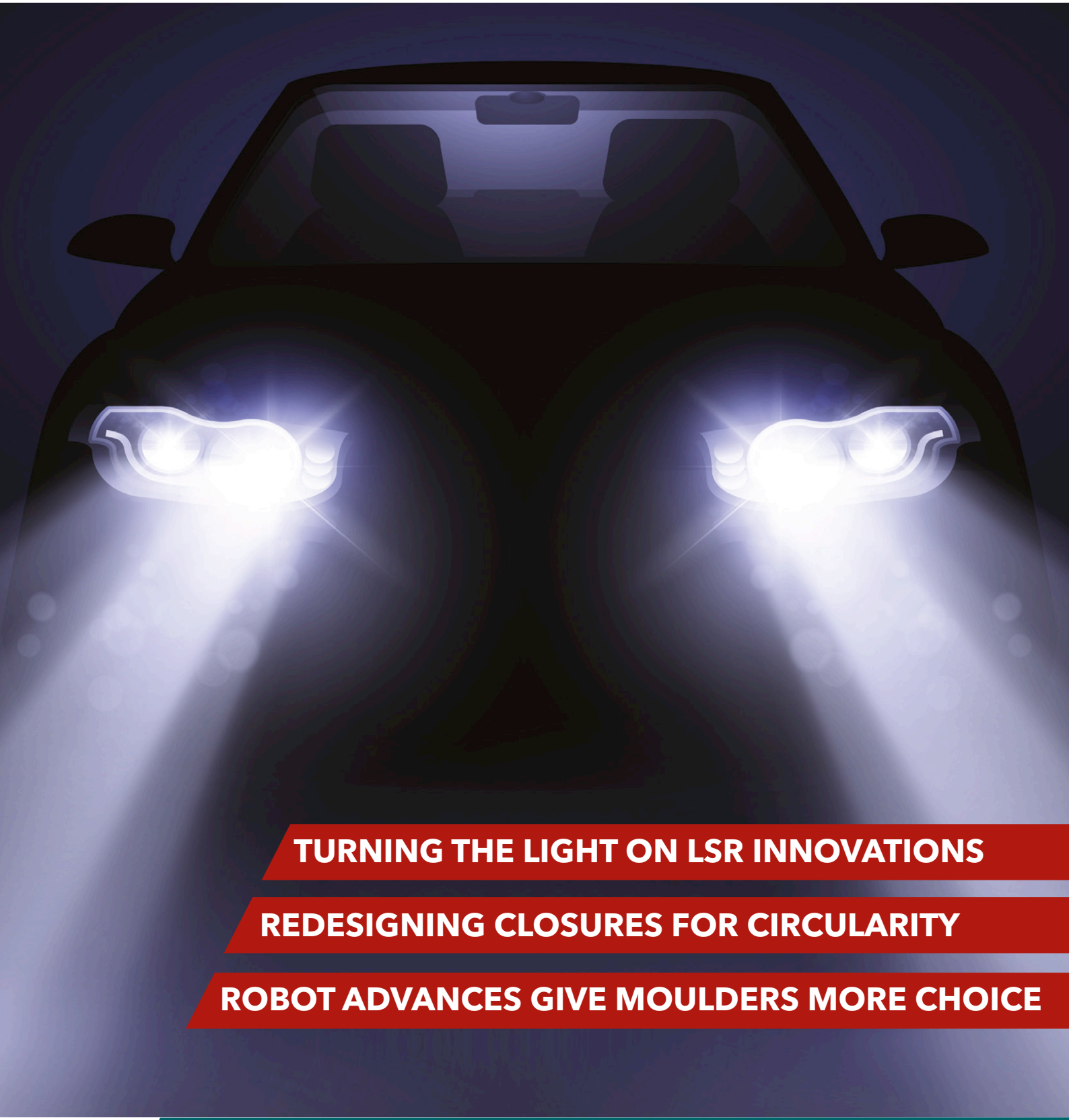
APRIL 2020

ISSN 2052-9376

Injection WORLD



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AMI announces new dates for Essen plastics expos

AMI has announced that its four focused plastics industry exhibitions, which were scheduled to take place at Messe Essen in Germany on 3-4 June, have been postponed to 7-8 October 2020. The decision to delay the Compounding World Expo, Plastics Recycling World Expo, Plastics Extrusion World Expo and Polymer Testing World Expo is due to the coronavirus pandemic.

"We have been reviewing the fast-changing situation daily, and we have been consulting with exhibitors, Messe Essen, local government and health authorities," said Rita Andrews, Head of Exhibitions at AMI, which publishes *Injection World* magazine. "Our primary concerns are for the health and safety of all attendees at our events, and delivering the very best audience for our exhibitors."

The shows will remain in the same two halls at Messe Essen, retaining the same floorplans with five free-to-attend conference theatres. The aim is to retain the existing conference programmes, augmented with additional speakers over the coming months.

AMI announced the decision to postpone the expos on Monday 23 March. Andy Beevers, AMI Events Director, said: "We felt it was important to make and announce this decision now, in order to end the current uncertainty and to allow exhibitors, speakers and attendees to plan effectively for the new dates".

Exhibitor numbers for the 2020 shows are up by over 80% compared to AMI's launch event in 2018. More than 1,500 people have already registered to attend the 2020 expos and those bookings will transfer automatically to the new dates.

› **www.ami.international/exhibitions**

Coronavirus pandemic update

We are living in unbelievably challenging times. Coronavirus restrictions mean much of global manufacturing is near shut down, leaving many plastics companies facing intense business pressures. The outlook is uncertain and the potential impact on all of us is on an unprecedented scale, in financial, personal and lifestyle terms. We can all only look forward, take what opportunities arise in today's difficult conditions, and try to position ourselves as best we can for when restrictions ease and our lives begin to return to normality. At *Injection World*, that means we will continue to do our best to bring you the latest business news and technical information so you are prepared for whatever the future holds. In the meantime, follow best practice, keep safe and stay healthy.

David Eldridge, Editor

Toyoda Gosei enlarges car grille

Toyoda Gosei has announced that its extra-large spindle grilles are now being used on the Lexus LM, a luxury minivan sold in China by Toyota. These are 1.5 times larger than the grilles on existing Lexus models. The company said that it used its expertise in plastic moulding and surface decoration using plating and painting to produce these grilles "for an elegant exterior with a commanding presence".

› **www.toyoda-gosei.com**

Hillenbrand sells Cimcool

US industrial group Hillenbrand has reached a definitive agreement to sell its Cimcool business to speciality chemicals firm DuBois Chemicals for $224m plus up to $26m more, contingent on any future sale. This is all subject to certain customary closing adjustments.

The deal follows Hillenbrand's previously announced strategic review of alternatives for this business, which was part of the 2019 acquisition of Milacron. It is now focusing on the continued integration of the Milacron APPT and MDCS businesses. Cimcool is specialised in fluid technology for multiple end use applications.

› **www.hillenbrand.com**

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Major automotive crash forecast for 2020

LMC Automotive, a global automotive forecasting company, has said that it expects the decline in the industry as result of the Covid-19 coronavirus pandemic to be "substantial". The percentage decline in unit sales could be "significantly worse than that experienced during the Great Recession" of 2007-09, LMC said.

Against the backdrop of rapid economic deterioration and the lockdown of normal consumer and business activity in most major markets, many OEMs shut down production lines and rising unemployment is bound to hit sales, LMC noted. Global GDP growth is expected to be nil in 2020.

LMC's current forecast is for global light vehicle sales to fall below 77 million units in 2020, 15% below 2019. By comparison, sales in 2007-09 fell by 8.7%, a compound annual growth rate of 4.5%. However, in an alternative scenario where the impact of Covid-19 continues into or relapses during the second half of 2020, the fall could be by 20% to 69 million units.

IMAGE: SHUTTERSTOCK

Above: Global sales of cars could fall by 15% in 2020, according to LMC Automotive

"Such a scenario would put 2021 and the longer-term recovery pattern at further risk," LMC said. That said, "the industry is far better prepared to weather this, and is in a healthier position", having absorbed the shock of 2007-09. Moreover, the much more rapid action by policymakers this time has put the means in place to facilitate a faster recovery.

While no regional market will escape the immediate impact, LMC added, two thirds of the volume reduction will come from China, North America and Western Europe. Each of these will see a fall in sales of about 3 million units. LMC's report in March showed Western European car sales in the month were down by 53% year-on-year to 774,280 units.

› **https://lmc-auto.com**

GW expands in silicones

US contract manufacturing and injection moulding company GW Plastics has announced a fourth expansion of its affiliate, GW Silicones. Based at Royalton near Bethel, Vermont, GW Silicones is active in liquid silicone rubber for healthcare applications, for which demand is said to be growing rapidly.

GW Plastics plans to invest about $2m in construction, new technology and equipment to create space for multiple new programmes. This includes an additional 275 m^2 Class 8 cleanroom space capable of housing up to ten new injection moulding machines, giving it about 1,115 m^2 of total cleanroom space. It all follows on shortly from the completion of a 2,800 m^2 expansion at GW Plastics' manufacturing and technology centre at the same site.

› **www.gwplastics.com**

IMAGE: CAROLINE SEIDEL, PLASTICS NEWS

Leading journalist dies aged 58

Veteren plastics industry journalist Bill Bregar has died of an apparent heart attack at age 58. He worked for 31 years at *Plastics News*, which published an obituary on its website and in its 13 April edition.

Bregar became well known among machinery suppliers for his years of experience covering plastics machinery, particularly injection moulding. He wrote extensively about developments in the North American plastics market but he also reported from Europe, particularly at numerous K exhibitions, where he showed a marked professionalism in his pursuit of stories at press conferences and during interviews with executives.

His knowledge, dedication and humour will be remembered by colleagues – including former colleagues now at AMI Magazines – and industry executives who he made contact with during his career.

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Medical Devices Regulation postponed in Europe

The European Commission has adopted a proposal to postpone the date of application of the Medical Devices Regulation by one year to 26 May 2021, subject to confirmation by the European Parliament and Council. The delay was adopted to allow member states, health institutions and companies to prioritise the fight against the Covid-19 pandemic.

The Commission said its decision "takes into account the unprecedented challenges of the coronavirus pandemic and the need for an increased availability of vitally important medical devices across the EU". Immediate implementation might have led to shortages or delays in getting key medical devices certified and on the market, not least due to capacity limitations among authorities and assessors.

IMAGE: SHUTTERSTOCK

Above: The European Commission has delayed application of the regulation until May 2021

This decision will not affect the date of application of the In Vitro Diagnostics Medical Devices Regulation, which becomes applicable from 26 May 2022.

Stella Kyriakides, Commissioner for Health and Food Safety, said: "Our priority is to support Member States to address the coronavirus crisis and protect public health as powerfully as possible – by all means necessary. Any potential market disruptions regarding the availability of safe and essential medical devices must and will be avoided. Today's decision is a necessary measure in these very exceptional times."

The new Medical Devices Regulation is designed to ensure patient safety and increase transparency on medical devices across the EU, said the Commission, but added that the currently applicable rules will continue to guarantee the protection of public health.

› **https://ec.europa.eu**

Swedish moulder purchase

KB Components has acquired its Swedish compatriot Placell from investment company Captea Markets. Based at Gislaved, Placell turns over about €12m per year through highly automated production of plastic components with gross weights of up to 2.5 kg.

KB, whose own turnover will rise to about €120m per year as a result, said that this will strengthen its position in the Nordic region.

› **www.kbcomponents.com**

Wittmann expands in Hungary

Wittmann Robottechnikai, the Wittmann Group's production plant in Mosonmagyaróvár, Hungary, has taken over a building from neighbouring company Lematex as of 1 April. This will expand the site's production area by 25% to 15,000 m².

The Hungarian facility is responsible for the series production of smaller robot models in the load-bearing capacity range up to 12 kg, plus the basic C90 and C140 temperature controller series. It also supports the Wittmann Battenfeld site in Austria in making SmartPower and EcoPower series injection moulding machines up to clamping forces of 1,800 kN, and sheet metal processing machinery.

