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# Injection WORLD

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# KraussMaffei begins work on its new HQ

KraussMaffei has laid the foundations for its new plant and headquarters in Parsdorf, east of Munich in Germany, at an official ceremony in front of local dignitaries on 11 September. The company is due to begin moving into the location in November 2022 and to complete the transition in 2023.

This move, which represents an investment of about €500m, will bring under one roof the corporate HQ, the injection moulding and reaction processing divisions, and the manufacturing and automation departments. Up to 2,500 employees will work there. The current HQ at Allach and the KraussMaffei Automation site at Schwaig will both close.

This follows on from the opening of a new plant in Jiaxing, China, in March and, more recently, the new plant for the Burgsmüller subsidiary at Einbeck, Germany, and laying the foundation stone in Laatzen near



**Foundation-laying for KraussMaffei's €500m project**

Hanover. Thanking the company's Chinese owners, Michael Ruf, CEO of KraussMaffei Group, said: "Without them, we would not be able to implement the renewal of our company and thus our growth plans."

Project developer VGP's Smart Factory concept will be to the fore at Parsdorf, with the emphasis on sustainability and energy efficiency. This includes, among other things, a photovoltaic system, a combined heat and power unit, heating and cooling

sails in the offices, active hall ventilation and air conditioning, sprinkler systems, early fire detection and intelligent LED lighting with light and motion sensors.

"Modern logistics, efficient work processes and consistent digitalisation will increase productivity and make the new location more attractive for employees," KraussMaffei said. It also hopes to facilitate future innovations in production as well as in research and development of new products.

[www.kraussmaffei.com](http://www.kraussmaffei.com)

## Desch Plantpak acquires IPP

Desch Plantpak has acquired fellow Dutch company IPP which it said will boost its position in thermoformed and injection moulded products for the horticultural industry.

The acquisition will bring Desch further manufacturing facilities in the Netherlands and Poland, giving it over 300 employees, 70 injection moulding machines, thermoforming capabilities and a combined annual turnover of around €80m.

"We've been wanting to expand our injection moulding capacity for quite some time," said Jan Willem Wieringa, MD at Desch. "IPP is a perfect match for us, with complementary products and a strong market position that includes Eastern Europe." Both companies are also large-scale users of recycled materials.

[www.desch.nl](http://www.desch.nl)

IMAGE: HELLA



## Hella buys FWB shares

Automotive lighting and vehicle electronics supplier Hella has taken over the 75% of its German compatriot FWB that it did not already own, from Manfred Schmidt and other shareholders. Hella said that it did this "to secure its own supply chain in the long term and further develop FWB as an independent company".

Pirmasens-based FWB has been supplying Hella with plastic components for many years. It has about 180 employees and sales of around €20m per year in the fields of injection moulding tools, automation, plastic parts and assembly.

Managing partner Frank Schmidt will leave FWB and Andreas Kleinehr, an 18-year veteran at Hella, will take over as its new MD.

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



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# Machinery firms provide sales picture during 2020 pandemic

The Covid-19 pandemic has impacted negatively on sales at major injection moulding machinery groups. The market difficulties – and areas for optimism – were discussed by three companies that gave online press conferences in early October to coincide with new machinery launches (see article starting on page 25).

Engel is expecting a 20% drop in turnover in its 2020-2021 financial year compared with €1.3bn turnover it reported for the 2019-2020 year to the end of March.

## Market uncertainty

Christoph Steger, CSO at Engel Group, said the pandemic has caused a “complicated and difficult market situation”. The automotive market was already weakened by car makers dealing with the fallout from the “Dieselgate” scandal, he said, and the impact of the pandemic meant the market is still not near a recovery. The packaging and technical moulding markets are relatively stable, but Steger said the teletronics sector has declined this year.

In global regions, Asia is



**Michael Wittmann: “The situation is very fluid, it is changing all the time”**

showing the fastest growth and North America is also showing a positive development. But Europe has been hit hard, said Steger: “The recovery, in our opinion, will take longer than in the US and Asia.” In the Q&A session, he said there are concerns there could be a wave of bankruptcies in Europe at the end of 2020.

Stefan Engleder, Engel's CEO, said one of the group's strategy focuses is on digitalisation in injection moulding. “In the Covid crisis, digitalisation is getting faster because everyone is staying at home and using video conferencing tools,” he said, referring also to Engel's remote

support service.

Wittmann Group is expecting turnover to fall by 17% to €310m this year. In a virtual press conference, Michael Wittmann, CEO, said the second quarter was affected by Covid-19 disrupting markets. “The situation is very fluid, it is changing all the time,” he said.

However, he pointed to positive signs in Wittmann's order book. “There has been a very, very strong recovery in recent weeks. The question is, how long will it last?” He said the group is seeing stable demand or improvement in all sectors except automotive.

## Order backlog

Looking ahead to 2021, Michael Wittmann said the company anticipates that its order backlog will lead to increased sales. But he cautioned that uncertainty continues to arise from the progress of the Covid-19 pandemic.

Sumitomo (SHI) Demag has had a good year due to a higher order intake. Gerd Liebig, CEO, said that from January to August 2020, the company's order intake increased by 24% to €183.7m. This was due to a

number of multiple machine orders in the packaging, medical technology and electronics sectors.

By the end of August, Sumitomo (SHI) Demag's cumulative turnover amounted to €152.3m and it expects the total to reach €250m for the 2020 financial year, versus €283m in 2019. Incoming orders are forecast at €275m for the full year.

The company said it is benefiting from a significant increase in demand for all-electric machines, including its new IntElect 2 machine generation. Compared to ten years ago when only one in five machines was fully electric, now the market share in Europe accounts for 50% of all small and medium-sized injection moulding machines, it said.

Sumitomo (SHI) Demag also announced a restructuring of its centralised group sales organisation, focusing on five business development areas: packaging, automotive and electronics, medical, consumer, and automation.

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

➤ [www.wittmann-group.com](http://www.wittmann-group.com)

➤ [www.sumitomo-shi-demag.eu](http://www.sumitomo-shi-demag.eu)

## Alpla buys Amcor's Indian preforms plant

Alpla Group has acquired a PET preforms plant at Alandi, near Pune, India, from Amcor, another global packaging firm. Financial terms were not disclosed.

The facility supplies international and domestic companies in the western part of India, including Coca-Cola and dairy products group Amul. It will be Alpla's ninth site in India

and its second in this region of the country. The 50 employees will transfer to Alpla.

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

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IMAGE: LUC &amp; BEL



Above: Luc & Bel makes medical components at its facility near Modena

## Italian deal gives Benvic medical moulding firm

PVC compounder Benvic has acquired a majority stake in Italy-based injection moulder Luc & Bel. This is Benvic's seventh European acquisition, including four in Italy, since it was acquired by Investindustrial in 2018. Founder and CEO Luca Ferrari will remain at the helm of Luc & Bel, and will keep a minority stake.

Luc & Bel makes complex medical components from single components to full assemblies under Class 8

cleanroom conditions. It is based near Modena, where Benvic last year acquired Modenplast, which is active in the same field via compounding medical PVC formulations and extruding tubes and hoses for medical use.

"PVC plays a fundamental role in all parts of this sector and we expect to further develop Benvic's medical division, starting with Italy," said CEO Luc Mertens. "We are confident that Luc & Bel,

with its highly technological and innovative business model, will provide great added value to our group and our customers."

Benvic is also active in the construction, fluid transport, electro-technical products, cables and food sectors. It employs 470 staff at eight production sites in France, Italy, Spain, Poland and the UK, exporting to over 60 countries worldwide.

➤ [www.luc-bel.com](http://www.luc-bel.com)  
➤ [www.benvic.com](http://www.benvic.com)

## STS sells acoustics business

STS Group, a systems supplier for commercial vehicles headquartered in Munich, has agreed to sell its Acoustics segment to the Adler Pelzer Group. This includes three plants in Italy, plus one in Brazil and one in Poland. The deal is expected to be completed in Q3.

The segment lost €5.1m on sales of €37.5m in the first half of 2020.

STS will now focus on its profitable Plastics and Materials segments in Europe and further expansion in North America. Together, these account for over 50% of its business.

Mathieu Purrey, CEO, said that the disposal meant STS could "bundle our strengths to make our opportunities even more efficient".

➤ [www.sts.group](http://www.sts.group)

## Arburg opens new Chinese tech centre

Injection moulding machinery giant Arburg has opened its new Arburg Technology Centre (ATC) at Pinghu in China at an official ceremony attended by 550 guests on 18 September. This covers 2,300 m<sup>2</sup> and has space for 60 Allrounders manufactured at the Lossburg headquarters site in Germany.

"The ATC in Pinghu will enable us to focus on driving forward our turnkey business in China," said Zhao Tong, Arburg MD in China. "We are also expanding our warehousing capacities in order to significantly reduce delivery times."

In addition, the ATC offers testing facilities and training in process and application technology. It is Arburg's fourth site in China, alongside the original Shanghai location that opened in 2004; a machine warehouse, also in Shanghai; and another ATC in Shenzhen.

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



IMAGE: ARBURG

Opening of the Arburg Technology Centre in Pinghu, China





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# Polyplastics doubles COC resin capacity

Japan's Polyplastics has announced plans to build a new production plant for its Topas brand of cyclic olefin copolymer (COC) at Leuna, Germany, in response to growing market demand.

This new plant will be operated by the company's Topas Advanced Polymers subsidiary and will have a capacity of 20,000 tonnes/yr when fully operational in the middle of 2023. Capacity will be similar to that from the current Oberhausen facility, which opened in 2000.

Topas COC is used mainly in medical devices for its high purity and glass-like properties. It is also used in some packaging applications; the company claims mono-material structures based on PE enhanced with Topas COC are more easily recyclable than multi-material structures using layers of PET or other PE-incompatible polymers.

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

**Right: The existing Topas COC plant at Oberhausen in Germany**



IMAGE: POLYPLASTICS/TOPAS ADVANCED POLYMERS

## 100th KM machine to Polycom

KraussMaffei has delivered the 100th injection moulding machine to be bought by long-standing customer Polycom. The machine, an all-electric PX 50-55 with a clamping force of 500 kN, is being installed at Polycom's new location in Dobje, Slovenia.

The new machine is also equipped with KraussMaffei's DataXplorer data analysis tool.

Polycom, which is owned by the Statzonik brothers, has been buying from KraussMaffei for 25 years. It is mainly an automotive components manufacturer but increasingly supplies other industries too, and has already ordered four more KM machines.

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

## Logoplaste consults on growth

Logoplaste has launched a strategic review to prepare for its next phase of growth. The company aims to increase its presence in Europe and the Americas and to expand in Asia and Australasia along with its clients.

To this end, Logoplaste has engaged Bain & Company to support CEO Gerardo Chiaia and the senior management. It has also retained Barclay's Bank

and Goldman Sachs International to evaluate strategic financial alternatives, including raising additional share capital.

Logoplaste has grown strongly in recent years, adding new facilities in Europe, North America and Brazil, and making acquisitions, including a majority stake in Poland's Masterchem. Sales in North America have more than tripled in the last five years.

This has been based largely on its business model of building dedicated facilities, fully integrated within customers' sites.

