Plastic Energy Advanced Recycling) and is being executed with a Top Sector Energy Subsidy from the Ministry of Economic Affairs in the Netherlands.

As part of the project's market foundation stage, SABIC has worked together with Plastic Energy and leading customers and converters to produce and commercialise certified circular polymers since early 2019. The new unit will enable SABIC to upscale production significantly, it says. Plastic Energy's Thermal Anaerobic Conversion technology converts low quality, mixed plastic waste into a feedstock called Tacoil. This is produced in the new commercial unit and will be used by SABIC in its production process as an alternative to traditional

fossil raw materials for polymers.

Lanxess has introduced a new Durethan ECO polyamide product range featuring fibres from waste glass. The company says that it is increasingly making use of recycled raw materials in the production of its thermoplastic compounds and composites. Durethan ECOBKV30H2.0, ECOB-KV35H2.0 and ECOBKV60XF are the most recent examples of products made in line with this strategy. Recycled fibres manufactured from waste glass make up 30, 35 and 60% by weight respectively of these three new PA 6 compounds. Ecocycle, an independent inspection company, has examined the amount of recycled material in each compound and the long-term use of the glass waste stream using the mass balance method and awarded an Ecoloop certificate in accordance with ISO 14021:2016. The glass comes from PIR waste left over from glass fibre production.

The Lanxess High Performance Materials (HPM) business unit's primary target for the three new compounds is the automotive industry. "For instance, Durethan ECOBKV60XF offers exceptional strength and rigidity, which makes it suitable for manufacturing structural components such as front ends, pedal bearing brackets and A-, B- and C-pillars, as well as lightweight battery trays for electric vehicles," says Guenter Margraf, Global Product Manager.

HPM is going to be gradually increasing the number of ECO product types certified in accordance with the mass balance method. For example, it is planning to launch a new PA 6 with a glass fibre content of 30% and a reduced carbon footprint. The caprolactam required to produce this more environmentally friendly PA 6 is based on a selection of petrochemical raw materials which support this concern. HPM is not currently using PCR waste glass fibres but says it does view them as a particularly sustainable raw material for use in manufacturing new glass fibres.

Below: Lanxess has introduced a new Durethan ECO polyamide product range featuring fibres from waste glass





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Above: **Covestro has** collaborated to develop a mobile outdoor logo installation made of recycled plastics for the **Dutch consulate** in Guangzhou, China

Tisan Engineering Plastics offers PA 6, PA 66, PP homopolymer and PP copolymer materials under the EcoSTAR brand name which includes compounds with recycled content. It says: "A pioneer in environmental dynamism, Tisan Engineering Plastics determines the standard for nylon and polypropylene recycling products with recycled polymer."

Ecostar C 30 D03 R02, for example, is a high performance glass fibre-reinforced PP homopolymer with recycled content. It is suitable for injection moulding of complex-shaped components used in home appliances such as washing machine. Another example is Ecostar A 20D03 K02 R02 grade produced from PIR PA 6 materials, reinforced with glass fibre, heat-aging-stabilised and lubricated for injection moulding. It can be used in all market sectors needing high performance environmentally-friendly solutions, such as automotive gear box applications.

Tisan says: "Development of technologies for reducing polymeric waste has proved to be a difficult challenge due to a whole range of complications inherent in the reuse of polymers. But modification of plastics with fillers, reinforcements and modifiers produces a substantial change in the properties of the base material."

It says EcoSTAR compounds are modified to achieve excellent mechanical properties, high quality consistency and cost reduction. They are suitable for markets such as automotive, electrical & electronics, home appliances, construction, industrial applications, safety equipment, transportation, office furniture, sports, energy and others.

Trinseo has developed a range of PIR-containing PC/ABS for automotive applications. The Pulse ECO Series contains between 30-50% recycled content, combining European-sourced PIR polycarbonate with Trinseo's virgin Magnum ABS. Developed using Trinseo's Pulse GX technology, the

company says that the new product family has strong technical features, such as good flow properties, low temperature ductility, a low CO₂ footprint and low density, allowing up to 3% more parts per tonne compared to competitive materials. Furthermore, the material's low odour performance makes it highly suited to automotive interior applications such as mid/floor consoles, instrument panels and pillars, for example.