The company said that the Hungarian plant has been "working almost continuously at its capacity limit and had also reached its limit in terms of existing space". An expansion is planned in 2021 following the addition of the new property.

› **www.wittmann-group.com**

IMAGE: WITTMANN

Above: Wittmann's plant in Mosonmagyaróvár, Hungary

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Germany's IK hits out at European Plastics Pact

Germany's packaging association Industrievereinigung Kunststoffverpackungen (IK) has responded critically to the European Plastics Pact – a partnership of public and private organisations initiated by France, the Netherlands and Denmark – that has published tough new targets for plastic packaging and disposable plastic recycling up to 2025.

The IK said the pact was "pure actionism, raising false expectations and thus doing more harm than good to the recycling industry", adding that it "remains disappointingly vague on the real levers". What is needed, it argues, is not more targets but better design of the framework conditions to ensure that existing ones can be met.

Dr Isabell Schmidt, IK's Managing Director for Circular Economy, said: "The EU has already set concrete goals in its plastics strategy, the Circular Plastics Alliance is pursuing them with courage, and in Germany the sharp rise in recycling quotas under the new packaging law is already demanding a joint effort along the value chain."

IMAGE: INDUSTRIEVEREINIGUNG KUNSTSTOFFVERPACKUNGEN

IK Managing Director Dr Isabell Schmidt says pact targets are "pure actionism"

Even the best recyclability, she said, is of no use if authorities do not ensure that plastic waste is collected separately and sent for recycling. IK said that enforcing EU-wide landfill restrictions and extending deposit systems for drinks bottles throughout Europe is vital, but added that the Plastics Pact is "surprisingly soft on these points".

IK also said the Plastics Pact's target of 30% of plastic packaging consisting of recycled materials by 2025 is unrealistic given that regulation effectively prevents this in the food sector, which is the main packaging consumer. It also criticised the target 20% reduction in plastics by 2025. That often "means substituting them with non-recyclable paper-plastic composites or glass", she said.

› **http://kunststoffverpackungen.de**

Sales fall at German processors

Total sales by German plastics processors fell by 1.2% to €65.1bn in 2019, according to GKV, the organisation that represents processors.

The year was marked on the one hand by the emotional debate about plastics and their effects on people and the environment, said GKV. On the other hand, difficulties in key markets, including the automotive and mechanical engineering sectors had a negative impact.

GKV said approximately 14.6m tonnes of plastics were processed in Germany last year. However, the number of employees remained at a high level at processor companies, at around 336,000 people.

› **www.gkv.de**

Haitian total revenues declined in 2019

Injection moulding machinery group Haitian International Holdings published results for 2019 which showed an overall decline. It claimed to have achieved some successes despite this being the most difficult year for the global economy since the financial crisis of 2008. Total revenues fell by 9.6% on 2018 to RMB 9.810bn, while the total number of machines delivered to customers was just over 32,000, 6.5% lower. There was better news in the South-East Asian market, where sales were 2.9% up to RMB 3.448bn and the overall share of exports in sales continued to increase, in line with corporate strategy.

› **www.haitianinter.com**

Ruf takes over at KraussMaffei

Michael Ruf (left) became CEO of the KraussMaffei Group as of 1 April, following the resignation of Frank Stieler. Ruf had hitherto been COO of the group; Stieler had been CEO since July 2015 and of the holding company since May 2019.

"Under the leadership of Dr Ruf, the company will streamline its organisation," it was stated. His appointment "allows further rationalisation to deal with the challenges from the current complicated and volatile economic situation and the impact from the Corona crisis".

› **www.kraussmaffei.com**

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Machinery firms adjust to Covid-19

Production of injection moulding machinery has gradually restarted at locations around the world following temporary shutdowns by manufacturers responding to the Covid-19 coronavirus outbreak.

In China, where the virus originated, Haitian Group said in a 11 March statement that it gradually resumed work from 10 February following a shutdown. Many production processes in its plants were reorganised as part of increased health and safety measures. Haitian said this ensured the delivery of ordered machines at the greatest capacity possible.

Italian trade association Amaplast said plastics and rubber machinery producers were included in a government decree enabling them to continue, but subject to health and safety restrictions at production sites.

Negri Bossi said that from 9 April its facility in Cologno Monzese, near Milan, has been using two machines to produce masks to counter the spread of Covid-19. BMB said in a 30 March statement it was restarting all activities with about 30% of staff at its factory in Brescia.

Engel has resumed production at its Austrian plants following a shutdown since mid-March, it said on 17 April. Engel's large machine plant in Shanghai, China restarted production on 10 February. The group's production plant for small and medium-sized machines in Pyungtaek, Korea, has been able to work without interruption.

Wittmann Group said on 14 April three production plants in Vienna and Wolkersdorf, Austria, are working again following a temporary closure. Its plant in Kottingbrunn, Austria, is due to restart on 20 April. Its plant in La Buisse, France partially reopened from 9 April. Wittmann Battenfeld USA factories in Torrington, Connecticut continued working to support essential medical customer needs.

KraussMaffei said in a 27 March statement it would temporarily close its sites in Munich, Treuchtlingen, Hanover and Schwaig in Germany, and its facility in Sucany, Slovakia. It said the Netstal plant in Näfels, Switzerland, was not affected.

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IMAGE: SHUTTERSTOCK

Turning the light onto LSR innovations

The unique qualities of liquid silicone rubber are being exploited in more applications as materials and machinery firms support its expansion in injection moulding. By David Eldridge

Liquid silicone rubber is a material that seems to have crept up on injection moulders in the past few years. The technology to mould LSR has been available since the 1980s but it has been perceived to be a niche area, needing specialist equipment and processing knowledge. The elastomer's new-found attraction has a range of reasons: wider recognition of its properties and their benefits, such as thermal stability, low compression set and good ageing profile; greater variety of materials with different Shore hardnesses and other benefits like self-lubrication; improvements in technologies for dosing and processing; and an expansion of applications in the key moulding markets of automotive and medical devices.

Automotive applications for LSR are literally in the spotlight. Intricate silicone mouldings are a crucial feature in the development of intelligent car lighting, from headlamps that track the road ahead, to interior lighting that adapts to the needs of the individual. **Hella,** which is at the forefront of intelligent headlamp development, says transparent LSR mouldings are a key enabler of innovation in adaptive headlights that adjust to the driving environment. "It's only possible because of the silicone part inside the optic," said Tilman Maucher, Project Manager at Hella. "[The LSR light guide facilitates] dynamic light distribution to have the maximum of light, but without the glaring light for the oncoming traffic and the traffic in front of you."

He presented Hella's Matrix HD84 headlamp at AMI's LSR Innovations conference which took place in Dusseldorf, Germany in March. The company's Matrix modules give glare-free road illumination in both high and low beam modes. These modules allow for variable LED configuration and therefore different lighting functions, automatically changing from town, to country to motorway functions, in which light distribution changes to suit the type of road and other road users. The dynamic bend light, for example, follows the curve of the road ahead.

Maucher handed round a sample of the LSR primary optic component with light guides for 84 LEDs in the Matrix HD84 headlamp, which is fitted in Mercedes-Benz E-Class models. The part collects light from the LEDs and directs it to the secondary

Main image: Automotive is an important growth market for LSR, especially in headlamp applications

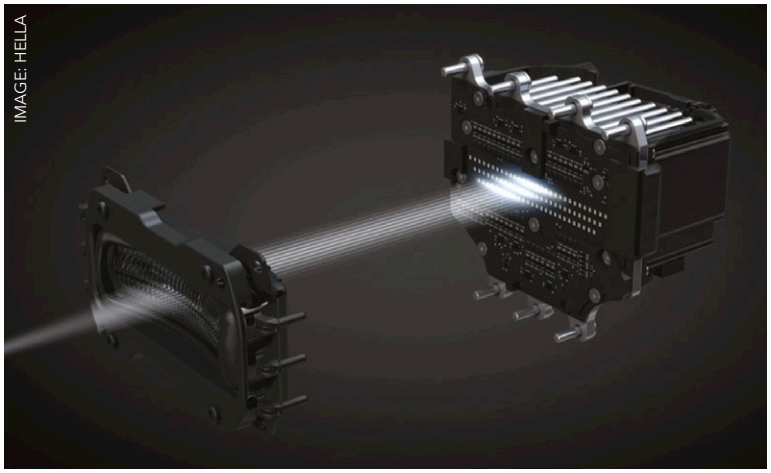
IMAGE: HELLA

Above: Exploded view of Hella's Matrix HD84 LED headlamp with LSR light guide in primary optic component on left

optics. Each LED can be switched on or off to create the different lighting functions.

Car lighting designers like the light transmission performance of LSR, which is better than PC, PMMA and glass, he said. LSR's refractive index is acceptable in comparison with other materials. Material selection is dependent on the complexity required in the headlamp's primary optics. He said: "We won't use silicone material if we are able to use thermoplastics or glass. But if glass can't be used because, for example, of the complexity of the part, and thermoplastics can't be used because of the heat resistance and energy resistance next to the white LED, we say yes to LSR for primary optics."

In answer to a question on whether LSR's higher cost is an obstacle for Hella, he said comparisons should not be made directly between material costs, but should be done on the basis of complete costs for the headlamp. "If we must use LSR for technical reasons, then we do this," he said.

The innovation possibilities of LSR in car interior lighting were discussed by Bernhard Mitteregger, Sales Manager at **Silcos**. "Illumination is standard in a car but innovation is using LSR to make surfaces flexible," said Mitteregger.

Silcos is a silicones specialist that predominantly manufactures for the automotive sector. Ambient lighting in car interiors is a target area for its LSR business. The company has developed Siloptics Flexilight, a flexible light guide, which consists of a flat silicone body, the dimensions of which are adjustable up to a maximum size of 500 x 300 mm. The construction combines reflector, light guide and decorated diffuser.

The lighting in Siloptics Flexilight comes from LEDs housed on a small board in the edge. Homogeneous illumination over the entire length is achieved with the highly transparent LSR core serving as a light guide. The product depth is small and is easy to clean, with low dirt and dust adhesion, says Silcos. "In order to decouple the light evenly over the entire surface, the light conducting, highly transparent silicone core of the Siloptics Flexilight is printed with a previously calculated structure. This structure is finer the closer it is to the light source and becomes larger the further it moves away from the light source. As a result, the Flexilight glows uniformly over the entire surface."

Mitteregger said the company has been discussing with car designers about the possible applications for the Siloptics Flexilight technology. In car interiors, interest is focusing on the technology's possible integration with materials including plastics, leather and fabric. Its flexibility makes it a candidate for use on curved surfaces.

He said exterior applications are also being investigated. These include pedestrian protection possibilities, for example, by integrating Flexilight in the "grille" area of electric vehicles, which are being transformed by new lighting design.

For **Wacker**, electrification of vehicles is a trend with great potential, said Udo Wachtler, Technical Manager for Engineering Silicones, at the conference. He said that by 2025, EVs and hybrid cars are expected to have on average 10,000 metres of cabling, 3,000 connections and multiple power supplies from 12V and 48V up to 800V. "Automotive megatrends are pushing material selection towards silicone elastomers," said Wachtler.

In EVs, high voltage insulating materials are required for cables and connectors. LSR is suited to these applications because of high temperature resistance and low thermal conductivity. For example, in a fast-charger, cables become very hot, so LSR helps manage the heat, he said. In combustion engines, the downsizing trend is leading to higher operating temperatures. Here, more heat-resistant materials are needed in connectors, gaskets and other applications. ›

IMAGE: SILCOS

Silcos developed Siloptics Flexilight, a flexible light guide with a flat silicone core, for ambient car lighting

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IMAGE: WACKER

Right: Wacker develops LSR materials for use in automotive and healthcare applications

Electrification is also fundamental in the digitalisation megatrend, in which cars are expected to have the functionality of a smartphone. Wachtler said this creates opportunities for low friction LSR materials in sealing applications, cable wiring and two-component moulding.

Self-adhesive LSR is widely used in safety-relevant applications, and these are expected to multiply due to the trend towards semi-autonomous driving. He said: "The whole car is surrounded by sensors, and all these sensors have to be sealed. If they are outside the car, they need a certain degree of UV resistance and LSR is the perfect material."