Recently, the company announced its Mission Zero+ commitment to build a fully functioning industrial plant with zero emissions. In June, it received a loan which links its interest payments to meeting CO<sub>2</sub> reduction targets.

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

## California passes recycled content bill

California Governor Gavin Newsom has signed Assembly Bill 793 into state law. This is the first recycled content mandate for plastic beverage containers in the US, requiring all bottles covered by the state's container redemption programme to average at least 15% post-consumer resin from 2022, 25% in

2025 and 50% in 2030.

"The passage of this bill is a critical step forward," said Steve Alexander, President and CEO of the Association of Plastic Recyclers (APR). "Mandated PCR content creates market demand, which in turn monetises the entire waste and recycling management system."

Those manufacturers who

miss the targets will be liable to fines of 20 cts/lb for each pound they fall short. This will be paid into a recycling enhancement penalty account, which will fund the recycling infrastructure, and the collection and processing of bottles. APR wants the law extended to other forms of plastic packaging.

➤ [www.plasticsrecycling.org](http://www.plasticsrecycling.org)



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# Suez and Loop aim to build huge rPET facility in Europe

Suez and Loop Industries have announced plans to build a PET recycling facility in Europe based on Loop's depolymerisation technology which they say will be the largest PET recycling plant in the world.

The partners said the planned recycling facility will have a production capacity of 84,000 tonnes of rPET pellets per year, requiring approximately 96,000 tonnes of PET and polyester fibre waste feedstock.

Final site selection and engineering are targeted to be completed by mid-2021

IMAGE: LOOP INDUSTRIES



**Computer image of the partners' planned rPET facility which would be built at a European location that is still to be decided**

and commissioning of the facility is currently projected for 2023.

Jean-Marc Boursier, Suez Group COO, said: "Suez has

been involved for more than 10 years in mechanical plastic recycling, while investing constantly in research and innovation. In

2019, we processed 450,000 tonnes of plastics across Europe and produced 150,000 tonnes of recycled plastics. Highly convinced by the complementarity between mechanical and chemical recycling solutions, we are thrilled to be part of this innovative project with Loop Industries as it will expand our offer and our solutions."

Loop has other projects with industry partners and offtake deals with brand owners.

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*Decoration processes are no longer just about simple visual communication. Peter Mapleston reports on developments in technology, inks and printing*

# Surface technologies unite aesthetics and functionality

In-mould and post-processing decoration technologies associated with injection moulding continue to make important progress. One prominent trend is to integrate functionality into decorative films that are subsequently back-moulded to create packaging and technical parts. Functionality in in-mould decoration (IMD) for rigid packaging may comprise things like “hidden” coding that can be read by smartphones to provide consumers with information that cannot fit in the normal way onto the label. Functionality in films and foils for technical parts – the technology is often called Film Insert Moulding (FIM) – can be activated by touch; in one example, it enables LEDs embedded in the foil to be turned on and off.

Visitors to the **Arburg** stand at K2019 could see FIM using **TactoTek’s** IMSE (Injection Moulded Structural Electronics) technology in a clean room

cell based on an electric Allrounder 470 A. Output was a demonstrator night light for a writing desk, in which the brightness of the light could be changed simply by stroking the surface of a dial integrated into the surface of the part.

Pre-formed 3D films with integrated electronic functions and five LEDs were fed into the cell from trays. After being cleaned with air jets, the films were in-mould laminated with a special polycarbonate from Covestro called Makrolon LED 5012.

With IMSE, printed conductor paths and electronic components that were applied to the film before deformation can be seamlessly integrated on 3D component surfaces. A re-working of the in-mould laminated films – coating or painting, for example – is not required. (For an introduction to IMSE, see E&E feature in *Injection World* October 2016.)

“As the cell at K2019 demonstrated, even in a

**Main image:**  
**In-mould labels enable packaging to be interactive with the consumer via a smartphone**

IMAGE: ARBURG



**Above:**  
**Functional**  
**testing station**  
**during**  
**production of**  
**a nightlight**  
**incorporating**  
**TactoTek**  
**technology on**  
**the Arburg**  
**stand at K2019**

temporary installation on a trade show floor, semi-automated IMSE manufacturing is reliable and repeatable using 'off-the-shelf' production equipment," says Dave Rice, SVP Marketing & Business Development at TactoTek. "That exhibition greatly expanded the audience that has seen live IMSE manufacturing that was previously limited to those who visit TactoTek's manufacturing facility or those of our licensees. With IMSE we have industrialised, verified and codified the technology foundations required by many product designs to ensure reliable, repeatable manufacturing and lifetime performance when materials that we've qualified and design rules that we've developed are used."

Apart from touch-controlled lighting, features that can be incorporated into the films include proximity sensing, connectivity (antennas), and 'look and feel.' "Our team continues to expand those boundaries to provide more functionality both with our own innovations and in collaborative R&D with partners who make IMSE inputs, such as functional inks, components including LEDs, films for insert moulding, resins and more," Rice says. "In addition to off-the-shelf components that we have verified, some component manufacturers are now designing components specifically to work well with IMSE processing. Ultimately, that enables us to integrate more electronic functionality within the moulded structure."

TactoTek's active market outreach has expanded from automotive interiors to include home appliance and smart home interfaces, Rice says. Despite the Covid-19 pandemic, the company is seeing growth in its home appliance and smart home business activity. "Public examples of our technology are becoming more common, such as the CES 2020 Innovation Award-winning Shepherd Smart Lock by PassiveBolt. There are multiple IMSE parts on their path to mass production. Even though

parts for automotive have been in process longer, we expect appliance and smart home IMSE parts to be visible in the market sooner."

Asked about the extent of possible partnerships with the company, Rice says: "TactoTek has developed IMSE on the premise of using materials already approved by and used in the markets we, and our licensees, are addressing with IMSE solutions. While we don't limit the number of key partners for resin, IML films, functional inks, graphical inks, electronic components, and so on, there are practical limits. We test each element individually and in a material stack, so we must prioritise what matches market requests and requirements."

He continues: "Regarding equipment, IMSE manufacturing is done using standard printing, component surface mounting (SMT), thermoforming and injection moulding equipment, and TactoTek does not require specific brands of equipment for IMSE manufacturing by our licensees. Automation equipment needs to be specified for the part being manufactured and the process steps being automated. In the automated manufacturing demonstration at K2019, Arburg used all standard equipment, configured with fixtures for the specific part being produced. For example, automated testing of electrical functions required a specific fixture and test programming."

One ink maker working with TactoTek is **Pröhl**. Its core business lies in the development of custom-made chemical products for coating/decorating plastics and other materials, as well as innovative ink systems for IMD/FIM technology, and screen and pad printing inks. One of its new developments is HTR N 990 NC, a non-conductive black for IMD/FIM technology for printed electronics. Containing no carbon, it is based on a proven, formable, back-mouldable, and solvent-based one-component screen printing ink. ➤

**Right: Testing a**  
**film insert in**  
**the TactoTek**  
**laboratory**



IMAGE: TACTOTEK



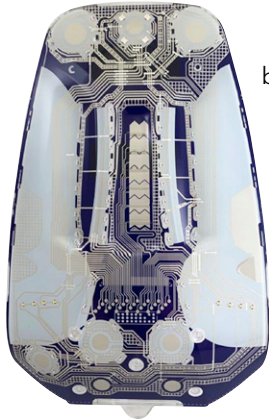
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**PC hard coat film for a TactoTek functional display panel is second surface printed with Noriphan XMR. TactoTek says the panel is 90% thinner and 70% lighter than a panel with the same level of functionality made using traditional technologies, which would require numerous pieces of tooling and multiple assembly steps**



Carbon-based pigments normally used for black colour shades are electrically conductive and can interfere with the functional structures, the company notes. "The Noriphan HTR N 990 NC colour shade has been formulated and optimised regarding the interlayer adhesion and shows good adhesion in compound values in the final film/ink/injection material composition," says Stefan Zäh, Marketing Communication Manager.

Noriphan XMR is a halogen-free two-component screen printing ink system for IMD/FIM technology. Zäh says it is formable, shows extremely high wash-out resistance, outstanding cohesion in compound and long-term durability in the final part. It can be used as decorating ink or a wash-out protective layer on PC films and PET films. It shows high electrical resistance in capacitive fields.

Surface decoration specialist **Leonhard Kurz** says it is developing a process combination to create new exterior designs for autonomous driving and e-mobility.

"New aesthetic and functional demands will determine the future of automobile exterior design," says the company. "Autonomous vehicles require materials permeable to LiDAR and radar beams. Electric vehicles without radiator grilles need alternative brand-defining front designs. Furthermore, exteriors must be extremely durable. To meet these requirements and expand creative leeway, Kurz has developed the new decoration process IMD PUR. It produces injection moulded parts in a clamping unit, coats them with in-mould designs, and floods them with polyurethane. In one production step, IMD PUR delivers the best of two worlds: the design quality and variety of IMD, and the depth and glassy appearance of PUR coatings. The process generates surfaces that support radar and LiDAR functions, while boasting a distinct, brand-defining design."

The PUR-coated surface meets durability requirements for exteriors and provides high surface protection, says Kurz. "The decoration remains intact after stone-chipping and scratching; what's more,

the PUR topcoat self-heals scratches." IMD PUR was demonstrated at K2019, using an **Engel** injection moulding machine and a **Hennecke** polyurethane processing unit. Engel calls the combination of thermoplastic and PUR processing Clearmelt.

Decoration can take place during injection moulding and subsequent PUR flooding in the roll-to-roll IMD technique, but individual sheets can also be processed in what Kurz calls PMD (Print Mould Design). Designs manufactured with both techniques can be combined with special light effects. Kurz has used an automobile front panel with single-image design to illustrate the light and depth effects achievable in the roll-to-roll process. The design incorporates a gradient from black to blue and incorporates a design that appears to show a structure emerging from under the surface.

For IMD PUR processing of individual PMD sheets, Kurz uses surface designs developed by its subsidiary Burg Design. These sheets are pre-formed and decorated using silk-screen printing, then fed individually into the injection mould, bonded with the component using injection moulding, and finally flooded with PUR. The silk-screen technique used, and the two-sided printing of the sheets, allows PMD to generate a special 3D effect.

In rigid packaging, functionality in in-mould labelling (IML) films (and in fact any form of product label or decoration) is being adopted using **Digimarc** electronic watermarks. Developed by the company of the same name, the individually-coded watermark is invisible to the naked eye but readable by smartphones and industrial scanners. It provides extra information for use by consumers, acts as an anti-counterfeit measure, and facilitates sorting in post-consumer recycling.