The environmental impact of Trinseo's Pulse ECO Series has been demonstrated through a specialised lifecycle analysis, which compared the difference in carbon dioxide emissions, water and energy consumption to that of virgin materials. In all cases, Trinseo's PIR-containing resins showed a reduced environmental impact, with up to 48% less energy consumption, 39% less global warming potential and 39% lower water consumption.

Covestro has collaborated with the Consulate General of the Netherlands in Guangzhou, China, and NANOxARCH, a local start-up company focused on sustainable material design, to develop a mobile outdoor logo installation made of recycled plastics for the consulate. The logo consists of the two letters N and L of the country code, each one metre high. The main frame of the figures is made of polycarbonate, which contains recycled materials from waste sources, such as used water bottles. It has been 3D printed using large format technology. This finished part is strong and durable and is suitable for both indoor and outdoor applications.

Covestro is already working with Chinese partners in the value chain to transform used PC water bottles into high-performance recycled plastics for the electronics, household appliances and automotive industries. The facade of the logo is made from recycled Maezio composite sheets, which are made from processing waste. This material is not only light, strong and durable, but also corrosion-resistant to meet the demanding requirements of outdoor installations.

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Looking for closure in the circular economy

Productivity, sustainability and the EU's tethering regulation are all issues currently driving developments in caps and closures. By **Mark Holmes**

Injection moulders of caps and closures are having to meet several new challenges. The influence of the circular economy means brand owners and end users are looking for greater use of sustainable materials - both recycled and bio-based. In addition, further pressures on lightweighting continue to drive the need for new solutions, while meeting increased productivity and quality targets. The advent of the tethered cap is also on the horizon and means are needed to ensure that the transition is seamless. However, machinery manufacturers and mould makers continue to develop new solutions for the industry, while material suppliers strive to help meet sustainability goals.

The main trends for plastics caps and closures are all related to the circular economy, according to Christina Haerter, Head of Application Technology and Stefan Kleinfeld, Product Manager Cap Systems of Netstal, part of KraussMaffei High Performance. Due to the EU directive, tethered caps are a major trend, they say. However, the growth of biodegradable or bio-based materials may well also become a major driver in a few years. In addition, Netstal sees the use of enhanced multimodal materials in the future in order to be able to realise further weight savings in closures. Depending on the materials used, there might also be future changes in plastification.



On the machinery front, like other areas of the plastics industry, Netstal adds that it sees continued connectivity and communication between different system components, for example machine and camera quality inspection system. With this communication it is possible to increase the intelligence of the complete production system. There are also significant improvements in digital connection and software. Increased system intelligence will remove many control duties from operators. As in other areas of the injection moulding industry, the aim in the production of caps is to increase the intelligence of the machine. In this way, human error can be further reduced, and the current shortage of skilled workers counteracted.

Netstal adds that in the production of caps and closures, there is always the need to increase productivity and decrease part costs. Mechanically, only small reductions in cycle time can be achieved, so a smarter, holistic systems approach has been developed by Netstal, particularly where closures are concerned. The company says that it is working to optimally match equipment to provide the lowest manufacturing costs with the highest availability and quality. For maximum availability, digital solutions such as remote support and e-service are becoming increasingly important, as

Main image: A
Sumitomo (SHI)
Demag El-Exis
SP 300-tonne
machine
producing and
quality
inspecting 72
caps (26/22mm)
every 2s

Right: The aXos controller with **Smart Opera**tion from **Netstal for** optimised injection moulding of caps and closures

well as good customer service.

One recent development at Netstal is a software improvement that can increase productivity. The company says that its machines detect the weight of a mould and use this value to determine the power resources required. These resources are then used to speed up the machine on the clamping unit side. The injection units have sufficient power reserves for this. This allows shorter cycle times.

Netstal has also developed 4-button 'Smart Operation', which is integrated into the aXos control system. This enables fast, guided and therefore safe operation during production shifts. The customer is free to program machine sequences, which can be recalled later using the four buttons. This allows employees to be trained more quickly and operate the injection moulding machine independently and error-free sooner, which also increases plant availability.

The company adds that it is also continuing to integrate peripheral systems into the injection moulding machine control system through defined interfaces such as OPC-UA. For example, the new PET-Line side entry has a connected dryer and camera system through OPC-UA and cap applications will head in the same direction.