The material requirements in high voltage applications such as cable and plug connectors include long-term high temperature stability, electrical insulation and tight connections. Wachtler referred to one of Wacker's LSR solutions in these applications, the self-adhesive Elastosil LR 3675 with a low coefficient of friction, which the company is promoting as an alternative to oil-exuding materials. This LSR also has a low compression set of 12% after 22 h/125°C.

Wachtler also discussed other key markets for LSR: healthcare and food-contact applications. He said Wacker is pursuing a twin track approach for LSR to meet increasing requirements regarding volatile organic compounds and productivity. It has upgraded its LSR portfolio to have a reduced volatile content, achieving this by significantly reducing the amount of D_x Siloxanes by improved devolatilisation of raw materials.

Productivity is targeted with new low-volatile LSR materials that eliminate the post-curing stage normally needed for sensitive applications. Elastosil LR 5040 series materials have the lowest content of volatiles, migratables and extractables in the Wacker LSR product range. They are formulated for high tear resistance so that, even without post-curing, they comply with current regulatory requirements that say baby items and food contact materials should contain no more than 0.5% volatile substances.

Healthcare materials were the main focus of the presentation from Marco Jesus, European Marketing Manager for Healthcare at **Momentive Peformance Materials**. Self-lubricating LSRs have advantages that include: low coefficient of friction that enables automated assembly of medical devices; biocompatibility compliance with USP Class VI and ISO 10993 requirements; and enhancement for moulded parts to glide into mountings. The latter benefits applications such as needle-free access valves, and other applications including O-rings, stoppers and seals.

Self-bonding LSRs are also useful in healthcare applications where two-component moulding is beneficial for combining LSR with a thermoplastic. Momentive has introduced its Silopren 47x9 LSR range for healthcare. Jesus said these were developed for combining with polycarbonate, which is a commonly used plastic in medical devices (the Silopren 47x9 grades also have good adhesion to co-polyesters, PBT and glass). The grades are compliant with USP Class VI and ISO 10993, including in a non-post-cure state. Their productivity benefits include: low temperature curing; no post-curing requirement; and no adhesion to the injection mould.

Jesus rounded off his presentation by handing round the audience a non-medical application featuring Silopren 4749 LSR which was shown at K2019. The demonstration part, a phone holder for a car dashboard, was 2K injection moulded with Covestro APEC 1745 polycarbonate. The butterfly-shaped phone holder was produced on the Momentive stand on a SmartPower Combimould 120/130/210S with a Unilog B8 control unit from

IMAGE: MOMENTIVE

At K2019, Momentive showed a two-shot LSR and polycarbonate phone holder

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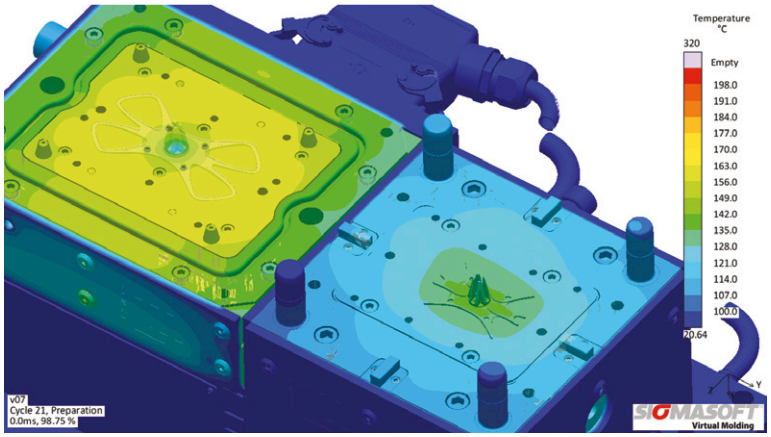
IMAGE: SIGMA ENGINEERING



Above: Sigmasoft simulation of injection moulding the LSR/PC phone holder

Wittmann Battenfeld, with dosing system and mould design by Elmet. **Sigma Engineering** demonstrated the use of its Sigmasoft Virtual Molding simulation package for the part's production on its K2019 stand.

At the AMI conference Payam Semsarilar, engineering support specialist at Sigma, discussed how Sigmasoft enabled widening of the process window for the phone holder's moulding. The two components are produced in the same mould, so the temperature distribution inside both the PC and LSR cavities is key to producing a good part and also keeping the process efficient. After an initial calculation of the two single components was done to gain insights in the filling, packing and curing behaviour of both components, a full Virtual Molding analysis was carried out to analyse how the mould behaved during production. A virtual design of experiments was then conducted which showed that the PC component's temperature had a bigger influence on the curing degree than the mould's temperature inside the LSR cavity. This discovery led to changes being made that widened the process window and increased the curing rate.

The experience of injection moulders processing LSR in a two-component application was also a subject of discussion at the AMI conference. Markus Landl, Head of International Business Development at LSR moulding specialist **Rico Group**, led the audience through decision-making criteria for using LSR in multi-shot applications.

Processors tend to decide to use multi-shot technology for one of three reasons, he said. For some, it is simply the idea that the technology is "nice to have" as they would like to be perceived as a state-of-the-art company. This does not factor in the technology's potential for product augmentation. This is the second reason: the benefits of using multi-shot for product innovation, part and function integration, and to enhance a product's performance and ease-of-use. The third reason is when multi-shot is a "must-have", as the customer has made it mandatory for reasons such as cost reduction due to function and assembly benefits.

A more systematic approach to multi-shot decision making was presented by Landl. The processor should determine the strategic decisions, such as whether it has the right capability to start production, and whether the market environ-

Sole shows LSR's 3D printing abilities

Dow's Silastic 3D 3335 LSR material for 3D printing is being used in an innovative project to manufacture shoes customised to individuals. Footwear brand ECCO's Quant-U project involves taking an individual's biomechanical data to 3D print LSR midsoles customised to the wearer's foot shape and natural movements – all taking place in-store in less than one hour.

Silastic 3D 3335 LSR was formulated by Dow for additive manufacturing and it has low viscosity to aid printing and rheology for high resolution and accuracy. In ECCO's customised shoe midsoles, the elasticity and recovery of the material optimises energy return, cushioning and foot stability.

Dow created Silastic 3D 3335 to be as fully functional as any other LSR, said Michael Backer, Research Specialist at Dow Performance Silicones, at AMI's LSR Innovations conference in March. Also presenting at the conference was **German RepRap**, which has developed liquid additive manufacturing technology that is used for printing the ECCO LSR midsole.

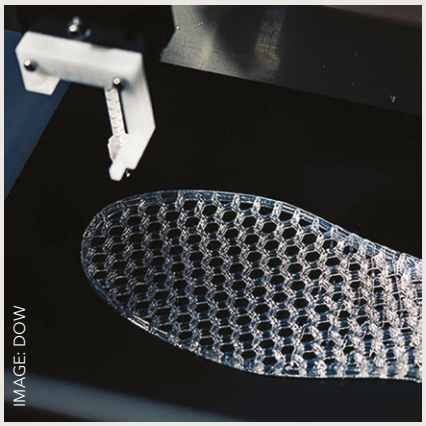


IMAGE: DOW

Dow has carried out tests on Silastic 3D 3335, which Backer said show that the material achieves mechanical properties closely matching those of injection moulded LSR, making it suitable for functional prototypes. He showed two demonstrators (both designed by German RepRap) 3D printed in Silastic 3D 3335: the Wave, a structure of two parallel walls only 0.1mm apart; and the Diamond, a hollow structure.

Left: Dow's Silastic 3D 3335 LSR material is used for 3D printing individually customised midsoles in ECCO's Quant-U project

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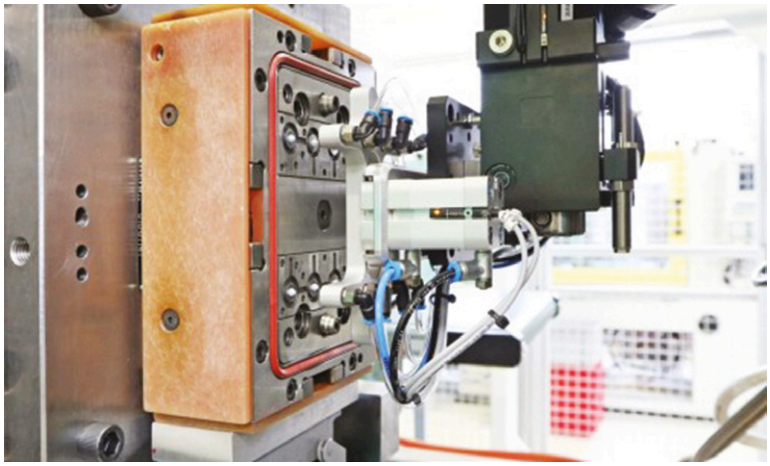
IMAGE: RICO



Above: Injection moulding of an LSR microswitch cap by Rico

ment is right for its use. The processor should also ask where the cost reductions will be across the whole value chain. Would multi-shot result in increased profits? This applies not just to the processor, but also to its customer asking the question "What's in it for me?"

Landl also recommended that the processor considers risk minimisation when starting multi-shot moulding. "You need experienced partners in LSR. You have to choose your partners wisely," he said.

At K2019, Rico showed its expertise in LSR moulding by demonstrating production of a microswitch cap weighing just 0.009g. The company developed the production process for the microswitch cap – used in various applications in healthcare and other industries – with **Arburg**. In the demonstration an electric Allrounder 270A machine with a clamping force of 350 kN was used, equipped with a size 5 microinjection unit and a Rico 8-cavity mould. During the process, Wacker's Elastosil LR3005 LSR with a Shore A hardness of 40 was pre-mixed using a cartridge and then injected using an 8mm screw.

Rico said the LSR was injected directly into each cavity using a mini valve gate nozzle, leading to waste-free production. An Arburg Multilift H 3+1 robot was used for handling. A camera monitored whether each cavity is filled during the process, and whether all parts were correctly removed by the gripper. The company said this ensures that the injection mould is protected against damage and that the right number of parts are removed. Defects can also be spotted in individual components, which are then separated from the parts that meet the specifications.

Trelleborg is another specialist LSR processor. At

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IMAGE: SUMITOMO (SHI) DEMAG

Right: A specially configured IntElect 130 machine was used by Sumitomo (SHI) Demag at K2019 in an LSR injection moulding demonstration

the conference, Ursula Nollenberger, the group's Product Line Director for LSR Components, presented a case study of the two-component solution Trelleborg devised for a customer needing to address a product problem. The existing product was a control valve with a spring-activated piston, moulded in glass-filled polyamide 66, sealed in an aluminium housing with two LSR O-rings. Trelleborg set out to analyse and resolve a leakage problem with the valve, and also to reduce friction and eliminate assembly issues with the O-rings.

FEA analysis showed there was a misalignment of the piston in the valve which was stressing one of the O-rings. Trelleborg proposed eliminating the two O-rings in a new design for the valve which would be two-component moulded in PBT and LSR. The company used Sigmasoft simulation before going ahead with production. This showed that to achieve good moulding results, it needed to reduce the connection bridges, balance the flow and add an overflow in the part.

The K2019 exhibition provided a showcase for other companies to show LSR machinery. **Elmet** highlighted its enhanced TOP 5000 P pneumatically driven LSR dosing system which has a smaller footprint than its predecessor. It has also developed a TOP dosing system with a fully electric dosing pump which is driven by a torque- and current-controlled servomotor. The focus is on minimising dosing fluctuations and maximising efficiency and simplicity of operation. Both versions are intended for the mass production of high quality parts with tight tolerances. They cover shot weights from less than 0.1 g up to several kilogrammes and viscosities ranging from 9,000 mPas to 3,000,000 mPas even when the viscosities of the two components differ greatly.

KraussMaffei included LSR has one of its many K2019 demonstrations. It showed a small all-electric PX 25 injection moulding machine with a clamping force of 250 kN in a medical LSR micro-injection moulding display. A micro membrane with a shot weight of 0.3 g was produced in an 8-cavity mould in a 14 s cycle time. For this application, KraussMaffei developed a screw measuring only 12 mm in diameter for extremely low shot weights. The company said its APC Plus machine function showed its strengths in this process, ensuring high shot weight consistencies and, consequently, uniform component quality.