One of the latest demonstrations of Digimarc in

**Right: Engel's Clearmelt process in action**

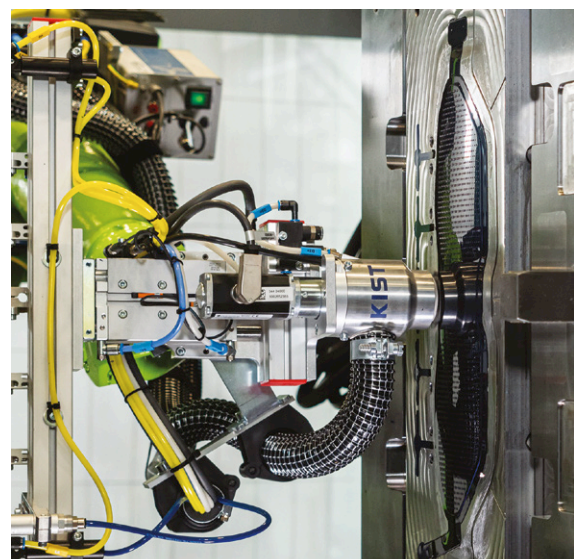


IMAGE: ENGEL



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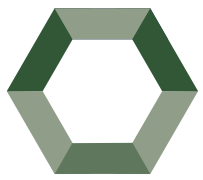
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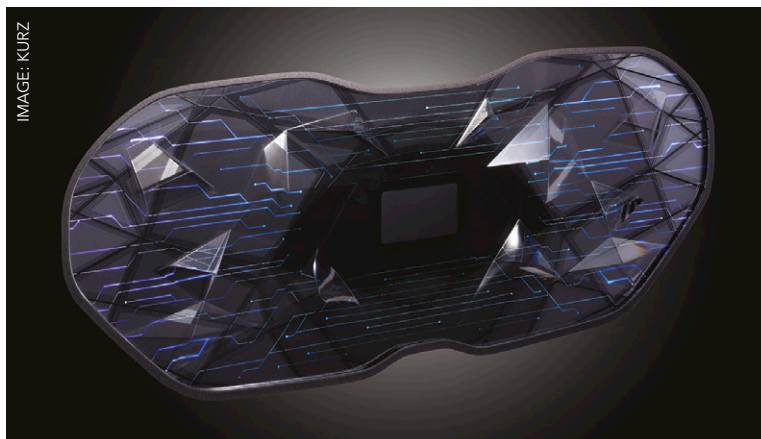
[www.ami.ltd/attend-thin-wall](http://www.ami.ltd/attend-thin-wall)

IML was given by Engel during October. During its virtual event called Live E-xperience 2020 from 13 to 16 October, Engel showed the latest addition to its E-speed range of hybrid electric machines, the 2,800-kN E-speed 280, producing 1-litre round PP containers for yoghurt. The new machine takes the E-speed machines into a lower clamping force range, with a particular focus on manufacturers of thin-walled containers, buckets, and lids. The "interactive IML" solution was implemented in cooperation with partners **Brink** (mould and automation) and **Verstraete** (labels).

"Combined with an app on a smartphone, the pack can talk to the consumer and explain how to recycle the empty pack," says Verstraete. "It can be connected with the GPS location so that wherever you are, you get the correct information. At the same time, big data is collected that can be of huge importance to optimise the way waste is collected and recycled in the future."

Demonstrating the extent of what is possible in IML for thin-wall packaging, **StackTeck Systems** had a four-cavity IML thin-wall 500g container mould running on a **BMB** 4500-kN hybrid injection machine at K2019. The container, which had three labels, incorporated StackTeck's TRIM technology and **Trexel's** MuCell physical foaming technology to enable a part weight 20% lighter than conventional thin-wall injection moulding. (TRIM stands for Thin Recess Injection Moulding, which StackTeck says "uses an advanced approach to thin-out portions of the wall section well beyond the conventional thin wall packaging approach used for polyolefins with high melt flow indexes.")

"This is a cost-effective approach that decorates



**Above: Kurz developed the Iconic Space Grille concept panel to demonstrate what can be achieved with IMD PUR using individual PMD sheets. It won in the category Future, Mobility and Parts in the 2020 Automotive Brand Contest**

the three largest sides of the container, while using a reduced overall label size compared to a typical wrap-around IML approach," says StackTeck President and CEO, Vince Travaglini.

In October 2019, StackTeck established a new facility for robotics engineering, assembly, test and injection moulding systems integration. StackTeck has an existing IML pilot cell that uses a dedicated IML robot with a 300 tonne injection machine for prototyping and sampling new IML products. Initial efforts for the new business will be focused on IML applications for the Americas, but the company says it has long term plans to serve a broad range of automation systems on a global scale.

Jordan Robertson, StackTeck's VP of Business Development and Marketing, says: "We see a niche in North America, where customers are looking not

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# Pad printing makes advances

Up to now, pad printing has only been able to display different levels of brightness and colour gradients at great expense and usually with unstable results. However, it was possible to simulate this process with the aid of print screens. **Tampoprint** says that, thanks to its development of laser-structurable clichés such as its Intaglio cliché, and the development of 3D microstructuring using its Cliché Laser Xi, colour and brightness gradients as well as four-colour prints can now be created with impressive quality.

In addition, this processing method can be used to create filigree lines and screened elements with contour lines, as well as a depth of individual image elements, or the combination of line and screen engravings.

The Intaglio cliché was designed for optimum direct imaging with the Cliché Laser Xi. Made from material that reacts highly sensitively to laser radiation, it has good mechanical resistance, a long service life and reproducible results. The new cliché is based on a thin steel plate. This is covered with an adhesive layer, a carrier material and a final coating specially developed by Tampoprint.

"Thanks to its fully digital imaging capability using laser technology, this new type of printing plate could replace conventional imaging processes," says the company. For example, it could replace previously used polymer clichés. It requires neither a repro film nor an exposure or any other steps that would be

necessary in conventional cliché production.

The workflow also shows the advantage of cliché production using direct laser engraving. Until now, the production of conventional clichés required at least eight work steps. The direct laser engraving now reduces the workflow to four work steps.

A striking feature of laser technology is the particularly high resolution, Tampoprint says: motifs can be produced with up to 5,080 dpi or 150 lines/cm. This ensures high detail reproduction and realisation of finest structures and fonts in the subsequent printing process. Even individual halftone dots can be varied in width and depth and achieve a homogeneous and detailed print result later.

just for system integration, but to have the mould-making and automation design teams meeting face-to-face and working closely together to tackle specialty technical challenges; along with having turnkey project responsibility." Travaglini says StackTeck will continue to build IML moulds working with leading IML robot companies. "However now if the customer is looking for a single source built in North America, we have a solution to offer."

In-mould labels are often used to help reduce weight in packaging, as they become an integral part of tubs and lids. But that is not always the case. IML label maker **Viappiani** was recently involved in a project for a peelable IML label on an ice cream tub to improve recyclability. "The idea was to sell the ice cream in a quite sturdy plastic tub," says Stefano Di Gregorio, Technical & Business Development Manager. "On the tub and on the lid, we have an IML label which can be removed by the end user once the product

has been consumed. The tub and the lid without the labels are quite sturdy and good looking, like a tub for the fridge you can buy in a shop."

Di Gregorio says the IML label is made of a special polymer (he will only say that it is not PP) which is removable even on the injection point. "The label carries a special adhesion voider in two corners on the back in order for allowing the label not to adhere at all in the corners," he says. This allows the consumer to pull the label away. "This way we turned a single-use packaging into a multi-use container," he says. "A very practical and green idea." The label has already been used by one Italian ice-cream company.

## CLICK ON THE LINKS FOR MORE INFORMATION:

- > [www.arburg.com](http://www.arburg.com)
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- > [www.viappiani.com](http://www.viappiani.com)
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IMAGE: VIAPPANI

Left: IML labels on this ice-cream tub and lid can be peeled off

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## Highlights from 2019



Total number of exhibitors:

**261**



Total number of visitors:

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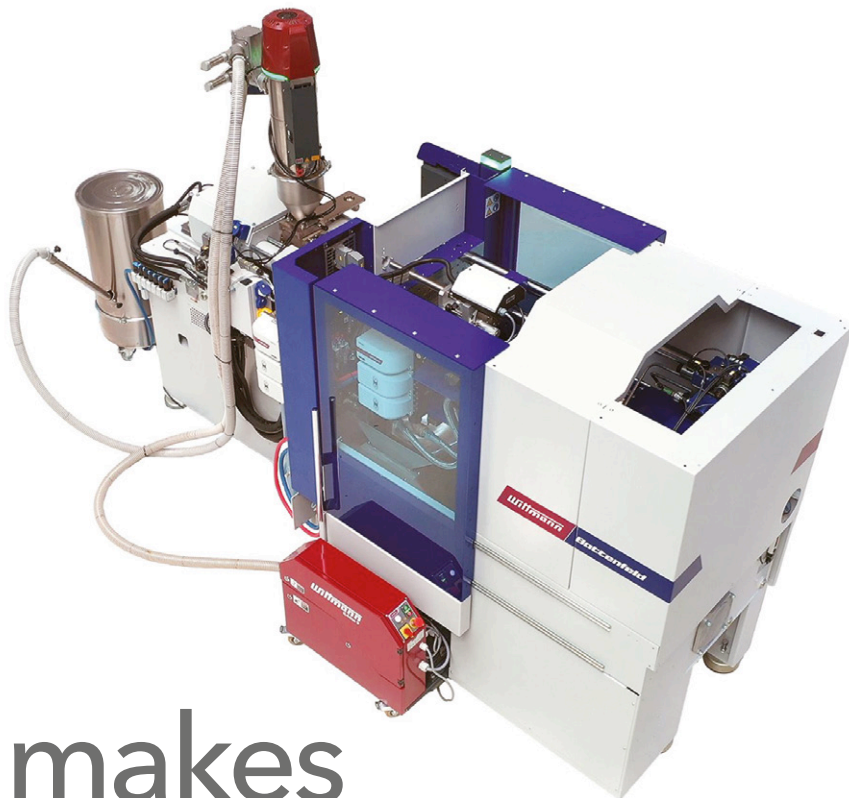
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*October is traditionally the month when suppliers show off new products to plastics processors. In 2020, the tradition is being maintained – but new launches are this year happening online*



# Machinery makes debut in the virtual world

The coronavirus pandemic has disrupted all areas of business activity in 2020, including live events at which plastics processors would normally get up close to new technology and find out details by speaking to staff on the supplier's exhibition stand. With normal practice not being possible this year due to Covid-19 restrictions, technology companies have taken an online route to reveal their new products.

Following the announcement by the organisers of Fakuma, the leading show for injection moulders, that the show could not go ahead in Friedrichshafen, some machinery groups are presenting their technology on virtual platforms. Many of them have posted information on the virtual platform provided by Fakuma: [www.fakuma-messe.de/en/fakuma-virtual](http://www.fakuma-messe.de/en/fakuma-virtual). *Injection World* here presents highlights of recent product launches by selected companies.

**Wittmann Battenfeld** has created Ingrinder, highlighting the trend for injection moulders to use recycled content to help customers meet their sustainability targets. Ingrinder is an injection moulding system with integrated sprue picker, granulator and vacuum conveyor. The granulator and the sprue picker can be operated via the moulding machine's Unilog B8 control system.

Wittmann Battenfeld highlighted Ingrinder on a SmartPower 60/210 producing a can with a lid in PS with a 2-2-cavity mould. A Wittmann WP50 sprue picker removes the sprue and passes it to the G-Max

granulator integrated in the system. The material recycled by the granulator is then transported to the machine's material hopper by a Feedmax S3 vacuum conveyor. The vacuum conveyors enable alternating conveyance of virgin material and regrind, so that a thorough blend is created by this process, together with discharge of the material into the hopper.