Tethered caps and closures will have a significant impact on cap moulding lines, maintains Sumitomo (SHI) Demag. The EU has introduced a directive on marine plastic litter, and tethered caps and closures play an important role. As of May 2024, EU producers, retailers and manufacturers, as well as importers to EU countries will be obliged to implement tethered closures on all beverage containers up to three litres. As a result, Sumitomo (SHI) Demag says that many of its customers have started to question the production challenges they may encounter.

"In theory, you can produce tethered caps through an existing packaging injection moulding



machine just as you would any other closure or container," says UK Managing Director Nigel Flowers. "Cycle times are of course extremely critical, and most closure manufacturers specialising in this sector produce tens of millions of caps per year. In order to succeed, closure moulders will need to examine every potential tethered ring and cap application - press on, side clip, flip top or carbonated screw cap - to ensure that the selection of materials, machine and tooling give the optimum blend of speed, quality and processing repeatability."

He says: "Several years ago, PwC conducted an impact report study estimating that the changeover cost could reach up to €8.7bn. This will of course be very dependent on how extensively neck finishes on beverage containers need to be changed. These forecast costs cover capital investment costs as well as significant losses of productivity and downtime for existing operations while lines are being reconfigured. Looking specifically at the moulding processing conditions, these in theory will not change considerably. Providing the material is not altered, melt stability will be the same. The main investment outlay will be in mould tool design, which may require increasing the mould space of injection moulding machinery or opting for a larger tonnage packaging machine. A number of mould toolmakers have already committed to increase - some double their production capacity in this space to cater to increased demand for replacement mould tools."

High cavitation (64, 72, and 96) mould tools are commonplace in closure production, due to the

Producing pails at K 2019, the 1.000-tonne Sumitomo (SHI) **Demag El-Exis**

Below:

can accommodate a 96-cavity tether cap and ring mould high volumes required. Flowers says that adding the tether ring into the mould design either means reducing the number of cavities in the tooling or increasing the size of the mould tool and consequently the mould space and tonnage of injection moulding machine to accommodate bigger tooling. Additionally, if the shot weight and part weight of the closure component increases, a greater injection unit capacity may be required.

The machine selected will be dictated by mould design and the cavitation layout. Higher pressures and speeds, faster cooling times, and modifications to part-ejection and gating arrangements are all important factors to keep in mind.

To support these efforts, Sumitomo (SHI) Demag continues to develop its packaging machines. The company's El-Exis SP range, available globally, now comprises ten machines, with a clamp force range of between 150 and 1,000 tonnes. Capable of delivering dry cycle times of less than 2s, the company adds that this latest generation of EL-Exis SP machines is specifically designed to withstand the higher stresses and injection pressures that are so critical in achieving repeatability. The range is aimed squarely at high volume manufacturers of polymer products, particularly caps and closures, and the new 1,000-tonne machine can easily accommodate a 96-cavity tether cap and ring tool. 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.

The company adds that reducing the cavitation of a tool to 64 or less might warrant closure moulders considering the efficiency and energy saving merits of an all-electric machine. Several closure moulders developing tamper-evident closure bands have invested in dedicated IntElect all electric machine cells in recent years as they deliver consistent moulding precision. Additionally, the newest IntElects feature an increased tie bar distance which significantly increases the mould space. This means they can accommodate larger mould tools combined with small injection units. The ability to install small screws matched with a

large mould space is a big advantage as it improves the dosing and injection performance.

"Processing consistently is equally important to the integrity of the tether ring which slides over the neck thread of a beverage container," adds Flowers. "Extra tests may need to be performed to ensure shrinkage does not occur, or conversely the tethered cap ring stays attached to the bottle. An integrated vision control system is more than capable of monitoring these processing conditions. An automated example was showcased at the last K Show. Featuring the inspection Capwatcher Q Line from Intravis, eight high-resolution cameras collected, visualised and provided up to 144,000 cavity-based measurements per minute. It also sourced a unique inline temperature measurement for each closure, which allows moulders to determine the shrinkage behaviour of each and every closure. From a quality control perspective, this is ground-breaking stuff and significantly reduces production waste."