Sumitomo (SHI) Demag highlighted its LSR know-how at K2019 by moulding a component for a matrix light on a specially configured IntElect 130 machine. The company said the latest IntElect series uses 20% less energy than competitor machines. The series has an improved drive system, which is geared towards dynamics, precision and repeatability, it said. The new motor design is shorter and features new types of spindles.

The all-electric IntElect 130 configured for LSR processing at K2019 was equipped with a special screw, a non-return valve, vacuum pump and toggle technology. The cell was developed in collaboration with a number of the company's partners that are dedicated to the LSR marketplace, including Nexus.

Nigel Flowers, Managing Director of Sumitomo (SHI) Demag UK, explained how the moulding machine differed from a standard IntElect. "Special screws, measuring between 14mm and 45mm in diameter, with a sealing system at the shaft are adapted to the material and machine size. Currently, the LSR package is available on IntElect machines ranging from 50 to 180 tonnes. Other special features include a spring-loaded non-return valve to avoid uncontrolled backflow of material, a shut off system specifically designed for LSR, plus a pressure controlled vacuum sequence to extract air and to prevent flash occurring during the filling of the mould."

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Redesigning the closure for circularity

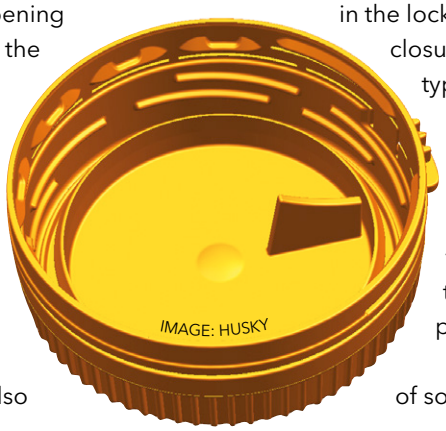
IMAGE: SHUTTERSTOCK

Injection moulders of caps and closures are now required to find solutions for a much wider range of problems, including the use of tethered caps and post-consumer recyclate. Mark Holmes finds more

Caps and closures have always required excellent functionality and shelf appeal for brand owners. However, sustainability and the needs of the plastics circular economy are providing new challenges for injection moulders, resin suppliers and manufacturers of injection moulding machines. As well as continued lightweighting, these now include more easily recyclable materials, increased use of post-consumer recyclate and tethered closures.

There are a number of significant market trends emerging at present for the injection moulding of caps and closures, reports **Husky**. "Firstly, there is health and safety," says Michael White, Business Manager for Closures. "By default, the existing neck and closure design needs to ensure a hygienic drinking experience from first opening until the package is deposited in the recycling collection box. In addition, there are increased lightweighting and legislative efforts that are designed to improve the sustainability of existing finishes and caps, for example, tethered closure legislation that requires the closure to remain on the bottle. Creating a premium product is also a factor, for example, tall and larger neck finish variants that provide a more pleasant opening experience. For commodity-type applications (for example, large case formats), the industry requires ultra-lightweight finishes to maximise production cost savings."

The need for tethering has led to a fundamental redesign of the closure. "The challenges are numerous," says White. "For example, a functional hinge needs to be incorporated that is robust and can achieve more than 30 openings and re-closings. In addition, the hinge must be intuitive to operate and have positive shell opening, locking and re-closing functions. It also needs to feature audible and tactile cues to signal when the shell is in the locked position. Additionally, the closure still needs to perform all of its typical functions of sealing, tampering evidence and carbonation retention. Weight neutrality is another design constraint while featuring a tether system that must be able to withstand greater than 25N pull force."



Left: Husky has designed a re-closure feature for caps

Husky has developed a range of solutions that address this teth-

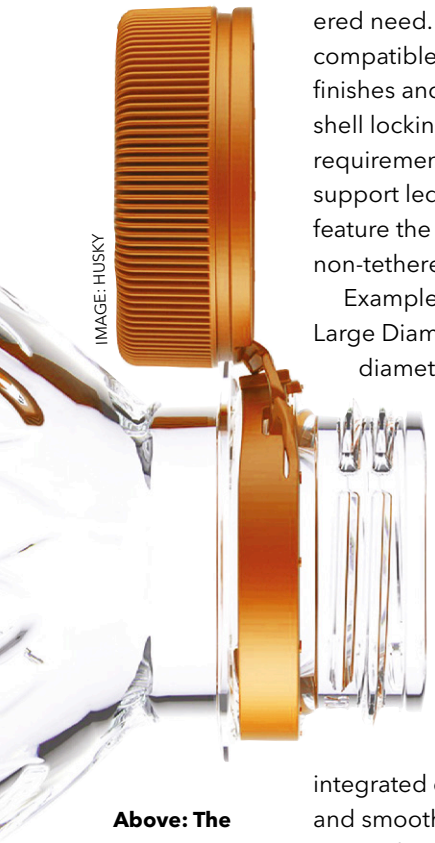


IMAGE: HUSKY

Above: The 1881 Large Diameter (33mm) Support Ledge tethered cap developed by Husky

ered need. The company says that they are compatible with all of the most popular neck finishes and have slight variations in terms of how shell locking is achieved based on neck specific requirements, for example, small versus large support ledge (SL) diameters. All of the designs feature the same performance criteria as the non-tethered alternative.

Examples of new designs include the 1881 Large Diameter Support Ledge. This is for large SL diameters (33mm), with a closure locking feature that leverages the support ledge to assist in the shell locking position. The 1881 Small Diameter Support Ledge is for small SL diameters (31mm) and has a closure locking feature that leverages a hook defined on the shell in cooperation with a flap defined in the tamper evident band to achieve a positive locking position. There is also a re-closing feature that employs an integrated cam to promote an intuitive, repeatable and smooth re-closing experience. Husky adds that it is working with a variety of recognisable global brands to offer solutions that incorporate these features to satisfy their specific product needs.

There are also a number of future opportunities that the company sees for caps and closures. "There are a number of priorities that Husky is focusing on in terms of development," White says. "Improvements will be focused primarily in a number of key areas. In terms of sustainability, there will be continued efforts around tethering, lightweighting and increasing the post-consumer resin (PCR) content to ensure that Husky's closure offerings offer the best environmental footprint possible. In performance, Husky's closure developments will continue to offer elevated performance levels without compromising safety, sustainability or user experience. There is also a need for enhanced safety. The global coronavirus pandemic has emphasised the importance of supplying a dispensing system that offers a hygienic drinking solution for the consumer. We will continue to seek alternative options to make tamper evidence more visible without adding weight or compromising performance. Finally, for shelf differentiation and usability, we will continue to develop designs that offer brands a means to further differentiate themselves on the shelf and incorporate features that enhance the consumer experience."

Caps moulders have also been responding to the EU's Single Use Plastics Directive's requirement for closures to remain tethered to the bottle during consumption. For their customers in the beverage industry, the new closures must not affect the cost of production, bottle design, bottle neck, filling line or the capper. In addition, the closures should be available both as lightweight press-on caps, which are mainly used in non-pressurised bottles such as still water, and as screw-on caps for higher demands on the tightness of the closure.

Bericap has achieved this through a redesign of existing closures. "Within the product development process, it quickly became clear that the screw caps had to be redesigned no matter which technical solution is proposed," says Volker Spiesmacher, Director Head of Product Sales and Marketing. "The tether requires more space in the area of the tamper evidence band. Hence, the screw caps had to be redesigned."

The four technical proposals for screw caps now presented by Bericap can be applied to the same closure shell which is a redesign of the current closure. All proposals can be applied to all major neck finishes available on the market. However, some proposals perform better, if small details of the neck are modified. The Bericap proposals allow for a market introduction of the new closure design suitable for tethered caps at an earlier stage. Therefore, the redesigned caps can be readily manufactured with all technical pre-requisites for a tethered version set in place when they become mandatory in 2024. The redesigned caps can then be introduced at a time that is in line with customers' marketing activities. In addition to the screw-cap solutions, Bericap also offers press-on caps for standard necks as well as a premium solution with customised neck finish which offers the highest weight savings on neck and closure.

IMAGE: BERICAP

Right: Bericap has developed a new tethered cap

Bericap has also developed a filling aid for AdBlue tanks in diesel cars. It allows car owners to fill their AdBlue containers easier and faster, and helps to comply with current emissions standards. Since 2015, all first-registered Euro 6 diesel vehicles have had to use the AdBlue additive to reduce nitrogen oxide emissions. The filling aid from Bericap simplifies the handling of common 10 l refuelling tanks

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Right: Closure Systems International has introduced the 38mm D-KL liner-less HDPE closure for dairy applications

considerably, which in turn saves time on the road. In addition, Bericap has developed two weight-optimised closures that can be used both for AdBlue and for commercially available car care products.

Bericap offers various shapes and sizes of expandable pourer types, which provide significant pouring assistance to the consumer, for example, when bridging a necessary distance for spill free pouring. They can be used for container sizes from 5-25 l. The foldable pourers are designed for easy push-in application into containers. They fit onto containers with standard neck sizes DIN42 and DIN45 due to their conical foot design – they are simply pressed into the container neck and start pouring leak-free. For accurate pouring results the long expandable nozzle is bendable 180 degrees and will remain in this position without additional fixing by hand. This feature allows the consumer to hold the container with both hands for safe pouring. The flow is fast and steady without leakage. The pourers are available with and without shrink foil, which can protect against dust when necessary. The Bericap foldable pourers are already used by notable customers from the automotive, mineral oil and chemical industry.

Berry Bramlage, part of Berry Global, has also developed a tethered closure design that meets the EU requirements. The company says that it has developed a series of designs for all types of neck finishes, including both screw and snap-on. The solutions involve additional strands or tabs on the tamper-evident band that keep the closure attached after opening and enable easy reclosing of the bottle. In order to maximise consumer convenience and ease of use, different options for the docking of the closure once the bottle has been opened are available to meet different product or pack requirements. These include placing the closure beneath the neck (the Lasso and V-Tethered closures) or adjacent to it at a wide angle (Compact Flip and Proxima closures). The two-piece SecureSnap closure for snap-on necks is based on the flip top design of Berry Bramlage's Secure Flip sports cap, with its opening tamper-evident band that is retained on the closure after opening. All closures can be specified in a variety of colours with a choice of decoration options for enhanced branding and on-shelf appeal.

Left: Filling aid for AdBlue tanks in diesel cars from Bericap

Closure Systems International (CSI) has introduced the 38mm D-KL liner-less HDPE closure (38D-KL), which is designed with consumers and dairy product applications in mind. With improved application performance and drop-down tamper evidence for additional security, the company says that the 38D-KL is engineered to deliver reliable performance on HDPE and PET dairy bottles. The 38D-KL is commercially available for applications in non-carbonated cold- and ambient-filled beverages and liquid dairy markets.

CSI adds that the 38D-KL closure offers a sustainable solution and can be sourced with up to 40% PolyCycle PCR HDPE resin. PolyCycle PCR is sourced from recycled milk and other beverage containers, providing an opportunity for closed loop packaging and ensuring the high quality sourcing. Both the HDPE and the PolyCycle PCR version of the 38D-KL closure are 100% recyclable.

Engel has introduced the next generation of the all-electric E-cap injection moulding machine series for beverage caps. The company says that production of 29/25 lightweight caps on a new E-cap 380 machine combines short cycle times with high precision and low energy consumption.

Up to its launch at K2010, hydraulic machines using accumulators for the injection movement were the standard for the production of caps. However, Engel claims that the E-cap is the most energy-efficient cap machine on the market and at the same time the only high-performance machine tailored to the requirements of the caps and closures industry providing all-electric operation even with a clamping force range as high as 4,200 kN. It has an average return on investment of less than two years, says the company.