The company showcased LSR processing on a SmartPower 120/350 machine with a 2-cavity mould supplied by Nexus, producing a drink timer. The injection unit in open design enables easy integration of the LSR metering unit. The Nexus X200 metering unit comes with a new servomix metering system with OPC-UA integration. In the mould, cold runner technology is used including Flowset needle shut-off control.

In addition to other demonstrations in the packaging and medical sectors, Wittmann Battenfeld is highlighting an upgrade to the MES solution TEMI+ from Ice-flex. The new version of TEMI+ comes with a completely new interface framework technology – allowing for fast operator interaction and highest stability – a powerful Production Planner and the optional IMAGOxt package for graphical measurements such as energy consumption.

➤ [www.wittmann-group.com](http://www.wittmann-group.com)

**Boy** presented its technology in demonstrations at its Technical Center in Neustadt-Fernthal, Germany, starting on 28 September 2020. It says the techni-

**Main image:**  
**Ingrinder**  
**comprises a**  
**Wittmann**  
**Battenfeld**  
**SmartPower**  
**60 with sprue**  
**picker,**  
**granulator**  
**and vacuum**  
**conveyor**

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**Left: Boy80 E hybrid machine**

cal highlight among its exhibits was a Boy 80 E hybrid with an electromechanically driven E-Drive injection unit which produced plates designed by Tide Ocean. This Swiss company has partners who collect used plastics (mainly empty PET-bottles) from the world's oceans, islands and coastal areas. The waste plastics are sorted, washed, shredded and then transported to Switzerland. In a multi-stage process, the material is prepared without additives in a mechanical process for reprocessing.

Another Boy exhibit focussed on bio-based material. A compact production line - consisting of a Boy 35 E, a specially developed LR 5 linear handling system and a protective housing according to Euromap 78 - demonstrated the automated production of delicatessen trays made of a PLA. The trays are removed from the open mould by the LR 5 and then placed on a conveyor belt. The entire production unit only requires a footprint of less than 4.8 m<sup>2</sup>.

Boy also highlighted its range of compact machines. A Boy XXS, with an 8mm diameter reciprocating plasticising screw, produced a small toothed gear with 0.2 g part weight made of PA 6. An even more compact Boy XS produced sprueless egg cups made of biologically degradable Fibrolon with wood-fibre optics.

➤ [www.dr-boy.de](http://www.dr-boy.de)

**KraussMaffei** has extended the clamping force range of its GX series upwards and the machines are now available from 4,000 kN to 13,000 kN in clamping force. It says the key benefit of the new GX 1300 is that items such as buckets or crates can be moulded in a double cavity on one machine. The compact design of the 2-platen technology also saves installation space.

The production of large buckets requires a large capacity and high stability at the same time, as well as minimum material consumption in

production and smooth, flawless surfaces. Krauss-Maffei says the GX series machines come with a Speed option, which, synchronised with GuideX (a precision guide with very low resistance even at high mould load), provides extremely fast clamping movements and reduces the cycle time for large opening strokes.

**Netstal**, the subsidiary of KraussMaffei, has developed a new generation of its PET-Line systems for PET preform production. It is the first Netstal PET system featuring lateral removal and has full compatibility with existing side-entry moulds and after-cooling stations. The new PET-Line has received its world premiere in presentations at Netstal's showroom in Näfels, Switzerland, and via online presentations.

Like its predecessors, the new PET-Line has reduced energy consumption. It is also equipped with a new generation of aXos controller technology. The first machine in the upgraded range has a clamping force of 4,000 kN and a 6000 injection unit that enables the use of moulds with up to 128 cavities. Netstal says the coming years will see the launch of further models to optimise coverage of all common beverage applications.

➤ <https://www.kraussmaffei.com>

**Engel** is expanding the E-mac all-electric machine series to include a version with a clamping force of 1,300 kN, which it is showed with other exhibits at its Live E-xperience 2020 online event from 13 to 16 October. In the demonstration, an Engel E-mac 465/130 produces actuators for connector systems of the Han-Quick Lock brand from Harting in a 16-cavity mould.

Engel says the dimensional demands on the small precision components, which have a great variance in wall thickness despite their very low weight, are high. A very high level of rigidity is required for reliable function, which is achieved by using a PC material with a glass fibre content. ➤

**Above: Engel's new 130-tonne E-mac all-electric machine**



**Below: Netstal has launched a new generation of its PET-Line systems**



**Right: Arburg  
Allrounder 270  
S compact  
machine**

The group also launched its new micro-injection unit for liquid silicone rubber at the online event. A fully electric, tie-bar-less E-motion 50/30 TL machine was shown producing the smallest precision components for ophthalmology with a single part weight of 0.0013 grams. The new LSR micro injection unit combines the highest precision with a maximum of flexibility and economy, says Engel.

Another highlighted technology is the Engel E-connect.monitor for condition monitoring. See more about this in the feature on Smart Functions starting on page 31 in this issue.

➤ [www.engelexperience.live](http://www.engelexperience.live)

New from **Arburg** is the hydraulic Allrounder 270 S compact, which is Arburg's first machine that can be configured online via the ArburgXworld customer portal and ordered directly with short delivery times.



The Allrounder 270 S compact with 350 kN of clamping force and a size 100 injection unit is also available with a parting line unit. The company says that by repositioning the injection unit, it can also be used to vertically inject in the mould parting line, enabling a wider range of moulds and processes.

Arburg has also launched the Allrounder

1300 T, which expands its range of vertical rotary table machines to include a 1,300-mm table diameter option. Compared to its predecessor, the 1200 T, this new machine offers more space for heavier moulds and has a significantly reduced installation area, says the company.

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

**Campetella Robotics** is welcoming pre-arranged visitors to its Robotic Centre facilities in Montecasiano, Italy, during October. In one demonstration, an X-Series Mini-Modula compact side-entry robot



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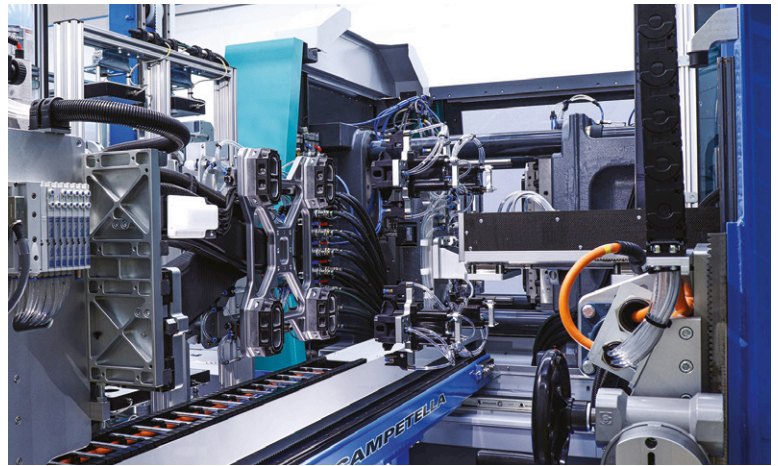
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is used for IML production of PP yoghurt cups. The robot is equipped with a quick and compact horizontal arm, responsible for very fast label inserting and product take-out operations. A tilting axis guarantees a hygienic process which ends with the cups being stacked upside down with their openings on the conveyor belt.

In the demonstration, a new X-Series CO1 Cartesian robot moves the stacks of cups from the conveyor to a storage box. An Omron AMR takes care of transporting the boxes to the finished goods warehouse. The entire system is a four-cavity application with a total cycle time of no more than 2.0 s.

An X-Series Modula is also used in the labelling of cheese spread tubs in a 4-cavity mould from Bazigos. Four Mevisco cameras monitor the product quality inline and continuously. A very fast label feeder with servo drive is used on the robot, which manages the 5-sided labels from Viappiani. The tilting axis performs hygienic upside down stacking of the tubs on the conveyor belt. With its high payload reachability an X-Series SPIN3 Scara robot grips the labelled stacks and quickly deposits them in a transport box. An Omron AMR



moves the boxes filled with cheese spread tubs to the warehouse.

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

**BASF** is using a virtual platform to offer chats with experts, product presentations and even a digital coffee lounge. Visitors can also see around 20 virtual stands based on themes ranging from household applications and metal replacement to tailor-made solutions for mobility.

➤ [www.fakuma.basf.com](http://www.fakuma.basf.com)

**Above:**  
**In-mould**  
**labelling with**  
**Campetella**  
**robot**

# Save the date



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# Smart machines offer multiple dividends

*Deploying the full array of smart functions now available on injection moulding machines boosts condition monitoring, process optimisation, trouble shooting and more.*

**Mark Holmes finds out what suppliers have to offer**

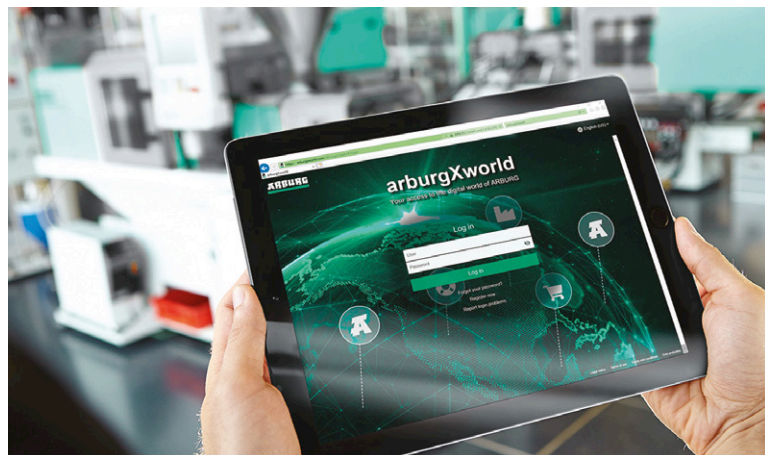
Smart functions can now provide essential assistance across the injection moulding process, through plasticising, injection, cooling and de-moulding functions, for increased manufacturing efficiency and product quality. In addition, advanced means for predictive maintenance are now minimising downtime and reducing labour costs, while data collection, evaluation and analysis can be shared throughout the value chain to meet quality and traceability requirements. Injection moulders are now also finding that this increased functionality on systems is proving invaluable during the current global pandemic, where restrictions on movement are likely to persist for some time to come.

With increasing digitalisation and networking,

the entire injection moulding process is becoming "smarter", according to **Arburg**. "A smart machine recognises the part that it produces and adaptively monitors and controls its processes," says Jürgen Peters, Head of Software Development. "It actively supports the person at the controls in every operating situation. Our control technology is consistently geared to these requirements. One example of support directly at the machine are the six assistance packages from Arburg for set-up (4. set-up), production start-up (4.start-stop), process optimisation (4.optimisation), programming (4. production), monitoring (4.monitoring) and service (4.service) for Allrounders. For standardised networking with higher-level software tools and

**Main image:**  
With Arburg's Control FillAssist, the filling pattern of the part being produced is displayed on the machine's Gestic control system interface

IMAGE: ARBURG



**Above: The ArburgXworld customer portal with its numerous interactive apps and smart functions makes daily tasks related to injection moulding easier**

platforms, all new Allrounders are equipped with an Industrial Internet of Things (IIoT) gateway and therefore offer basic connectivity."