HTS IC has developed conformal cooled gate inserts for injection moulding in combination with water distribution plates and hot runner manifolds that can significantly reduce cycle times and warpage in the injection moulding of caps and closures. "In caps and closures, continuous lightweighting is resulting in increased pressure to decrease cycle times and optimise cooling rates," says Primož Maraž, Head of R&D. "In some cases, this means that cycle times have already dropped under 2s. Maintaining these short cycles, while ensuring moulded part quality is a challenge for the whole value chain - from moulders and injection moulding machine manufacturers to toolmakers and resin suppliers. Effective thermal management of mould and gating system components is often the key to meet both cycle time requirements and the dimensional and surface quality of moulded parts. Conformally cooled parts are known for better thermal management properties, therefore their use is gaining popularity. Most often these parts are Powder Bed Fusion [PBF] 3D printed. However, technological advancements over the last decade have made it possible to develop and produce conformally cooled components with







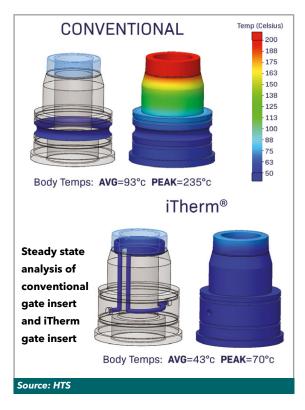
Left: ITherm single gate insert and iTherm multiple gate insert from HTS different additive manufacturing technologies that allow larger dimensions, smoother channels, and higher cost effectiveness compared with Powder Bed Fusion 3D printing technology."

Traditionally, cooling channels for moulds were straight and drilled in secondary machining operations. If a mould required additional cooling, toolmakers might design an insert that provided channels with baffles or helix baffles. In more complex instances requiring highly intricate cooling channels, the mould would be split into segments. Matching half-channels were milled into the segments, which were then soldered together to produce channels that did not follow straight lines. This process is expensive and mould life shortened because the solder often deteriorated over time. Moreover, these designs are often limited geometrically, introduce potential leakage issues (a risk if high value controllers and hot runners, for example, are nearby), and offer unbalanced water flow on multi-cavity tools. This means that thermal performance is almost always limited with these techniques, often resulting in slower cycle times or warp/sink quality issues associated with hot spots or uneven cooling patterns.

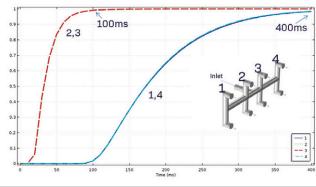
Most conformally cooled components are now manufactured by PBF, which typically does not perform well with overhangs greater than 45 degrees (cooling channels will all have to close at greater angles), introducing porosities or crack initiation sites at the closure of channels that are too large. For this reason, PBF is typically limited to 3-4mm diameter channels and often using awkward 'tear drop' shapes to try and reduce overhang challenges. Rough internal surfaces result from the process and must be dealt with properly, otherwise corrosion, scale and contaminants build up much more guickly on the small rough channels. To counteract the high pressure drop from small channels, designers of PBF parts often introduce parallel flow circuits which are notoriously hard to troubleshoot for clogging. Additionally, microcracking, bad thermal post-processing, warping

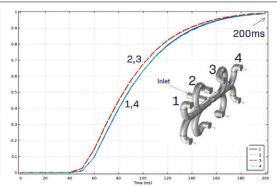
and high cost are all associated issues with PBF. Material choice in PBF is limited to non-tooling steel grades, such as Maraging steel.

HTS IC has developed Metal Fusion Technology (MFT) - a form of Diffusion Bonding Additive Manufacturing - to produce conformal cooled components under the iTherm brand. MFT is based on diffusion bonding of pre-machined layers of premium tool steel, with the mechanical properties of the diffusion bond being comparable to that of forged tool steel. Material selection can practically be any tool steel, although most often 1.2343 / H11, 1.2344 / H13, 420SS, High Thermal Conductivity Steel (HTCS) is used. The company says that this presents many material options, including new high thermal conductivity tool steel alloys that can offer a unique thermal advantage when combined with iTherm technology, to deliver industry-best thermal performance for challenging geometries. MFT also enables complex geometry possibilities,









Source: HTS

such as perfect 90-degree overhangs, embedded copper pins and embedded sensors, for example.