"Since 2010, the requirements for beverage caps have changed substantially," says Friedrich Mairhofer, Product Manager for all-electric injec-

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Right: Caps are becoming lighter, causing increasingly tough challenges for injection moulding machine technology, says Engel

tion moulding machines. "This is why the continuous further development of E-cap now is being integrated into a next generation machine. Continuous part weight reductions play a central role. For still water, caps with a weight of significantly less than 1g are produced today. As a result, the cooling and cycle times have continued to drop. Where the cycle times ten years ago were still 2.5s, today's cap machines need to be able to produce at 2s intervals and faster."

IMAGE: ENGEL

When developing the new generation of machines, Engel says that the main focus was therefore both on performance and stability. The new E-cap achieves faster mould opening and closing movements and is designed with a more stable machine bed for more frequent load cycles.

The company has demonstrated an E-cap 2440/380 producing 29/25 caps in a 96-cavity mould from Plastisud. The shot weight is 1.3g per cavity with a cycle time of less than 2s. An HDPE from Borealis/Borouge is processed. The system is equipped with camera-supported 100% quality inspection by IMDvista and a dry air system by Eisbär. Further system partners are Piovan, PackSys Global and PSG.

The reinforced frame and mould mounting platens on the new E-cap ensure good stability of the machine movements even with extremely short cycles and small shot volumes. The company says that the result is outstanding reproduction of surface detail and a maximum number of good parts. The fast dry cycle times of 1.3s with the E-cap 380, for example, and the parallel movements included in the standard right from the outset make an important contribution to achieving cycle times of less than 2s.

Ejection occurs parallel to the mould opening. What is new is that the ejectors can be amplified by a switchable hydraulic booster on demand. This ensures that the machine operates with the best possible efficiency both during production and start-up after a production interruption. While the caps are not yet completely cooled and easy to demould during ejection in ongoing production, the ejectors have to apply more force in stop situations to remove caps that have already cooled down in the mould. Since production interruptions are rare, it is more efficient to use servo-hydraulic drive amplification than to generally equip the machine with more powerful ejector drives. The new E-cap generation is offered with two different ejector drive technologies. The machine works with hydraulic ejectors as standard. Servo-electric drives are available as an option, which require around 10% less energy.

In addition, the plasticising unit has been redesigned, because the properties of the materials to be processed have also changed. Raw material manufacturers have adapted their products to lower cap weights. For CSD (carbonated soft drink) caps, the melt flow index (MFI) of current HDPE grades is 0.8-1.4g/10 min. Very short cycle times require particularly high plasticising rates. Engel has increased the torque of the plasticising drive accordingly and developed both a new plasticising screw and a new highly wear-resistant sliding ring non-return valve specifically for cap manufacture. Both products are part of the standard scope of supply of the new E-cap machines. With its new design, the barrier screw processes high viscosity HDPE in a particularly gentle way, even given high throughput levels, while ensuring a good melting rate and homogeneity of the melt. This further contributes to the high process stability and repeatability of E-cap machines.

Engel adds that an encapsulated toggle lever and a clean linear guide of the moving platen, result in E-cap machines reliably meeting the requirements of strictly regulated production standards of the food industry. The machine's all-electric drive technology makes a major contribution to good energy efficiency. In addition, braking energy is recuperated, reliably preventing the need for expensive peak power. Due to the high efficiency of the drives used, E-cap machines also only require a minimum of coolant. The E-cap 380, for example, operates at high speed with a specific energy consumption of 0.37 kWh per kg of pellets processed. The new E-cap is available in the sizes 220, 280, 380 and

Below: With extremely short cycle times of less than 2s, Engel's new E-cap machine ensures high precision and repeatability

IMAGE: ENGEL

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IMAGE: KRAUSSMAFFEI

Above: The dry-cycle times of the Netstal Elion have been reduced by up to 0.2s across the entire model range

420 with clamping forces from 2,200-4,200 kN.

KraussMaffei has reduced the dry-cycle times of the high-performance Netstal Elion by up to 0.2s across the entire model range. The shorter dry cycles are available for all models with aXos version 8.2.0 and upwards. The company says that this update for the series incorporates the latest controller technology insights, which had already been applied to the Netstal Elios series. The additional speed is made possible through the adaptive optimisation of the acceleration and deceleration ramps for the clamping unit drive. The result is that the maximum moving speed will be reached faster and can be maintained longer before the moving mould plate is decelerated and the toggle lever mechanism transitions to building up the clamping force – all without compromising mould protection.

The company adds that taking into account the potential mould weight allows shorter production cycles. However, a shorter dry-cycle time does not automatically mean a faster cycle under real production conditions. That is why the new control algorithm takes into account the potential tool weight based on the set installation height and incorporates it in the control of the acceleration and deceleration process. This allows speeding up of production and further productivity increases.


IMAGE: BOREALIS

Right: Borealis has launched BorPure RF777MO, which is designed for flip-top cap applications

For high-performance closure applications, a Netstal Elion 4200 with a 96-cavity mould was set up to produce type 29/25 HDPE closures. One closure weighs 1.23g. Due to the optimised control, the cycle can be shortened from 2.77s to 2.6s. The hourly output goes up from 124,750 to 132,920 closures, which is a productivity increase of 6.5%.

Borealis has developed BorPure RF777MO for flip-top cap applications. Based on Borstar Nucleation Technology, this new resin fulfils value chain demand for high-quality solutions offering good organoleptics. A next generation random polypropylene (PP), BorPure RF777MO has been designed for use in flip-top caps, a growing caps and closures market segment.

The company says that the caps and closures industry needs to respond to a broad and diverse set of requirements. Converters demand innovative material solutions that reduce energy consumption and help increase productivity on injection moulding lines. Resins must offer easy processability, consistency, high quality and provide optimal performance on the capping line. For brand owners and final consumers, caps and closures must secure package contents, provide ideal organoleptic properties, safety and convenience. They must also stand out on the retail shelf and, increasingly, offer the lowest possible environmental footprint. This expansion of the BorPure family of multimodal polyolefin resins with good taste and odour properties enables Borealis to support its value chain partners better in fulfilling this diverse range of demands, it says.

The company adds that BorPure RF777MO is based on in-situ nucleation technology, which helps producers enhance productivity and sustainability. Cycle times are reduced. For certain cap applications, cycle time reductions of more than 10% can be achieved due to fast crystallisation behaviour. The impact of colouring on dimensional stability can be lowered due to fast colour change during processing without having to change process parameters. In addition, energy consumption can be reduced resulting from lower barrel temperatures. Finally, the overall CO_2 footprint can be lowered due to reduced energy consumption and faster cycle times on injection moulding lines.

For brand owners, BorPure RF777MO offers high transparency in combination with good gloss and hinge performance. Testing by an independent institute in Europe has confirmed the good organoleptic properties and the suitability of RF777MO for the most sensitive beverage and food applications. Hinged caps made using this new resin are particularly robust, demonstrating good hinge strength and stability. As a monomaterial solution, caps made using RF777MO are also 100% recyclable, says Borealis. ❯

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IMAGE: INEOS

Right: Ineos Olefins & Polymers is partnering with Forever Plast to use PCR from used caps in new closures

Ineos Olefins & Polymers is partnering with **Forever Plast**, a leading polymer recycling technologies operator in Italy, to develop a range of new polyethylene grades that mirror Ineos' virgin grades for injection moulding and compression moulding machines. The new Recycl-IN products take PCR PE from used bottle caps and carefully blend them with highly engineered virgin polymer to create new high-quality caps. Over the next five years, the companies say that 6.5 billion bottle caps will be diverted from the waste stream to be recycled.

The initiative is an expansion of the Ineos Recycl-IN polymer range into the PE non-food caps market. "For a while PET bottles have been increasingly recycled but this is one of the first circular developments to tackle the caps," says Iain Hogan, CEO of Ineos Olefins and Polymers. "This is a major step forward. We are creating a truly circular approach to ensure used bottle caps are recycled and returned to the market as new highly engineered high-quality caps, rather than being thrown away or wasted."

SABIC has opened a Technology and Innovation Centre dedicated to caps and closures in Geleen, Netherlands, located in SABIC's Global Technology Center for Europe on the Chemelot Campus. The opening ceremony of the new facility was led by Sergi Monros, SABIC Vice President of Performance Polymers & Industry Solutions, Petrochemicals. The facility opening comes a year after SABIC established its Caps & Closures industry segment organisation.

"With our dedicated organisation, we already have a strong focus on innovation-driven solutions to meet the changing market trends that our customers within this strategic segment are demanding," says Monros. "This new state-of-the-art facility will enable us to accelerate the pace by using market-leading materials and technologies aimed at a range of related applications – not only caps and closures, but also pumps, dispensing systems and other product delivery mechanisms for beverages, food and non-food applications."

Below: SABIC has opened a Technology and Innovation Center dedicated to caps and closures

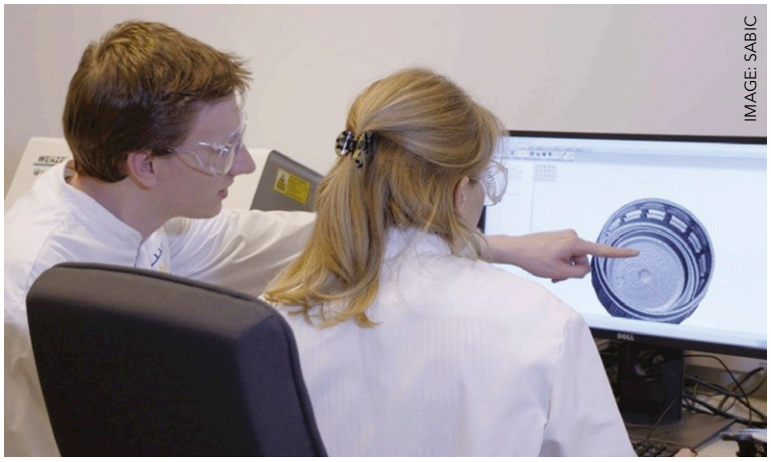

IMAGE: SABIC

Monros points to the growing need for creative solutions that are sustainable, cost-efficient and compliant. These solutions are coupled with the increased number of regulations governing product safety and consumer well-being. "End-users are looking for convenience too, and we are always thinking about new ways to improve functionality," he says.

SABIC says that it is developing technologies related to both new material development and to application testing. Polymers developed specifically for applications in this sector help enable, for example, lighter caps, and pumps and dispensing systems that are more efficient and easier to manufacture, all the while supporting customer efforts to improve overall sustainability. The centre includes facilities that allow SABIC to simulate the real-life performance of finished products. The research laboratory has equipment for testing material characteristics such as mechanical properties, dimensional stability and environmental stress cracking resistance. Cap specimens can be produced in-house for performance testing for potential applications and for the development of improved products. There will also be capability for developing and testing new product designs.

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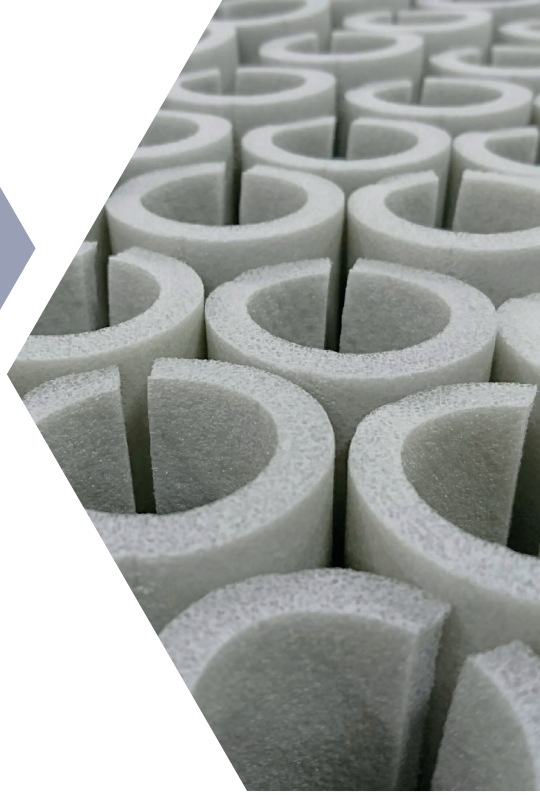

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Robot advances give processors more choice than ever

The use of robots by injection moulders continues to expand, but suppliers are showing there are even more opportunities to benefit from cartesian and multi-axis technology. By Peter Mapleston

If there was ever a time when the benefits of "lights out" production became clear, it is now. Automation can help all sorts of operations stay running even when no-one is around.