Arburg adds that smart functions and intuitive operation ultimately lead to higher productivity, more reliable processes, fewer errors, better part quality, and consequently to increased production efficiency. "They make daily tasks on the machine easier and offer a wide range of options for making the injection moulding process even more efficient," says Peters. "The Arburg ALS host computer system is a central component for online data acquisition, the provision of process data and detailed planning down to the minute. Predictive maintenance is another major benefit for injection moulding companies."

He continues: "As networking increases, the range of digital platforms for smart production is growing. These include the ArburgXworld customer portal, available as a cloud solution, with its numerous interactive apps that can be used to document production processes or display status information and key performance indicators, for example. The ALS-Dashboard app, for example, provides an overview of the machine fleet and process data – even on the move or when away from the company. MachineDashboard is designed for status display and visualises the production process by means of trend diagrams. The VirtualControl app allows users to simulate machine control on a PC or tablet in order to create data sets offline and optimise processes. There are also numerous digital services relating to the injection moulding process."

Peters adds that benefits to the end-user are mainly the result of networking the production processes, which enables high transparency and traceability down to the individual product. In this context, the possibility of individualisation should also be mentioned – for example, by means of multi-variant parts production using an injection moulding production cell that produces flexibly from shot-to-shot due to Industry 4.0 elements, so

that customer requirements can be integrated online into the ongoing injection moulding process. The same can be done for additive manufacturing on Arburg's Freeformer systems.

In contrast to machining, a conventional injection moulding machine does not "recognise" the moulded part that it produces. "In order to change this, Arburg has developed the aXw Control FillAssist and aXw Control MeltAssist for 'smart' filling and plasticising," Peters says. "The filling assistant is an example of how component simulation can be integrated into the machine control system to make the simulation a part of the injection moulding process. The machine operator can see how the filling process takes place under real conditions."

With Control FillAssist the simulation model which is created offline and the part geometry are loaded directly into the Gestica control system. The machine obtains the 3D geometry of the moulded part from the filling simulation, so it knows the shot volume and can calculate the dosage volume from this. Via the Gestica, users can then interactively compare the results of the simulation with the filling behaviour of the last cycle. Rather than having to analyse curves, the installation technician is provided with a 3D visualisation of the filling process on the machine, which also shows how the process will change if one parameter is set differently.

The Control MeltAssist feature uses the data from the memory chip on the smart cylinder module to calculate parameters such as capacity utilisation and dwell times automatically. Material processing can thus be quickly assessed and optimised. In addition to this, module and process history data such as operating hours and cylinder module throughput are written to the memory chip. With this assistant, the Allrounder "knows" its plasticising unit. This not only facilitates on-demand maintenance (required for predictive maintenance) but also makes troubleshooting simpler for service personnel.

Virtual control is an interactive app in the ArburgXworld customer portal that can be used, for example, to simulate machine control in order to create data records, optimise processes or train employees. In addition, the Control PressurePilot ensures bionically optimised, precise pressure control when switching from injection pressure to holding pressure. This new smart function reliably eliminates burr formation and under-filling. At the same time, mould filling becomes more consistent, with filling differences – and thus differences in component weight per shot – reduced. With only one parameter (time period), adjustments are extremely easy. The bionically optimised profile is automatically created by the control system. The





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effect is most obvious with multi-cavity moulds.

In general, existing machines can be retrofitted with the Arburg assistance packages and assistance functions. The extent to which this is possible depends on the age and configuration of the respective machine in each individual case. Free access to the ArburgXworld customer portal is open to everyone. The fee-based apps are available for a free trial for three months.

Arburg adds that as a technology and systems partner, it is continuously driving forward digitalisation and networking in plastics processing. "The basis for this is the IIoT gateway, which comes as standard on all our injection moulding machines," says Peters. "The high complexity of plastic as a material and its processing is a major challenge when it comes to generating meaningful smart data analyses from a wealth of big data. The processes and numerous parameters differ hugely, depending on the component and material - making simple data comparisons impossible. Instead, a great deal of process data must be collected, the relevant data evaluated, and considerable expertise used to draw the appropriate conclusions."

He says: "We can achieve the partial goal of 'machine recognises component' by using the filling assistant to merge simulation and reality. Further development is aimed at transferring setting parameters inline to the machine from a real calculation model. We are working very hard on this type of data transfer on a scientific basis. In addition, our ArburgXworld programme and the customer portal of the same name will provide great scope for ever new digital solutions."

**Milacron** has developed a number of smart functions for its injection moulding machinery. "These include Intelligent Mold Safety Monitoring, which provides protection through the full clamp stroke and uses artificial intelligence (AI) to measure pressure on the mould closing cylinders to prevent

the clamp from closing should it become obstructed," says Brian Bish, Business Manager, Manufactured Product. "Additional features protect the ejector pins and mould parts from wear. This is available on most of our injection moulding machines, including the Q-series, Roboshot, MPs and Cincinnati. In addition, base level monitoring measures base level and platen parallelism in real-time through three sensors per base rail and two platen-mounted sensors. This system dramatically improves machine diagnostic capability by detecting machine level changes, before quality issues show up as mould wear, bad parts or result in downtime. This feature can be configured and linked to Milacron's IIoT platform, M-Powered."

### Recipes and efficiency

Edward Jump, M-Powered IIoT Digital Analytics Leader, says: "Building on our former capabilities, Milacron's M-Powered is now able to interpret the data to determine impending failures, maintenance needs or incorrect machine settings. Recipe Insight is designed for setting up a good process. Validating and maintaining its integrity is critical to part quality and identifying changes in operation. Controls typically provide the ability to monitor set points and variation, but this can become difficult to manage and monitor on a machine by machine basis. By gathering machine set points into recipes, integrated with control settings from the entire work cell and reviewing the actual values against dynamic limits, this application cultivates sophisticated learning algorithms that distinguish the best recipes and generates alerts as processes fluctuate."

Jump continues: "As M-Powered becomes part of the management culture, the Efficiency Report application is essential to review and plan production. This application digitally monitors the impact of wear-and-tear. Parts degrade, and long before the part is technically 'out of specification' and needs to be replaced, wear and tear is already impacting the efficiency of the machine. This is a cost impact for our clients through operators' compensating wear-and-tear with higher temperature, more pressure, increased cost, and potentially loss of quality. Data Science allows us to quantify these effects, allowing operators to weigh these extra costs against the cost of an early part replacement for pumps, feed screws and barrels. Through this application's dashboard, anyone with permission can access constant quantified feedback on the efficiency of all operations for connected machinery."

According to Milacron, the new applications optimise process control and decision making.

"Significant benefits can be found through

**Below: The Cincinnati 1900 from Milacron**



IMAGE: MILACRON



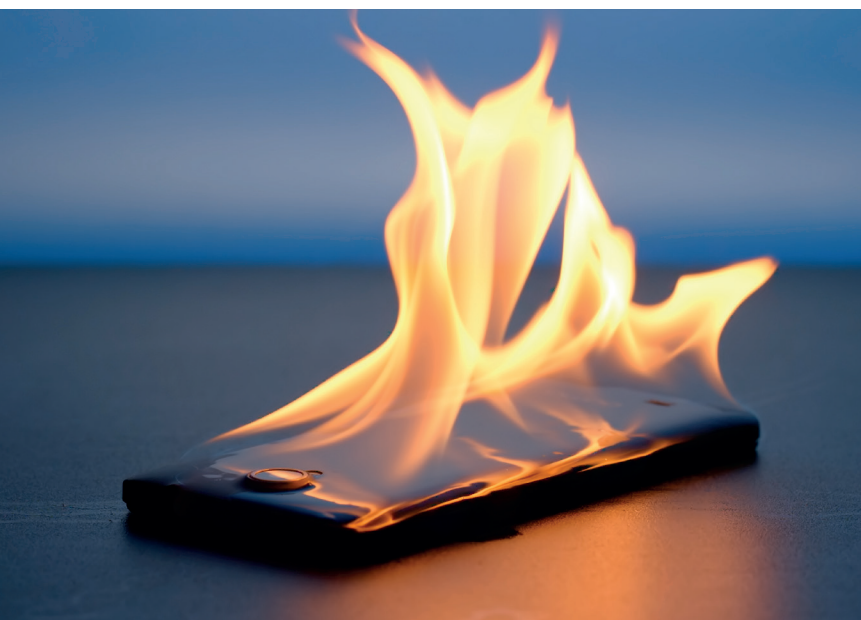


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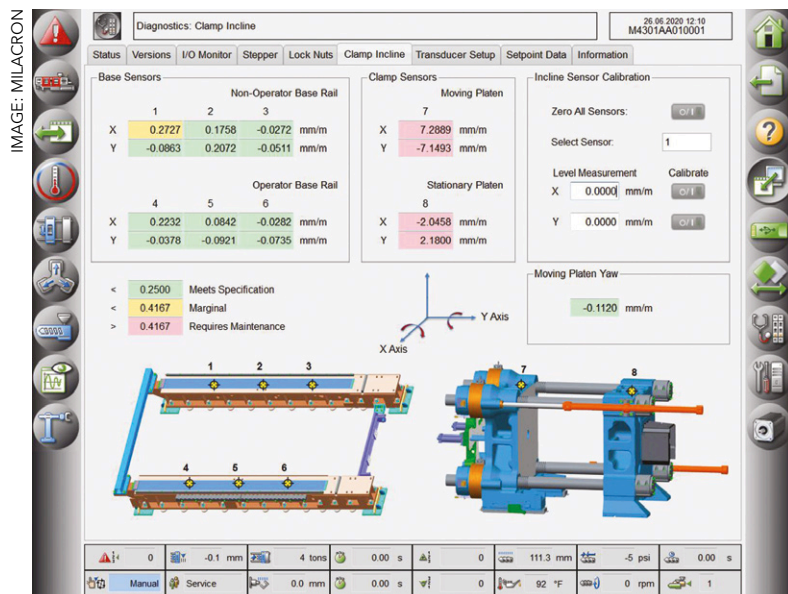
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**Above:**  
Base level  
monitoring  
on Milacron's  
Mosaic+  
control system

reducing costs for maintenance, tooling upkeep and labour," adds Bish. "The M-Powered applications generate a strong return on investment with a demonstrated ability to improve yield, save labour, and automatically issue reports. With tools like Mold Safety Monitoring, automation tools are safer for operators to be near because fewer human touches are necessary. Additionally, automation is extremely useful for repetitive processes – thus sparing the workforce from repetitive-stress injuries. It also mitigates the risks associated with human error."

In addition, less training or experience is needed for operating any process, as the machine and remote technicians can solve or troubleshoot issues. "M-Powered technology allows end-users greater self-regulation, greater connectivity between machines, and improved communication between humans and machines," says Jump. "These applications work to reduce waste and time needed for maintenance actions, contributing to more efficient and therefore more sustainable manufacturing."

Milacron says that it strives to increase efficiency and create leaner processes so that customers can utilise their talent to solve problems quickly. This shift stems from an aging workforce, as well as exposure to innovative technologies it continues to roll out. The company adds that for connecting older machines to M-Powered control systems, additional hardware may be needed compared to those with a Mosaic+ control or the machine's control can be upgraded through the company's retrofit and rebuild department.