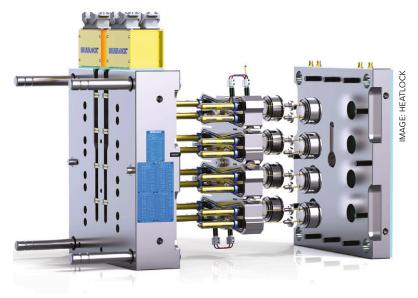
Volume throughput of MFT is more than 100 times greater per machine than that of PBF/SLM powder bed printing. In addition, MFT produces a smooth (<5Ra) surface finish of internal channels that can be engineered, while 3D printing requires extensive post-process finishing and can leave interior passageways rough (>20Ra).

According to HTS IC, the iTherm gate insert offers several advantages over conventional gate inserts. "Gate cooling is improved," says Maraž. "Stringing is reduced on the thermal and sprue gates and cold slugs are eliminated through hotter tip operating temperatures for the valve gates. Gate blush and other heat related cosmetic defects can also be prevented. Lack of quality defects means that cycle time improvements are also possible. It also allows the operation of the hot runner tip at a higher temperature without impacting part quality or inducing mould sticking. In several recent cases, using an iTherm gate insert, cycle times were shortened by up to 20%."

The iTherm hot runner manifold plate is also produced from forged tool steel or billet steel using HTS additive manufacturing technology. It is a single body component with the same mechanical properties as a tool steel monoblock, but plastic distribution channels can be designed freely, according to the requirements of the moulded part and not limited by the use of conventional drilling methods.

The company adds that compared to traditional hot runners, iTherm hot runner manifolds offer advantages, such as uniform distribution and improved part filling through equivalent distance channels, shorter flow paths and uniform pressure drop. There are quicker colour and material changeovers because there are no plugs, dead zones and sharp corners. They also enable higher density of injection gates and a simplification of the manifold stack.

Hot runner manufacturer **Heatlock**, a Swedishowned company based in China, reports that it is increasingly being asked for solutions that are more affordable for mass production without compromising performance and quality by large manufacturers of caps and closures. "We design our manufacturing process to ensure that flow channels are balanced and that the pressure drop and speed is controlled for each cycle," says Calle Helldin, the company's owner. "We have seen instances in Germany where customers using new electric injection moulding machines have found that whatever settings they tried, each cavity filled equally. Our design process keeps things as simple



as possible, which maintains production stability and life. All our hot-halves are manufactured from high quality P20 or long-lasting stainless steel. Every cap and closure hot-half has a number of standard elements. These include insulation plates, high tolerance location elements and built-in service tools. They also have a counter to monitor service times, built-in flash memory with complete mould details and a digital project book, which includes full project documentation with service information," he says.

"For particularly demanding projects requiring pre-production simulation, we can arrange this through Heatlock's global business cluster. Simulations can be conducted as a virtual mould trial if required. The key features of all Heatlock products are standardisation and modularity. Spare parts are available from stock. delivered from one of our service centres around the world, and in most circumstances the next day."

StackTeck Systems, the global manufacturer of multi-cavity, high-volume production moulds, has added stack mould applications to its FastTrack program, a new approach to fast mould deliveries, using automated design capabilities that work with a pre-set, optimised set of mould design rules. Stack moulds for round lids and containers are now available for moulds of up to 2×16 cavities, making them especially attractive to those companies in need of increased productivity as a response to sudden market demands for food packaging applications.

StackTeck says that it has achieved record lead times for round container and lid moulds, with deliveries in the range of six to nine weeks.

Considering two examples from the FastTrack matrix, the lead time for a round container mould in a 2 × 2 configuration is six weeks from order until

Above:
Hot runner
manufacturer
Heatlock is
developing
affordable
solutions
for mass
production
of caps and
closures



Above: **Borealis Borcycle UG522MO** contains 50% post-consumer recycled material

mould test and at the same time, a 2×16 round container mould lead time is now 11 weeks under the FastTrack program. Round lid moulds also average six to ten weeks on stack mould configurations starting with 2×2 and up to 2×16 cavities.

New materials

Polyolefins producer **Borealis** and closures moulder Menshen have collaborated to launch a series of ten packaging closures based on Borcycle, a process to manufacture a range of compounds made of recycled polyolefins, which can be used in rigid packaging applications. Borealis adds that this evolving technology unites recycling and compounding expertise with its own Borstar multi-modal and nucleation technologies. These packaging solutions are predominantly made for use in laundry and homecare, and also include twocomponent closures.