Robots and other forms of automation already figure quite strongly in injection moulding operations, although there is still much room for further application. Statistics released by the European plastics machinery organisation Euromap shows that the proportion of injection moulding machines sold equipped with robots rose from 18% in 2010 to almost a third towards the end of 2019. Additionally, communications between diverse elements of a production operation using OPC Unified Architecture (OPC/UA) have been more widely adopted, offering moulders broader connectivity and remote management options – something many companies operating skeleton workforces may value more now.

Nigel Flowers, managing director at the UK arm of injection moulding machinery supplier **Sumitomo (SHI) Demag**, says: "There has been a significant upwards trend towards automation in plastics processing in recent years. Part of this has been driven by demand for more flexible solutions, so the use of six-axis industrial robots in precision moulding in particular is certainly more commonplace today. Additionally, the price gap between cartesian [gantry] and industrial robots has closed markedly, they've become easier to programme and simpler to integrate."

Industry's ability to adapt is being thoroughly tested right now, says Flowers, yet much production goes on. "As an industry, we are united in our focus to stay operational, look after the welfare of our workforce and support the concerted efforts to produce life-sustaining healthcare and other products essential to everyday life. Automated systems and moulding processes will be integral to this effort," he says.

One of the biggest challenges for robotics manufacturers is the perception that the technology is here to take the jobs of humans. That is simply not the case, says **TM Robotics** founder and CEO, Nigel Smith. "Unfortunately, the notion that automation poses a threat to jobs often overshadows the potential benefits of investing in the technology." (TM Robotics is an authorised distributor for Shibaura Machine robots; Toshiba Machine changed its name to Shibaura Machine on 1 April this year.) ›

Main image: One of Shibaura Machine's new TVM models

Right: The Kuka KR Agilus has no issues picking up even complex components

"Consider this as an example. In the past, most end users opted for a classic cartesian X-Y gantry-style robot to unload parts from a moulding machine. Today, the technology is available to improve and add to this basic operation. By using a ceiling-mounted six-axis robot, for example, taking a product from the moulding machine, there is an opportunity to do more work with the specific part you are taking out. While doing this process, the robot allows you to inspect, assemble or pack the product."

TM Robotics has recently expanded its six-axis robot range, which includes the introduction of the Shibaura TVM. Smith says the machine's larger payload and longer reach enables TM Robotics to offer a solution for the unloading and loading of larger machines.

Kuka highlights a flexible cell developed by German automation solutions specialist Robomotion based on a robot from its KR Agilus series. The cell is in operation at processor Gindele in Pforzheim, Germany, optimising a multi-stage handling and machining process for reusable cutlery. The cutlery was the idea of students at University of Applied Sciences in Reutlingen, looking for an alternative to disposable plastics cutlery at trade fairs.

The Flexobot robot cell performs handling at the injection moulding machine as well as various downstream processing tasks, including removing the sprue, quality inspection by means of a vision system, and assembly of the knife and fork/spoon into a kit.

The six-axis KR Agilus removes the cutlery from the mould and feeds it to the vision system for quality inspection. Since the component is still very hot, it is first set aside to allow it time to cool down. Once it has cooled down, the robot picks the component back up and removes the sprue. The robot is fitted with a 3D-printed gripper for this purpose.

IMAGE: KUKA

At **Fanuc**, Shinichi Tanzawa, Europe President & CEO, says that as the demand for integrated automation solutions is growing, its "One Fanuc" solution comprising CNCs, machines and robots is becoming more popular. He says Fanuc is the only company focused on factory automation that can supply all the key elements including CNC-controllers, servo motors, industrial robots, machines and Industrial Internet of Things (IoT) solutions from one source. It has a worldwide 20-30% share of the robot market. Fanuc's share of the US market is 50%, which Tanzawa claims is because it dominates the automotive market, where it has been in business for a long time with its broad range of industrial robots.

Technology trends in both robots and injection moulding machines vary around the world, Tanzawa says. In Asia and America, Fanuc in the past has focused mainly on large volume applications with "lean" machines. "In Europe, the requirement is more for muscular multi-functional machines," he says.

Fanuc is now increasingly offering customised machines that are in high demand in Europe, such as for medical components, multi-component moulding and liquid silicone rubber (LSR). Ever more often, these machines are combined with robots for loading and unloading. "We have strength in robots and we want to benefit from that", Tanzawa says.

The benefits of higher output and boosted productivity, two of the biggest reasons in justifying the use of automation, can be easily integrated into today's injection moulding machinery and auxiliary equipment through **Milacron's** proprietary Mosaic + control, says Brian Bish, Business Manager, Manufactured Product. "Mosaic + is a practical approach to host a seamless integration in a complete

Below: Fanuc makes a wide range of industrial robots for injection moulding and other technologies

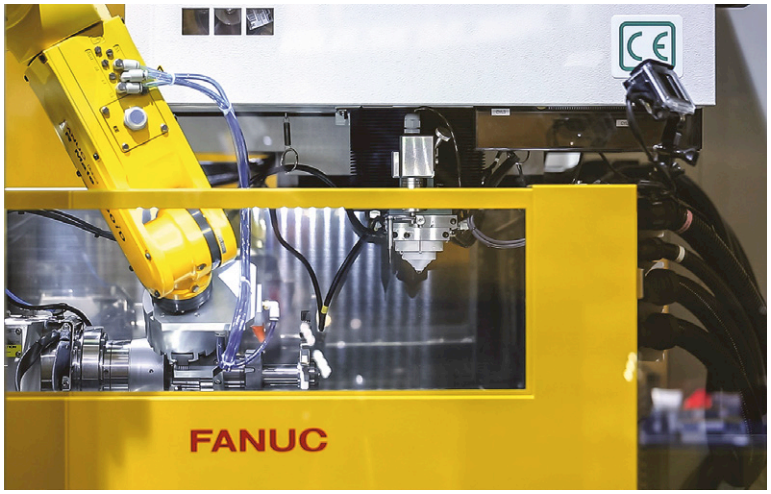

IMAGE: FANUC

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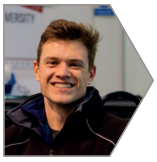

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IMAGE: UNIVERSAL ROBOTS

Left: Cobots can easily be moved from press to press, as seen here at Dynamic Group

automation cell, that consists of robots, hot runner controllers, dryers, conveyors, mould temperature controllers; more are in development."

Andy Stirn, Director, New Product Development, Applications and Product Management, adds: "Milacron is working towards smarter automation, which would utilize the existing capabilities of a machine's controller. When a new mould is loaded into a machine, the mould's teach pendant would allow the necessary parameters to be automatically set up for the entire work cell. This process reduces any potential errors that may be experienced with an operator programming each component manually; but also saves time in reconfiguring each automation component every time the mould is removed and replaced for a new part."

Collaborative robot specialist **Universal Robots** says the use of cobot automation, which enables robots and people to work side-by-side, is "exploding" in the injection moulding market. It says that while cobots deliver most of the benefits of regular six-axis robots, they also deliver other significant advantages. When properly applied, for example, cobots often do not require the heavy, expensive and space-intensive safety fencing and access doors associated with traditional automation.

The company highlights the portability of cobots. "Lightweight and easy to set up and program, cobots are often treated as a manufacturing tool, moved from machine to machine as the production mix and schedule demand," says Joe Campbell, the senior manager of applications development for Universal Robots North America. "Cobots have been successfully mounted on rolling bases or carts and wheeled into position for a short part run. Other installations have utilised magnetic bases, or a high-precision collet mounting to enable cobots to be moved machine to machine."

One processor that began using cobots from Universal Robots is Dynamic Group, a contract manufacturer based in Minnesota, US, which sought to automate repetitive manual tasks when finding employees to fill injection moulding jobs proved challenging.

The cobots are used in three different applications. The first robot tends a complete machine cycle; it picks and places "book frames" that hold pieces to be moulded into the injection moulding machine, transports the units to a trimming fixture, places the part in front of an operator for further handling, and finally pushes a button to activate the cycle again.

Dynamic Group CEO Joe McGillivray says: "Universal Robots' UR10 robot arm gave us a perfectly consistent cycle. We went from having three operators on a single shift to being able to run three shifts per day with just one operator per shift. So we essentially quadrupled our production capacity and our scrap went from significantly high to near zero."

The second application uses a traditional cartesian robot that drops a moulded piece down a slide where the UR robot picks it up and places it in a degating fixture, then palletizes the part on a table in front of the operator for inspection. Previously, the parts would fall onto a conveyor, which often damaged parts, and the operator had to catch them before they unloaded.

The third robot is deployed in a kitting application. The UR10 picks up and places sterile wipes and saline solution into a box, which it then pushes onto a conveyor. Dynamic Group previously used six to seven employees at once for this high-speed, very high volume application. "Now we're able to run it

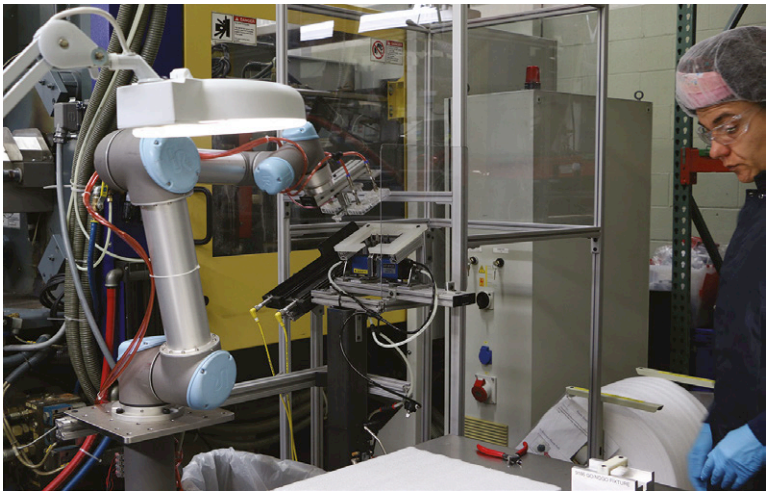


IMAGE: UNIVERSAL ROBOTS

Above: A UR5 from Universal Robots works in tandem with a cartesian robot at Dynamic Group. When the cartesian robot drops the moulded part down the slide, a proximity sensor alerts and activates the UR cobot, which picks up the part, places it in a degating fixture and then on a table, where an operator does a final quality check

Right: This Engel Viper 20 has an extra-long reach along the X axis

with as little as two people. Our return on investment was less than two months, and we can even go further because we're able to adapt the robots to other products so quickly," says McGillivray.

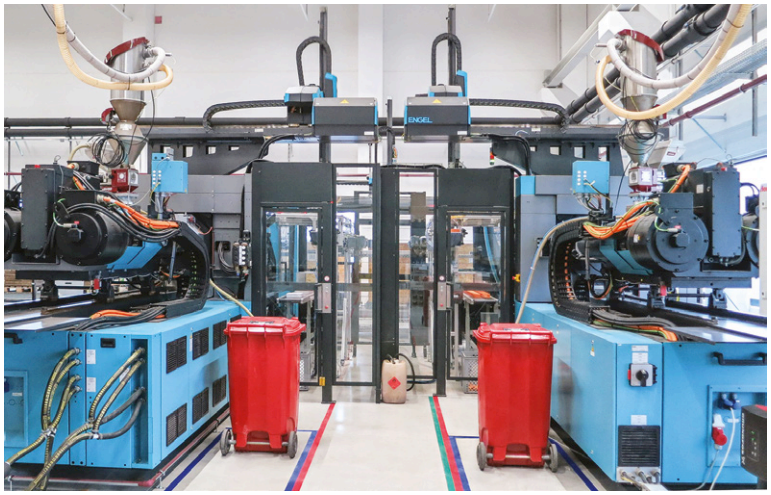
Whatever the advantages of six-axis robots, it is clear that in many applications, linear robots are still more than adequate for the job – and they are getting better all the time. And while six-axis proponents say their products are becoming more popular, it is also true that linear robots are increasingly capable of doing what once might have been thought could only have been done by six-axis types. Processors are becoming spoilt for choice.