"The shift to implementing automation technologies will continue to grow," says Bish. "Not only to reduce labour but so that processors can minimise hands-on involvement with increasingly complex, high-precision parts. With IIoT and automation

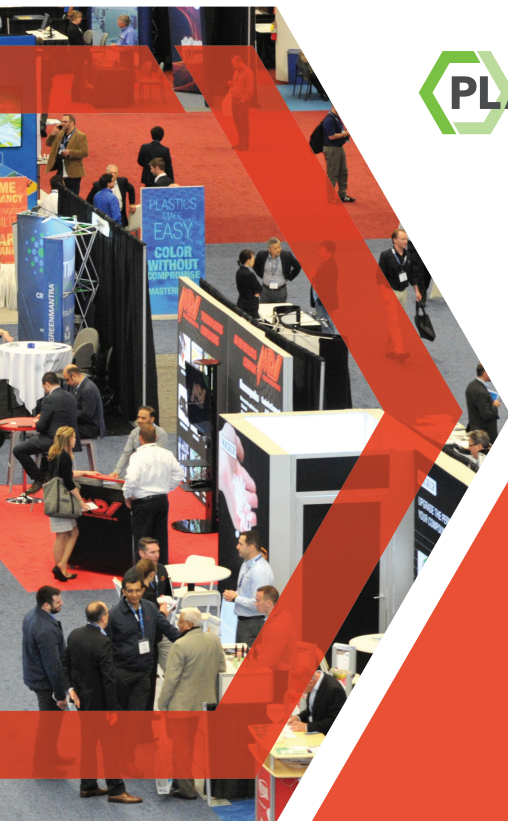
combined, manufacturers maximise overall equipment effectiveness (OEE) through capacity and productivity on their entire fleet, while keeping overheads manageable. Powerful cloud analytics will expand to drive predictive maintenance, predict failures of additional components crucial to optimising OEE and spare parts programs. On a modern machine, all aspects of the machine's operation that are significant to product quality can be handled by the machine's controller or through a remote interface.

**Wittmann Battenfeld** believes that the most important area for smart functions within the plastic injection moulding process is process control, in particular process control within the plasticising unit. "There are complex processes occurring within the cylinder that can be optimised by the machine, automatically, with alterations specific to each shot," says Benjamin Pearson of the Process Engineering and Development Department. "Analysis of the process is also an important feature that enables early detection of process deviations. For the machine user, the major benefit is ease of use. These functions should be semi-automatic in configuration and use minimal user inputs. The automatic nature of the functions leads to fewer interactions required by the user to maintain part specification, and therefore one user could be responsible for more machines. For the company, these functions can allow recycled or reggranulated materials to be used, while maintaining tight product specifications, which will reduce raw material costs. The end user should also benefit from a high quality injected product. The reduced material wastage lowers production costs and results in a lower overall carbon footprint."

He continues: "Cost is the ultimate driving force behind smart functions within the injection moulding process. Smarter, more networked machines, in theory, require fewer personnel to use and monitor them. There is also an increase of components produced more ecologically, with recycled granulate and biodegradable materials. These materials can add more deviating factors to an injection process and smart functions can help alleviate them. Smart functions are the next evolutionary step for injection moulding process control."

Wittmann Battenfeld says all of its smart functions are software-based and do not require any hardware modifications. "These include HiQ Flow, which automatically adapts the switchover point and the following holding pressure, within the same shot, to account for fluctuations in the material viscosity," says Pearson. "Therefore, the part weight deviations are smaller and the scrap





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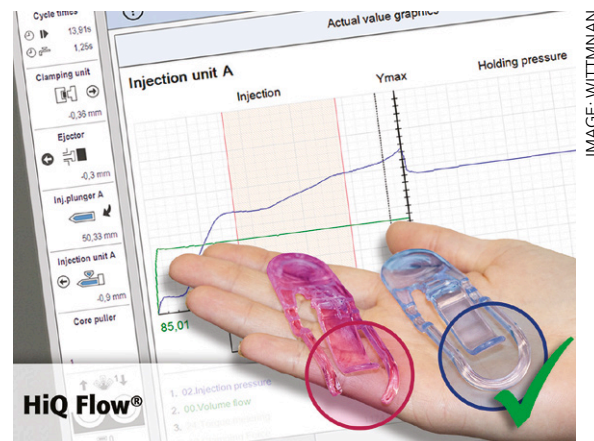
rate can be reduced. It is able to account for large viscosity changes, for example a mix of two PP types with a difference in viscosity of approximately 100g/10min. This is for use in situations where there are viscosity fluctuations between material batches, for example, plastics containing differences in glass fibre content and applications where regranulate or recycled materials are used."

He says: "HiQ Melt measures the work required metering material. This software packet is an early warning signal to stop production when material discrepancies occur, possibly from an incorrect material change and thus stops the machine as early as possible, further reducing the scrap rate. Finally, HiQ Metering is a program step between end of metering and start of decompression. By using particular movements of the screw that are specific to the current melt pool properties, the check ring is depressurised and brought into the 'closed' position in preparation for the following injection step. This stabilises the filling times and melt cushion readings. This is because injection starts when the screw begins to move without having to firstly shut the check ring. Another benefit is that pressures within the screw are released at the end of metering without being allowed to leak into the antechamber."

## Viscosity variation

Wittmann Battenfeld adds that it was recently involved with a customer in the automotive industry for safety relevant components. The company was having issues with a viscosity change in its material. The polyamide material it was using contained 40% wt glass fibre. Fluctuations in the material's glass fibre content caused unstable viscosity deviations. Using weight as the quality reference criterion did not work due to the varying glass fibre content, resulting in fluctuating material densities. Hence, the part weight did not correlate with the correct part dimensions. Instead, the maximum cavity pressure was used as the quality parameter. HiQ Flow was able to maintain a much more consistent peak cavity pressure and could be a cost-effective replacement to having cavity sensors in every cavity.

"Within the next few years, we expect to see smart functions becoming more user friendly with single button set-ups," adds Pearson. "Along with the ability to optimise processes and reduce waste, they could also help to achieve optimal energy usage. They would also give the user more information about what is occurring during the process, for example the melt quality, and give suggestions on how the process could be improved."



**Above: Wittmann Battenfeld's HiQ Flow automatically adapts the switchover point and the following holding pressure, within the same shot, to account for fluctuations in the material viscosity**

According to **Fanuc**, smart functions can provide an extremely high level of process control, which will have a massive impact on the injection moulding process. "Smart functions allow the process of controlling the melt and melt quality to be quickly and automatically adapted, which in turns allows for a more repeatable process," says Andy Armstrong, Sales and Marketing Manager at Fanuc UK. "Not only does this help to ensure consistency of product and improve productivity by reducing the amount of scrap, but it can also increase production yields and reduce the need for human machine intervention. One of the most important factors for manufacturers, and particularly injection moulders, is uptime. Keeping equipment running for as long as possible, working effectively and efficiently, is absolutely critical to productivity, and therefore profitability. Smart functionality helps to make processes more repeatable, which reduces the amount of downtime associated with an injection moulding machine, and ultimately ensures utilisation rates are greater in terms of yield."

He says: "This is where all-electric injection moulding machines, such as Fanuc's Roboshot series, are perfectly suited to maximising the output of an injection moulding shop. Feedback from the drive elements can provide instantaneous information, allowing smart functions to deliver a better process control while increasing equipment uptime. The ability to get a mould running reliably without intervention or human input is a big benefit, and one that ultimately allows the moulding facility to increase its output, even in the face of potential skills shortages."

He continues: "The other way in which smart functionality can increase uptime is by predicting where issues may occur, before they cause the





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**Above:**  
**The Fanuc**  
**Roboshot**  
**α-S450iA**  
**injection**  
**moulding**  
**machine**

machine to breakdown. Fanuc systems can predict if a failure is likely to take place, allowing the problem part to be changed in a controlled manner which minimises downtime. This moves away from a fire-fighting approach of battling to repair equipment breakdown, which in turn will further increase utilisation rates."

Armstrong points out that while machine suppliers are always looking for enhancements and new technological advancements, the injection moulding machine has remained largely unchanged since the 1950s. "While there have been advancements in accuracy, and efficiency, the design remains very similar to what it was several decades ago," he adds. "What has allowed injection moulding to improve as a process is the accuracy and control levels employed by the injection moulding machine manufacturers; whether that is improvements in digital servo hydraulic control, proportional valve control technology or the modern day all-electric technology. However, the control system and feedback mechanism has an ever-increasing role to play in improving process capability and the future development of artificial intelligence and smart functionality."

He says: "The only way to take advantage of the new processes and performance is to have faster and better drives. This means utilising CNC controls and the latest drives - both of which Fanuc is a leader in - but most importantly using smart

functionality to optimise existing processes. The majority of injection moulding machines still use a feedback mechanism external to the drive unit to give positional or pressure feedback. Through Fanuc's 60 years of experience in CNC control, the feedback is constantly monitored and fed back to the CNC controller, via high-speed connections.

What's more, there is a huge amount of data generated by the latest injection moulding machines, and the only thing that can react in real time to that data is another computer - a person is simply not fast enough. To get the maximum out of a machine, you have to allow the machine to do what it thinks is best. This is where the value of a CNC-controlled system lies, as it can provide faster feedback and more efficient monitoring compared to an industrial-based PC system."

However, there is a further challenge in knowing what to do with all the data that is collected. He says the drive towards total connectivity of equipment through Industry 4.0 initiatives will inevitably lead to more smart functionality and AI functions. Machines of the future will have the capability to monitor part quality and adjust process control as a standard feature.

Smart functions come as standard with the Fanuc Roboshot all-electric injection moulding machine, which means there is no need to retrofit smart systems. "However, there is the potential development of new software functionality, as well as third-party equipment such as sensors that could complement the production process," says Armstrong. "Rather than looking at how smart functionality can be retrofitted, there needs to be a collective acknowledgement that it already exists, and we just have to dig deeper in order to fully utilise it. Capturing this data and analysing it is also key to making the correct decisions within the production environment. Ultimately, this is still something the

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**Above: Engel's iQ Process Observer continually analyses several hundred process parameters across all phases of the injection moulding process**

human mind has to do in order to close the loop back to the operation of the equipment."

Fanuc says a good example of how smart functions can prevent downtime in injection moulding equipment is that of check-ring performance. The company's screw and barrel technology provides a warning for when the check valve assembly is wearing, giving the user a graphical representation to know when they need to check the part. It is a key item in injection moulding, and when it wears it gives a greater variation in the process. It is something that cannot be seen without taking the screw and barrel apart. By using smart functionality to predict when it will need replacing, it avoids having to disassemble the barrel head to gain access for a visual inspection, which can typically render the machine out of production for a few hours.

Looking to the future, Armstrong says that the most effective way to improve the injection moulding process is by utilising many of the smart functions that already exist. "The core design of an injection moulding machine will not change, but the way in which it is used will," he says. "Looking ahead, systems that allow manufacturers to gather, read, and then use feedback from machines, will instigate an improvement in productivity."