The companies say that Menshen employs a rigorous process to ensure that the quality of the post-consumer recycled (PCR) material selected for a closure is in perfect alignment with its required functionality. In the course of the collaboration, Borealis and Menshen determined that Borcycle UG522MO, a PP compound made of 50% PCR content, would be the ideal choice for the new closures. It offers a potential reduction of CO₂ emissions of up to 15% when compared to the use of comparable virgin PP in similarly demanding packaging solutions. The material is also reliable and of consistent high quality, making it ideal for rigid packaging applications. A ready-made, drop-in solution with processability rivalling virgin polyolefins is possible and it provides good end-oflife recyclability in existing PCR streams.

Dow has introduced its first low density liquid silicone rubber (LSR) for injection moulding for brand owners and formulators in Europe and North America. The company says that the material's properties make it a good option for food dosing

valves, closures, dispensers, seals, gaskets and other food contact applications.

"This innovative material expands Dow's Silastic injection moulding LSR portfolio in several key areas," says Nathalie Gerard, European Market Manager Consumer Rubber, Dow Consumer Solutions. "It allows us to help our partners along the value chain fulfil ambitious recycling targets. The innovation at the same time enables attractive gains versus standard LSR and TPE in processing and in-use performance."

In addition to its sustainability, Silastic 9250-40 LSR offers key processing and performance characteristics, such as optimised processing. The white, low viscosity LSR helps fabricators improve processing compared to standard LSR while utilising established injection moulding machines. In addition, it helps brands create better performing closures and dispensers for food contact and other consumer applications. The new material has been designed specifically for the moulding of closures and dispensers in a wide range of consumer packaging applications. Its low compression set allows reliable sealing. Due to its high resilience, valves made with this lightweight LSR are capable of superior dispensing performance compared to existing solutions, especially for inverted packages and in food applications. It is formulated to meet the requirements of the BfR XV recommendation and of FDA 21 CFR 177.2600.

Silastic 9250-40 LSR also has low density compared with standard LSR. Floatability is a key factor when separating materials for the production of high-quality recycled feedstocks. With a specific gravity of only 0.97, it can be split from higher density plastics in a gravity-separation process. This helps reduce some of the decisive impediments in plastics recycling and allows fabricators, brands and consumers to stay aligned with regulatory mandates and their own sustainability objectives.



Right: The BericapValve is a TPE valve used for ketchup, mayonnaise and other spreadables

Anti-counterfeiting for pharma packaging

AlpVision is a Switzerland-based developer of anti-counterfeiting digital technologies for product authentication and counterfeit protection in a variety of sectors, particularly pharmaceutical. The company says its AlpVision Fingerprint product is a unique anti-counterfeit technology that tracks and authenticates plastic mouldings such as caps and bottles.

The technology does not require changes to standard injection moulding practices, the company says. "AlpVision Fingerprint leverages the intrinsic microscopic surface irregularities found in a mould and uses these unique characteristics as the means of authentication (as opposed to adding safety features). The process requires capturing a

AlpVision
Fingerprint
tracks and
authenticates
plastic
mouldings
such as caps
and bottles

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digital image of the matte-finished surface of a moulded part and storing it in a database. This image is then used as a reference to perform product authentication. It follows that one image per mould cavity is sufficient to authenticate an entire line of objects produced by the same mould cavity."

Authentication is carried out via a smartphone app that links to AlpVision's centralised server operating its Brand Monitoring System. A user running an authentication check on a moulding can identify the original mould cavity, help locate the equipment manufacturer, and determine the approximate production date.

Closure producer **Bericap** has addressed sustainibility by designing a recyclable 100% silicone-free closure. BericapValve won *Packaging Europe's* Sustainability Award 2020 in the category of Recyclable Packaging. The award recognises and awards the major sustainability impact behind the small visible change to a 100% silicone-free valve. Unlike conventional silicone valves, Bericap's product is made of TPE and its recyclability is top-rated and certified according to institute standards such as Bifa Umweltinstitut and Fraunhofer. As it is made of TPE, it recycles within the HDPE and PP recycling stream without contaminating it, while possessing the same properties as conventional valves.

The BericapValve is available in the company's range of food closures and fits all common neck and standard flip-top closures. It can be used for sweet, sour and fat-containing products and ensures exact and clean dispensing. The valve can be adjusted in material hardness and cutting geometry to any squeezable product. It is suitable for bottom down or bottom-up usage.