Deborah Lidauer, product manager for automation at **Engel**, says applications for the company's Viper robots are increasing in diversity. "The legacy application for the Viper linear robot is serving an injection moulding machine, but there are even more examples on the market where a free-standing Viper is used for downstream processes, where it significantly boosts efficiency," she says. For these applications, Engel mounts the linear robots on a separate gantry, which absorbs the robot's dynamic action just like the injection moulding machine.

Case in point is at Steinbach, a producer of swimming pool accessories located not far from Engel in Schwertberg, Austria, which has just installed a new production facility. It has a Viper 40, equipped with the longest available Z axis. Engel says it plays a key role in Steinbach's overall automation strategy.

The Viper 40 connects two Engel E-motion injection moulding machines used for producing container caps with a high-bay warehouse. "We have taken a totally new approach here," says Michael Meister, proprietor of engineering company Meister-Quadrat in Niklasdorf, Austria, which is mainly responsible for the new manufacturing and injection moulding processes. "Palletising tasks are something that linear robots are normally not expected to handle. Steinbach also initially envisaged an articulated robot in the concept planning, but we would not have achieved our efficiency objectives with it. The linear robot is cheaper, needs less space, is easier to operate, and even faster when it comes to stacking. We now have the simplest, most efficient and most cost-effective solution. Linear robots open up far more options than many processors believe."

IMAGE: ENGEL



Above: Container caps at Steinbach are produced on two adjacent Engel E-motion machines with integrated Viper robots. Directly behind them is the stand-alone robot that connects the injection moulding cell with a high-bay warehouse

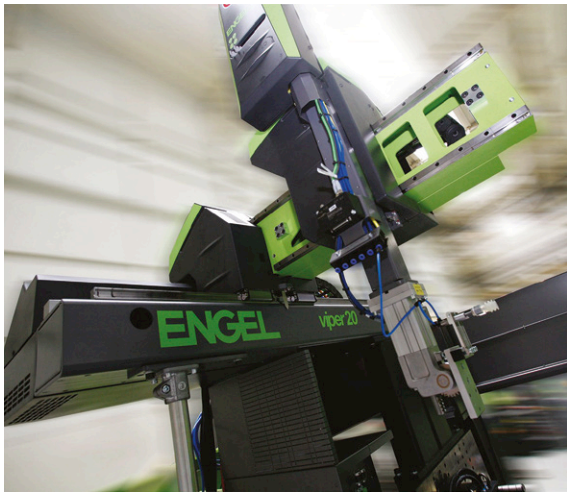


IMAGE: ENGEL

Engel says operating the stand-alone robot is also so easy for the plastics engineers at the plant because the injection moulding machines are also equipped with Engel Viper linear robots. The robots on the E-motion machines remove different types of container caps from the moulds and deposit them on conveyors that run above the clamping units.

At the end of the conveyor, the stand-alone robot alternately picks up 16 round caps and four snap-on caps and sorts them into boxes. Layers are separated by sheets of cardboard, which the Viper also autonomously picks from the magazine and places.

Every ten seconds, the robot transmits the current quantities to the high-bay warehouse, reports full boxes and requests empty ones. A transverse carriage automatically transfers the boxes. The stand-alone robot transfers up to 50,000 parts a day from production to the high-bay warehouse, which is one of the largest in Austria with 60,000 pallet bays.

At K2019 last October, Engel announced that Viper linear robots in sizes from 12 to 60 can now be supplied with a longer reach (X-stroke), without compromising load-bearing capacities and maximum dynamics. Reach on the Viper 20, for example, has increased from 900 mm to 1,100 mm,

allowing it to fully reach Euro pallets – a task previously requiring a Viper 40.

Also extending its scope in linear robots is independent producer **Sepro**. Later this year, it will introduce a redesign of its Success Range of general-purpose Cartesian beam robots, which have been on the market since 2011. It says there will be "significant" mechanical and styling enhancements. "The Success Range delivers reliable 3-axis servo performance in an affordable package," says Sepro. Four models, sized for small and mid-sized moulding machines up to around 7,000kN, will continue to be available. A 5-axis variant – the Success Line X – will combine the redesigned Success 3-axis platform with a 2-axis servo wrist co-developed with **Yaskawa Motoman**.

IMAGE: SEPRO

Left: This Success 22X prototype, shown by Sepro at K2019, is the first unit in a redesigned range of general-purpose robots for small and mid-sized moulding machines up to around 7,000 kN

"The new generation Success robots will have sleek, streamlined styling and features like an extended strip stroke which, in certain applications, can allow a robot of a given size to serve a higher-tonnage moulding machine than previously possible," says the company.

Cam follower bearings for linear motions will be used on all new Success robots. These were originally developed and patented by Sepro some years ago to handle the heavy payloads and long strokes on its large robots. Sepro says the technology provides more even weight distribution and smoother operation than linear bearings and also is more tolerant of dust and other contaminants.

Sepro says the Success Line X "brings new levels of flexibility to general-purpose robotic automation." It expands Sepro's 5-axis offering, which already includes the 5X Line of small and mid-size robots, and the 7X Line large robots.

These "premium" robots have a 2-axis servo wrist developed in partnership with **Stäubli Robotics.**

The latest addition to **Star Automation's** line-up is the new ZPX-1000 model, which premiered at K2019. This is the fastest Star robot, even faster than ZXW-VI series, which was introduced at Plast 2018 in Milan. It has a vertical axis made entirely in a carbon fibre composite.

Also new from the company is the STEC-620A controller, which sits at the top of the range. "Thanks to its completely reviewed operative system, STEC-620A guarantees flawless integration on the command panel of the injection machine," the company says.

According to Sebastiano Deppieri in Star Automation Europe's marketing department, Star's strategy for 2020 will also include pallet changers, coming in two models, I-IVS and M-IVS.

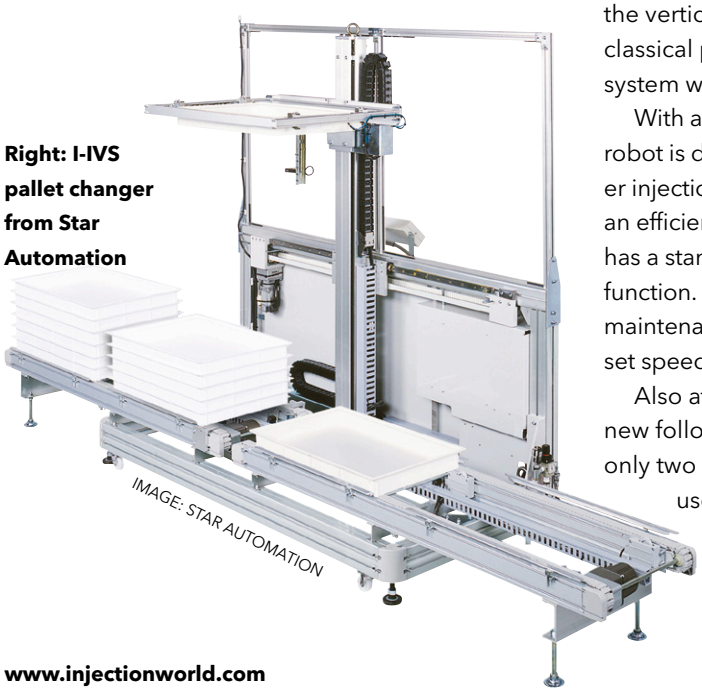


IMAGE: STAR AUTOMATION

Right: I-IVS pallet changer from Star Automation

Arburg showed off a new Multilift V30 cartesian robot at K2019, in a turnkey system based on a dual-component electric 2,500-kN Allrounder 630 making handles for its own injection machines in a foamed PCR polypropylene over-moulded with a TPE, both from Borealis. The machine was equipped with a size-800 horizontal injection unit and a size-290 vertical injection unit. In order for the vertical injection unit to be installed in the classical position on the fixed platen, the robotic system was mounted over the moveable platen.

With a load-bearing capacity of 30 kg, the vertical robot is designed for automation of large Allrounder injection moulding machines. Arburg says that for an efficient compressed air supply, the Multilift V 30 has a standard "smart" vacuum unit with air saving function. Lubrication is dependent on performance: maintenance intervals are calculated based on the set speeds, distances and times.

Also at K2019, **Wittmann** was demonstrating a new follow-up to the Primus series it introduced only two years ago. Primus robots are typically used for pick-and-place applications. The new series, called Sonic, is suitable for various applications. They are based on Wittmann's UHS (Ultra High Speed) units,

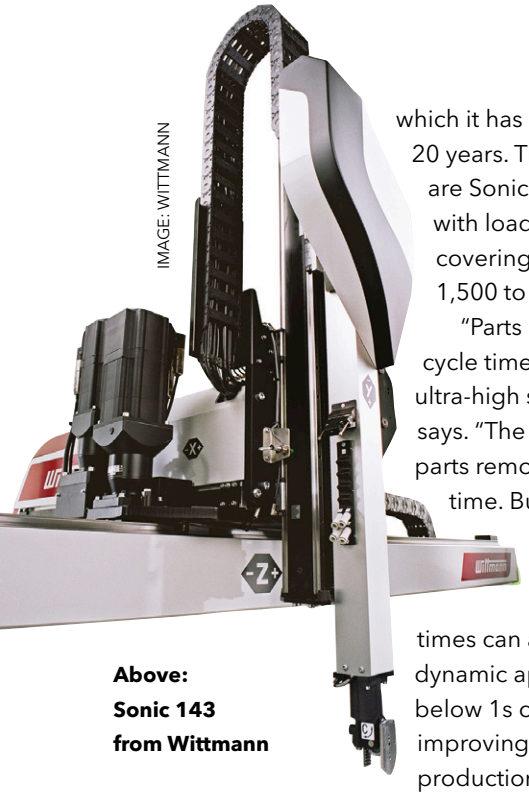


IMAGE: WITTMANN

Above: Sonic 143 from Wittmann

which it has been producing for more than 20 years. The models currently available are Sonic 131, Sonic 142 and Sonic 143, with load capacities from 3 to 7 kg and covering a clamping force range from 1,500 to 5,000 kN.

"Parts removals with a total robot cycle time of less than 8s are known as ultra-high speed removals," Wittmann says. "The Sonic series can be used for parts removals down to 4s robot cycle time. But short-cycle applications are only one of many possible uses, since applications which require longer production times can also benefit from these highly dynamic appliances. Gripping times below 1s contribute to significantly improving the productivity of such production cells, too."

Users can benefit from a number of additional advantages, the company says. For example, to ensure safe removal of parts, the mould closing process is only initiated if all parts have remained inside the gripper. Compared to production where parts free-fall from the mould, this method involves only a minimal lengthening of the cycle time, Wittmann says. The new series, according to the company, owes its extraordinary dynamism to acceleration rates of 65 m/s².

This March, **Muller Technology Colorado** (previously CBW Automation), which specialises in robots and automation solutions for thin-wall packaging, launched the M-Line, an integrated robotic and automation system that it says "delivers significantly greater flexibility and versatility for production of injection moulded packaging."

Taras Konowal, Director of Sales – North America, says the M-Line is the first product it has developed together with sister company Muller Technology Conthey (previously H. Müller-Fabrique de Moules) in Switzerland. Both companies are part of Muller, previously known as Mold & Robotics. "The M-Line will be manufactured in both locations, so this is a global platform," he says.

Vice President, Engineering, John Taggart says: "We wanted to develop a linear side-entry robot that was incredibly flexible, that could be used on any machine and any mould with changes only necessary to the end-of-arm tooling (EOAT). The M-Line can be used on moulds with inside or outside gating, a single face, stack moulds. It can go from operating as a two-arm system to a one-arm system at the push of a button."

Each arm can handle moulds with anywhere between one and 48 cavities per face. Changing from one EOAT to another is simple and fast. Despite being very rigid, the tooling is also very light and can be handled by one person. The robots are mounted on a steel frame, which is also very rigid, and which is on casters for ease of movement between machines if necessary. Systems are supplied pre-assembled.