He adds: "The Roboshot all-electric injection moulding machine is designed to use smart and intelligent functionality to its absolute maximum, and is indicative of the type of production equipment likely to be used in the smart factories we can expect in the future. However, to fully realise the potential of a smart factory, production equipment needs to work in tandem with platforms such as Fanuc's Field system. Suitable for industrial applications ranging from sub-contract machine shops through to major production facilities alike, the Field system is an open source platform which connects a broad range of Fanuc and third-party production technology - including both new and

legacy models dating back to 2000. Its ultimate aim is to provide fast, centralised access to all production data within a factory and help end-users take a decisive step towards Smart Factory status."

Engel has developed intelligent assistance for its injection moulding systems with the iQ Process Observer, which is able to provide an overview of the entire process for a whole batch rather than just optimise individual steps in the injection moulding process, such as injection and cooling. This makes it possible to identify changes in the process at an early stage, allowing operators to determine their causes and find a solution more quickly. The iQ Process Observer continually analyses several hundred process parameters across all four phases of the injection moulding process - plasticising, injection, cooling and demoulding. The results, split into the four phases, are immediately visible in an easy-to-understand overview on both the injection moulding machine's CC300 control unit and the Engel E-connect customer portal.

### Optimised plasticising

In addition, iQ Melt Control is specifically designed to optimise the plasticising process. In real-world situations, plasticising is often faster than what the cycle requires. This can have an effect on the screw's service life and product quality. However, improved melt homogeneity, increases process reliability. In order to ensure that this outcome is delivered automatically, iQ Melt Control determines the optimum plasticising time for the specific application. Instead of plasticising at the maximum possible speed, the system makes full use of the part's in-mould cooling time for plasticising. For this to happen, the machine operator enters the screw type and material to be processed. Then, along with the optimum plasticising time, recommendations for optimising the temperature and back pressure are provided. The benefits for the processor are a longer service life for the screw and a melt quality that is consistently high. This then results in parts of improved quality and higher efficiency levels.

The latest addition to Engel's range of smart functions for injection moulding is designed for barrier screw condition monitoring. The company says that E-connect.monitor can now also analyse the condition of barrier screws and make reliable statements about their condition. The measurement is performed without having to remove the screw. In classical maintenance, the barrel is a "black box". Its condition can only be assessed if production is interrupted and the plasticising screw removed. This is a time-consuming and resource-





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**Engel**

intensive process, which means that it is infrequently performed in many plants and that quality problems and unplanned system shutdowns repeatedly occur. Systematic use of machine data offers the opportunity to reduce maintenance costs and boost machine availability. Engel adds that E-connect.monitor is the only system on the market that allows the screw condition to be assessed without dismantling the plasticising unit.

Based on the latest sensor technology, Engel has developed a measuring system that can be installed easily on the outside of the barrel. It relies on ultrasound to assess the condition of the plasticising screw through the barrel wall and the molten plastic. The distance between the screw flight and the barrel liner, which increases with increasing production time, is measured. If the gap becomes too large, process fluctuations occur, and this can lead to quality problems with the part. The measurement is performed by an Engel service technician and takes just a few minutes to collect the data. The measurement results are transferred to Engel via a secure data link, where they are automatically evaluated and interpreted with the aid of specially developed mathematical models. The processor can discover the results of the evaluation at any time via the Engel E-connect customer portal. If the screw condition is checked at regular intervals, the maintenance department can evaluate the wear trend enabling the next screw replacement to be planned in a precise way. This means that system downtime can be kept to a minimum while making optimum use of the screw service life. For three-zone screws, the E-connect.monitor is already a reality in practical applications. Barrier screws pose special requirements for the analysis technology due to the complexity of the screw geometry, the different pitches of the flights and the wide range of variants of this screw type. They require a proprietary algorithm, which Engel has now developed.

Barrier screws are mainly used on large machines and in applications with a high material throughput in 24/7 operation. Unscheduled machine downtime is particularly critical, especially since an interruption in operation for the removal and evaluation of the plasticising screw on a large machine can sometimes take two workdays. Engel says that E-connect.monitor offers a far faster solution. In the long term, regular condition monitoring supports process optimisation. Evaluating the wear parameters makes it possible to identify critical process settings that accelerate wear and avoid these settings in the future by making appropriate process adjustments. In addition to the module for plasticising screws, Engel offers E-connect.monitor modules for three other critical machine components: hydraulic pumps, the hydraulic oil and ball screws in high-performance electric machines.

### Virtual visits

During the current Covid-19 pandemic, the company has been involved in digital process optimisation with Netherlands-based **Helvoet Rubber & Plastic Technologies** through virtual site visits. Using smart tools and services, Engel has assisted Helvoet to master process optimisation tasks via E-connect.24 and Skype to overcome contact prohibitions. Filmed images of moulded parts were encrypted and transmitted securely between Engel headquarters in Schwertberg, Austria and its subsidiary in Houten, Netherlands, as well as Helvoet's Tilburg facility.

Helvoet specialises in high-precision injection moulded parts for medical technology, diagnostics and other applications. In collaboration with Engel, Jeroen Molenschot, Development Manager at Helvoet, carried out a mould and process optimisation procedure for a diagnostics product: a lab-on-a-chip product that poses the highest demands on the precision and consistency of the injection moulding process. Helvoet is a member of the Flow Alliance, an association of experts in the field of microfluidics. Helvoet's customer expected the component to be optimised in good time: typical daily work for a plastics processor used to producing highly complex components and assemblies where the interaction between mould and injection moulding machine has to go to the limits of what is technically possible. The product has been under development in Tilburg for several years. Now a technical revamp had to be implemented.

Digital solutions were prompted by the pandemic and the schedule threatened to collapse,





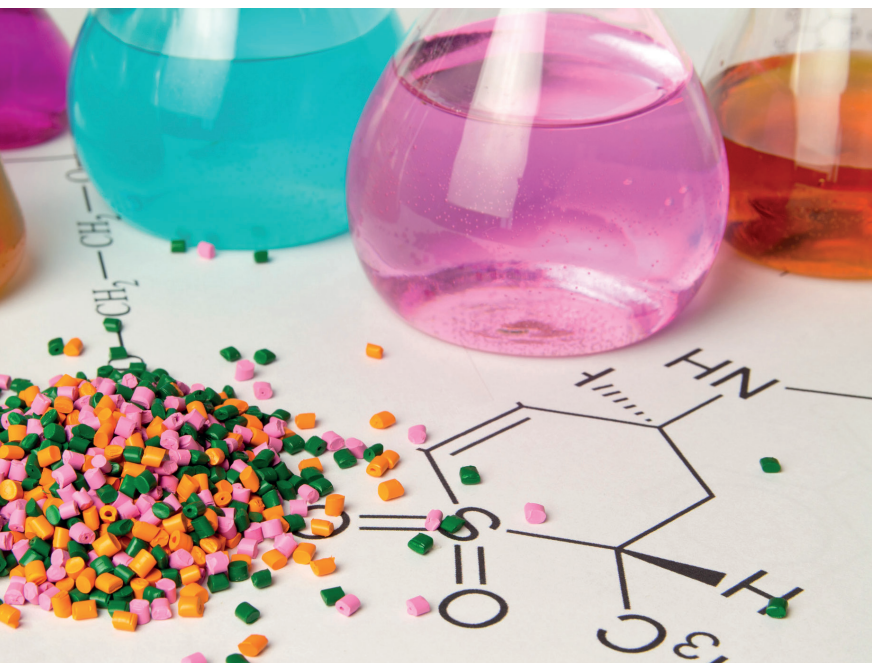
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meaning postponement of the project to an unspecified date. The all-electric Engel E-mac 75 injection moulding machine, on which the lab-on-a-chip articles are produced using the Engel Coinmelt injection compression moulding process, includes E-connect.24 for remote maintenance and online support. This meant that Engel technicians from both Schwertberg and Houten were able to access the data required for optimising the injection moulding process in real-time. Mould data had already been exchanged by email. The data provides important technical information for the feasibility and quality of the product, but is ultimately not sufficient on its own to get the best out of the machine. The moulded part must be repeatable, ensuring the same quality and precision over thousands of shots.

In order to transmit results of the individual optimisation steps, Molenschot sent live images from the cleanroom production of the test runs. A Skype conference was used to discuss the parameters, which needed further modification. The level of technical sophistication is high, because the surface structure of the component, which otherwise needs to be manufactured to be absolutely flat, is a real challenge. Very filigree microstructures had to be placed deeper in the mould than in relation to its diameter.

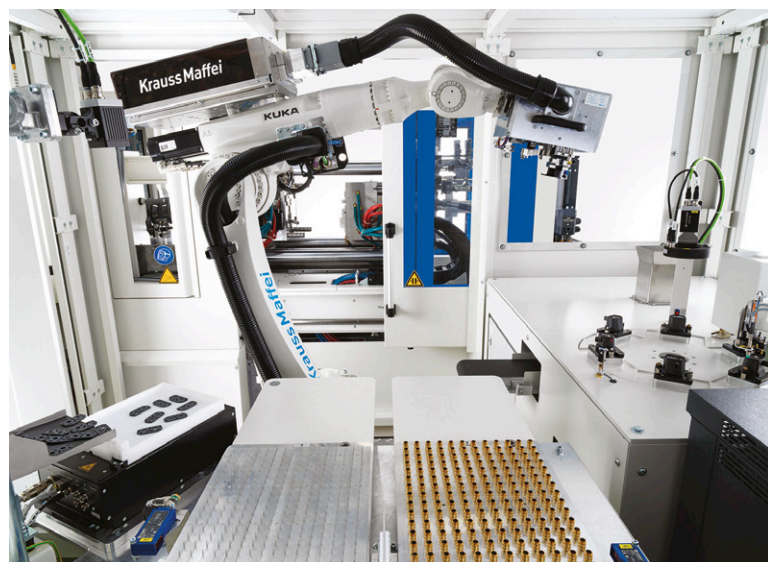
The project is considered a precedent for future cooperation. "Without the Corona crisis, we certainly would not have agreed to this procedure," says Molenschot. "I would have attached great importance to an employee from Engel's headquarters in Austria visiting us on site in Tilburg." At the same time, he demands more flexibility from all those involved in such a process: "We as developers have to learn to actually use these new technologies, all of which are already available," he adds. "Even if it

just means working more effectively and also more cost-effectively."

**KraussMaffei** has developed the EasyTrace modular system that gathers all relevant production data in plastics processing and transfers them to the specific customer systems for evaluation, whether from the extruder, injection moulding machine, automation or peripherals. EasyTrace acts as a central data hub between the individual levels of production, creates more transparency over the entire value chain and supports quality assurance. All machines communicate with their production environment. They log their manufacturing sequences and provide the information at the proper time for the respective cycle for further processing – whether for the downstream system in the process or for central evaluation. However, the various protocols are not always fully compatible.

The company says that making all data available together for evaluation – for example by an MES system – is essential, particularly for Industry 4.0. These systems should be as simple as possible and not overloaded with powerful IT systems. However, this is a shortcoming of most solutions. They are not adequately tailored to plastics processing. The EasyTrace data hub is a type of information highway with integrated interpreter. EasyTrace quickly acquires information from material dryers, plastics processing machines, complex automation systems, cameras, printers and scanners. The special feature is that EasyTrace supports nearly all interfaces that exist in the market, including E63, Profinet and E77. This makes it possible to integrate machines from different manufacturers or older machines into digital production. For example, if the injection moulding machine already has the KraussMaffei DataXplorer analysis software, communication between the machine and EasyTrace is direct. DataXplorer saves up to 500 signals per second as continuous curves and acts as a "magnifying glass" for taking an in-depth look into the injection moulding or extrusion process. EasyTrace can be coupled to the customer's own MES or FFS system, store data there or take over other data, for example for labelling the individual articles with codes.