Closure Systems International (CSI) has collaborated with Coca-Cola to introduce a beverage closure made of 30% PCR content. CSI says that its portfolio of HDPE closures that include PCR content was developed with circularity and recyclability in mind. All of CSI's closures that

include PCR are 100% recyclable, and are made from recycled HDPE milk bottles. CSI's FDA-grade PCR closures are commercially available for applications in still and sparkling water, carbonated soft drinks, non-carbonated beverages, and liquid dairy markets, as well as in various food and personal care applications.

CSI has also launched the 38D-KL closure for dairy beverages. Offering improved application performance and drop-down tamper evidence, the one-piece HDPE closure is designed to deliver reliable performance in cold-fill and ambient applications. The new 38D-KL allows for minimal changeover disruption in manufacturing facilities and is compatible with an HDPE and PET 3-lead finish, from single-serve to gallon sized packages.

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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.

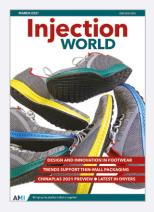
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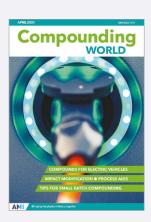
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The January-February issue of Injection World investigates the increase in demand for medical plastics during the Covid-19 pandemic. Plus the latest in thermoplastic composites and new granulator technology for injection moulders.

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Features in the April issue of Compounding World cover compounds for electric vehicles and impact performance, along with small batch compounding, process aids, a preview of Chinaplas 2021 and an interview with PVC compounder Benvic.

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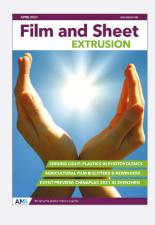
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The Film and Sheet Extrusion April edition has features covering advances in photovoltaics, agricultural film and slitters and rewinders. There is also a preview of Chinaplas 2021, the first major plastics exhibition to take place in over a year.

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Injection Plastics Recycling

GLOBAL EXHIBITION GUIDE

13-16 April	Chinaplas 2021, Shenzhen, China	www.chinaplasonline.com
17-21 May	NPE 2021 CANCELLED	www.npe.org
1-3 June	JEC 2021, Paris France POSTPONED	www.jec-world.events
8-11 June	Moulding Expo, Stuttgart, Germany CANCELLE	D www.moulding-expo.de
15-18 June	FIP, Lyon, France POSTPONED	www.f-i-p.com
22-25 June	Plast 2021, Milan, Italy POSTPONED	www.plastonline.org/en
22-25 June	Colombiaplast, Bogota, Colombia NEW DATE	www.colombiaplast.org
10-12 August	Feiplar, Sao Paulo, Brazil NEW DATE	www.feiplar.com.br
13-17 September	Plastex, Brno, Czech Republic POSTPONED	www.bvv.cz/en/plastex/
14-18 September	Equiplast, Barcelona, Spain NEW DATE	www.equiplast.com
29-30 September	Compounding World Expo Europe, Essen, Germany NEW DATE	www.compoundingworldexpo.com/eu/
12-16 October	Fakuma, Friedrichshafen, Germany	www.fakuma-messe.de
3-4 November C	Compounding World Expo USA, Cleveland, USA NEW DATE	www.compoundingworldexpo.com/na/
8-12 November	Plastico Brasil, Sao Paulo, Brazil NEW DATE	www.plasticobrasil.com.br
15-18 November	Arabplast, Dubai, UAE NEW DATE	www.arabplast.info

PlastIndia, New Delhi, India NEW DATE 17-21 February www.plastindia.org 8-10 March JEC 2021, Paris France **NEW DATE** www.jec-world.events 19-26 October K2022, Dusseldorf, Germany www.k-online.com

AMI CONFERENCES

1-3 June	Plastic Closure Innovations VIRTUAL
22-24 June	Thin Wall Packaging VIRTUAL
27-29 July	Smart Packaging VIRTUAL
21-22 September	Single Serve Capsules, Barcelona, Spain
27-28 September	Chemical Recycling, Dusseldorf, Germany
4-6 October	Polymer Sourcing Europe, Hamburg, Germany

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

www.ami.international





29 - 30 September, 2021 **ESSEN, GERMANY**





3 - 4 November, 2021 **CLEVELAND, OHIO**

www.ami.international/exhibitions