The M-Line is suitable for machines running with cycle times down to 3.5s. There are three models for various injection machine sizes.

"People are buying robots with multiple EOATs that are specific to mould pitches, not necessarily individual products," Konowal says. "With this robot, you put it on a moulding machine, and whatever mould you put on that machine, even years out, the robot can handle it."

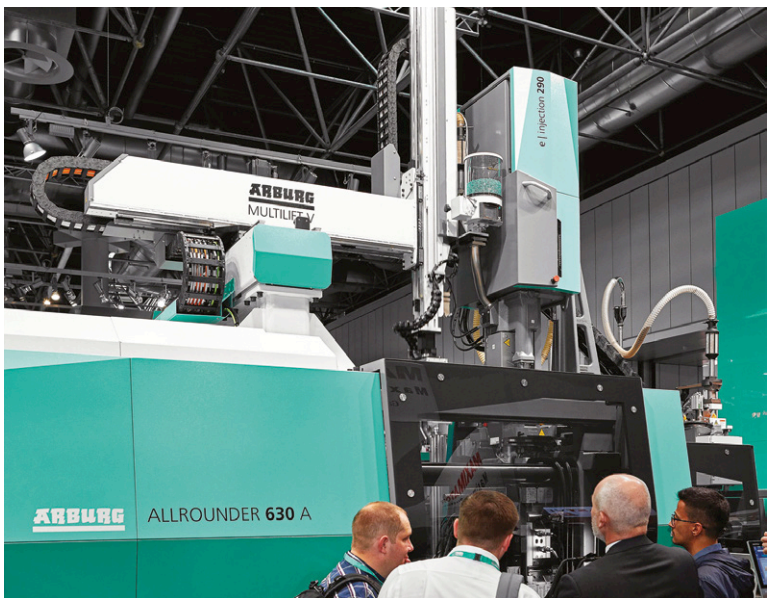


IMAGE: ARBURG

Above: The new Multilift V30 expands Arburg's portfolio of linear robotic systems, designed for large injection moulding machines. The turnkey solution described produces two-component handles for Allrounders. The handling is performed by a six-axis robot

CLICK ON THE LINKS FOR MORE INFORMATION:

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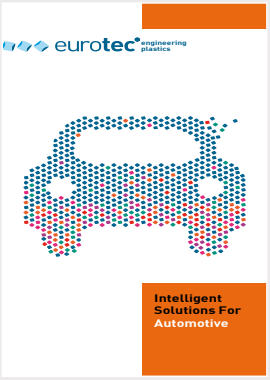

This brochure presents the full range of Eurotec's engineering polymer compounds for automotive applications, including interior, exterior and under the hood. Read all about Eurotec's innovative products and tailor made services.

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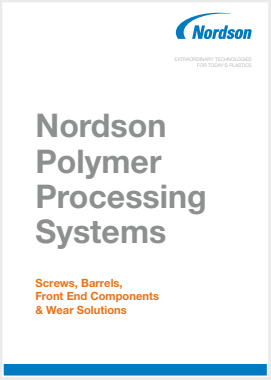
NORDSON PROCESSING SYSTEMS



The plasticising components offered by Nordson for injection moulding include bi-metallic barrels, screws and FECs, as well as barrel coatings and wear solutions. Find out more in this brochure.

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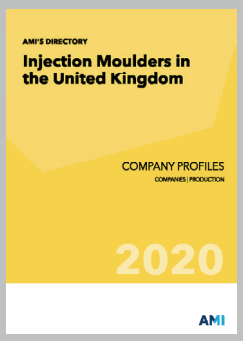
Injection Moulders in the United Kingdom



A complete and up-to-date picture of the injection moulding industry in the United Kingdom. Find out the polymers processed, the products manufactured and the number and size of machines operated by 904 injection moulding sites in the United Kingdom.

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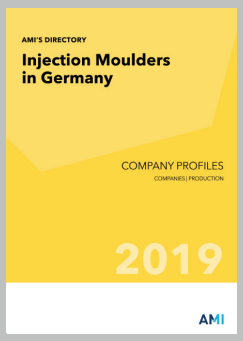
Injection Moulders in Germany



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.

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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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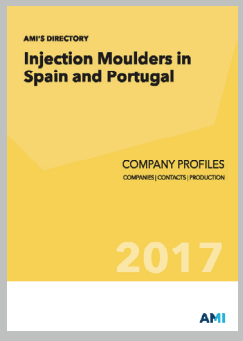
Injection Moulders in Spain and Portugal



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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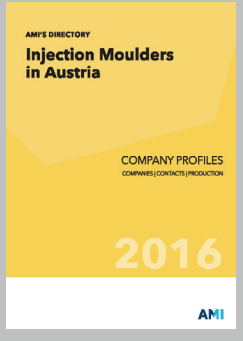
Injection Moulders in Austria



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.

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Learn more about AMI's upcoming conferences

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POLYMER SOURCING & DISTRIBUTION

The AMI event specifically created for companies involved at every stage of the European polymer supply, Polymer Sourcing & Distribution takes place in Hamburg on 14-16 September 2020, and reviews trends in sourcing options for both commodity and engineering resin grades.

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PLASTICS RECYCLING TECHNOLOGY

Exploring the future of plastics recycling and finding new ways to boost productivity, quality and profitability are the key reasons to attend AMI's Plastics Recycling Technology event, which takes place for the third time on 16-17 September 2020 in Vienna, Austria.

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TOOLING FOR COMPOSITES

The launch edition of Tooling for Composites will take place in Bristol, UK, on 16 September 2020. Experts across the supply chain will evaluate and discuss advancements in tooling, for the processing of thermoset and thermoplastic composite materials and systems.

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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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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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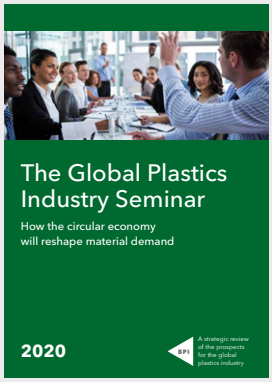
GLOBAL PLASTICS INDUSTRY SEMINARS



Business Publishing International is running a series of one-day seminars in 2020 providing concise, accurate and informative analysis about the global plastics industry. The seminars will take place at venues in UK, USA, Germany and Singapore.

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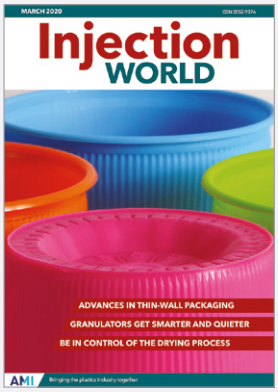

Injection World
March 2020
The March edition of Injection World magazine looks at the latest mould and machinery developments for thin wall moulding. Plus the latest introductions in granulation and material drying technology.

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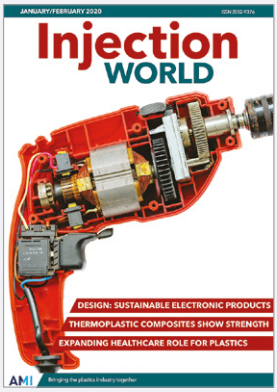

Injection World
January/February 2020
Injection World magazine's first issue for 2020 looks at how careful plastics design can make electrical and electronic items more sustainable. It also examines the latest in thermoplastic composites and healthcare polymers.

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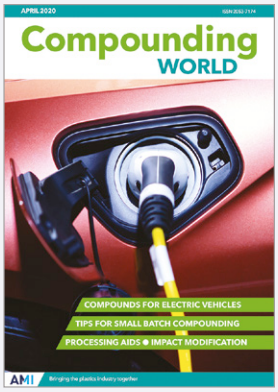

Compounding World
April 2020
The April edition of Compounding World takes a look at the opportunities for compounding companies as car makers turn their attention to electric vehicles. Other features cover small batch compounding, impact modification and innovations in lubricants.

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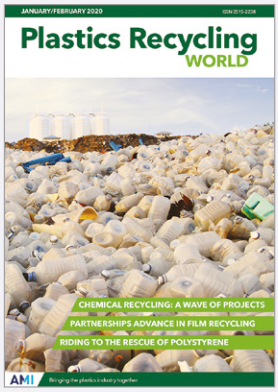

Plastics Recycling World
January/February 2020
The January-February of Plastics Recycling World takes a deep dive into chemical recycling, with features on the many technologies being developed for polyolefins and polystyrene. Plus the latest on film recycling technology and projects.

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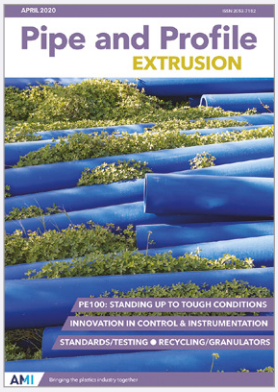

Pipe and Profile
April 2020
The April edition of Pipe and Profile Extrusion takes a look at some of the latest innovation in PE100 pipes. It also examines new developments in process control and instrumentation, extrusion standards and material size reduction.

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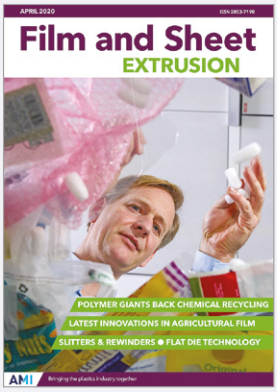

Film and Sheet
April 2020
The April edition of Film and Sheet Extrusion looks at how chemical recycling could help boost recycling rates for film and sheet waste. Plus in-depth features on agricultural film, recent advances in flat die technology and the latest in slitters and winders.

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Compounding WORLD
Film and Sheet EXTRUSION
Pipe and Profile EXTRUSION
Injection WORLD
Plastics Recycling WORLD

GLOBAL EXHIBITION GUIDE

2020	**12-14 May**	JEC World, Paris, France **CANCELLED**	www.jec-world.events
	24-27 June	Interplas Thailand, Bangkok, Thailand	www.interplasthailand.com
	3-6 August	Chinaplas, Shanghai, China **NEW DATE**	www.chinaplasonline.com
	8-10 September	Feiplar, Sao Paulo, Brazil	www.feiplar.com.br
	9-13 September	Taipei Plas, Tapei, Taiwan	www.taipeiplas.com.tw
	10-12 September	Plasti & Pack, Lahore, Pakistan	https://plastipacpakistan.com
	21-25 September	Colombiaplast, Bogota, Colombia	www.colombiaplast.org
	29 Sep-1 Oct	Interplas, Birmingham, UK	www.interplasuk.com
	6-10 October	IPF Japan, Tokyo, Japan	www.ipfjapan.jp
	7-8 October	Compounding World Expo Europe, Essen, Germany **NEW DATE**	www.compoundingworldexpo.com/eu/
	13-17 October	Fakuma, Friedrichshafen, Germany	www.fakuma-messe.de
	4-5 November	Compounding World Expo USA, Cleveland, USA	www.compoundingworldexpo.com/na/
	8-11 November	Pack Expo, Chicago, USA	www.packexpointernational.com
	10-13 November	Plastimagen, Mexico City	www.plastimagen.com.mx
	23-26 November	All4Pack, Paris, France	www.all4pack.com
	1-5 December	Equiplast, Barcelona, Spain **NEW DATE**	www.equiplast.com
2021	**13-16 April**	Chinaplas 2021, Shenzhen, China	www.chinaplasonline.com
	4-7 May	Plast 2021, Milan, Italy	www.plastonline.org/en
	17-21 May	NPE 2021	www.npe.org

AMI CONFERENCES

14-16 September	Polymer Sourcing & Distribution, Hamburg, Germany
16-17 September	Plastics Recycling Technology, Vienna, Austria
16 September	Tooling for Composites, Bristol, UK
29-30 September	Single-Serve Capsules, Berlin, Germany
30 September-1 October	Performance Polyamides, Dusseldorf, Germany
7-8 October	Polymer Foam, Hamburg, Germany
8-9 October	Composites in Rail, Berlin, Germany

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