**Below:**  
**KraussMaffei is able to create custom reports with data from EasyTrace for fabricating connectors overmoulded on a CX 80 with metal inserts**



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# Automotive drives plastics development in E&E

*As car makers pursue their electric dreams, innovations are emerging in E-mobility applications that push the boundaries for plastics used in electric and electronic settings. Peter Mapleston looks at what material suppliers are developing*

As the automotive and electrical & electronic (E&E) worlds converge, developers and producers of engineering thermoplastics are facing new challenges in creating materials that insulate well, withstand high temperatures without changing colour, exhibit very good mechanical properties over extended periods, resist a wide range of chemicals, do not cause metal corrosion, and have good flame resistance delivered by halogen-free additive packages, even at extremely thin wall thicknesses – sometimes all in a single package. It's a big ask, but suppliers are delivering the goods.

Giacomo Parisi, Global Marketing Director for Automotive Electrification at **DuPont** Transport & Industrial (T&I), says that traditionally, automotive OEMs weren't so interested in flame retardant materials, or even in the electrical properties of plastics, but with the rise of hybrids and fully electric vehicles, these are now important topics.

"In combination with the need to resist high temperatures and various automotive fluids, it is becoming more and more difficult to find the right material," he says. Particularly when OEMs are so tight on prices.

For high-voltage applications, especially for live parts, DuPont has developed a portfolio of orange materials, for such applications as connectors, switches, bus bars, etc. Materials are mostly based on either PBT thermoplastic polyester, or polyamide 66.

"Some users prefer PBT, some prefer 66," says Parisi. Colour stability over time and across a wide temperature range is very important in the final product life in high-voltage applications, all the way through to vehicle dismantling. Normally, PBT is best for colour stability, he says. DuPont has been working on improving PA66 to get colour stability properties close to those of PBT.

PA66, on the other hand, is tougher and more

**Main image:**  
**Cars are becoming increasingly connected – and plastic materials must meet the demands of working in electronic applications**

IMAGE: DUPONT



**Above: DuPont has developed numerous hydrolysis-resistant grades of Crastin PBT for automotive sensors**

ductile and so is more suitable for bigger parts needing to withstand high stresses. Over long periods, PBT doesn't normally retain its dimensional stability or its elongation properties so well, meaning that the integrity of over-moulded metal conductors may suffer. Electrical properties in PBT are more stable, thanks in part to the fact that PBT does not absorb water.

The number of sensors on a car continues to rise, and they need to work in a wide variety of conditions. DuPont has a range of Crastin grades for these applications. The portfolio includes halogen-free flame retardant (HFFR) PBT grades (FR40 types) as well as one hydrolysis-resistant PBT, Crastin HR5330. Crastin FRHR5325 is flame retardant and hydrolysis resistant.

With Industry 4.0, and the high level of automation that comes with it, QR codes are becoming a key enabler for identification purposes. "There is a need to look at contrasts obtainable with laser marking," Parisi says. Laser transparency is also important in some applications, so that it is possible to use laser welding, which is becoming more popular in electronic switches for example, where it is not possible to use vibration welding often used for electro-mechanical components. DuPont has been able to raise transparency levels in some of its grades. For example, in Crastin HR5430, transparency has been raised from 20% to 25% at 1mm thickness.

The future of the automotive industry is being shaped by E-mobility, says **Eurotec**, the producer of PA6, PA66, PBT and many more engineering "plastics for E-mobility with the combination of its deep material knowledge and experience in automotive and E&E industries". The company's approach to E-mobility has five target areas; battery pack, electric motor, high voltage connectors, thermal management systems and drive assistance sensors.

"Plastic materials could be exposed to high currents or sparks in the battery so they need to

have high thermal and ignition resistance with good tracking behaviours to avoid any safety failure," says Eurotec. "In addition, if the plastic materials directly contact with battery, they need to show good resistance against chemicals which comes from battery leakage. Eurotec offers intelligent solutions that meets these strict requirements in a battery pack."

In electric motor applications, like gears, bearings, covers, coils, brushes, it is important to choose the right material for due to the high temperature requirement, dimensional stability and friction resistance.

For high voltage connectors, it is important that materials should have a high dielectric strength, creep and tracking resistance for high voltage applications. These materials should also have halogen-free or red phosphorous-free options to meet high CTI demand for these applications, which Eurotec says it offers through the use of highly resistant own masterbatch solutions for orange-coloured compounds.

The company says: "Thermally conductive plastic materials increase the performance of electric vehicles due to their lightness in weight compared to metals. In E-mobility applications, components become smaller, require more power and need to have an aesthetic aspect but a new challenge arises at this point, high thermal load. Thus, it is important to dissipate heat to enhance life time and reliable power for the battery."

Eurotec offers high hydrolysis resistant grades which comply with OEM specifications such as Renault (AS 27), VW (TL 52682) and PSA (B71-6000). It additionally offers thermally conductive grades for thermal management requirement for electric vehicles.

In the area of drive assistance sensors, the company says it is important that sensor housing materials should have a good mechanical stiffness, creep and fatigue resistance, dimensional stability

**Right: Eurotec offers high hydrolysis resistant grades which comply with OEM specifications including Renault (AS 27), VW (TL 52682) and PSA (B71-6000)**



IMAGE: EUROTEC





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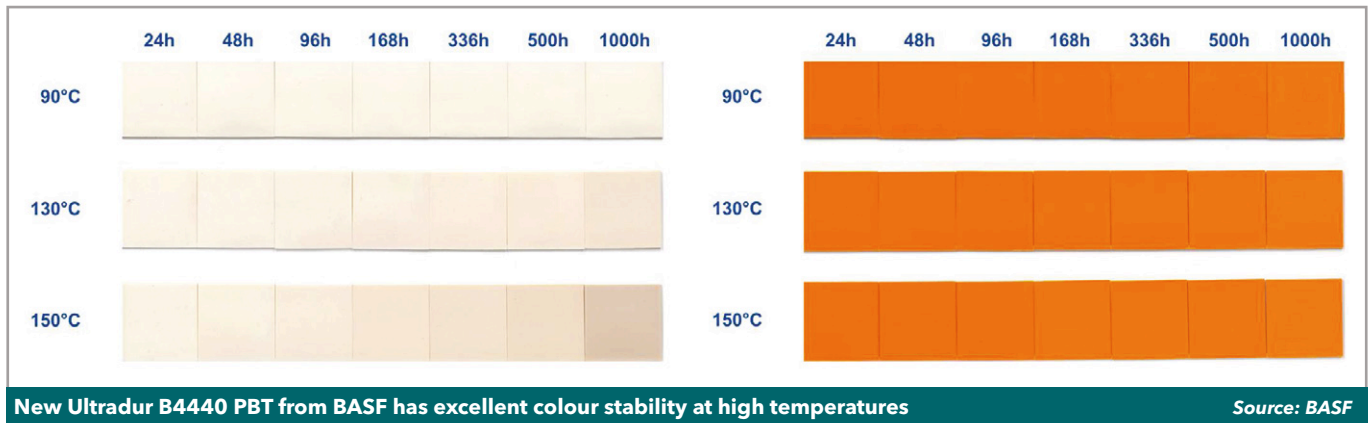




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and EMI/RF shielding properties to avoid any safety issue. "With its vast knowledge in electrically conductive plastics, Eurotec provides electrically conductive and structural materials that are especially suited to sensor components," it says.

Ruediger Bluhm, Group Leader Technical Development EP Industrial, says **BASF** has been putting a strong emphasis on development of flame retardant materials for E&E applications, most of them using halogen-free systems. The company is getting an increasing number of requests from the transportation sector, as it moves in the direction of e-mobility, for such products.

One new development is an HFFR unreinforced Ultradur PBT, B4440. This is suitable for a wide range of products, including connectors, as well as extruded products such as filaments and optical cables. CTI value is 600V. RTI values are also very good, indicating high resistance to heat ageing.  $RTI_{Elec}$  and  $RTI_{Str}$  are both 155°C.

Ultradur B4440 has an elongation at break of over 20%, which BASF calls a "quantum leap" in performance.

Tsunenobu Sato, in the Sales Planning Department at **Polyplastics**, also points to trends in automotive that are influencing plastics development. He says reliability requirements of components in electrical systems continue to increase, including resistance to harsh in-vehicle environments for a long period of time. "If the parts are damaged or their insulation and airtightness cannot be maintained, there is a risk that the system will break down or fail, causing an accident," he says.

Polyplastics is developing and commercialising various PBT grades for diverse electrical components and situations. For example, for automotive connectors that meet USCAR requirements, unreinforced Duranex 201HR and glass fibre-reinforced, tracking-resistant Duranex CG7030 are employed; both are hydrolysis resistant (HR).

Meanwhile, for ADAS sensors, glass fibre-reinforced, hydrolysis resistant Duranex 330HR, and

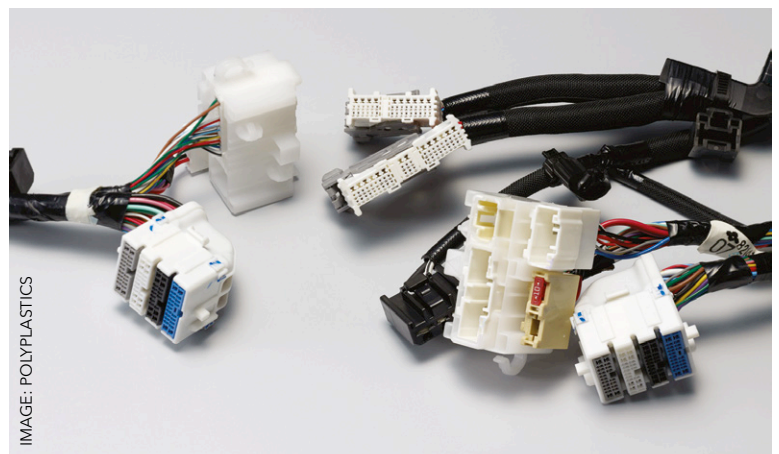
reinforced, low warpage, Duranex 733LD or 7407 can be selected to achieve both radio wave characteristics and durability. For xEV applications (xEV is a term used in Japan to cover various types of fully electric and hybrid vehicles), in order to improve the reliability of over-moulded products, another set of PBTs are used, and there are yet more for applications that require flame resistance.

Duranex 201HR was launched in the last few weeks. Polyplastics says it delivers "significant" improvements in hydrolysis resistance and thermal shock resistance for a range of applications. The supplier says it is particularly well-suited for automotive connectors located in harsh operating environments. Duranex 201HR complements Polyplastics' Duranex LT Series which also has high thermal shock resistance.

**Lanxess** says Pocan XHR (Xtreme Hydrolysis-Resistant) product range, launched at K2019, has outstanding resistance to hydrolytic degradation in very hot and humid conditions. In internal testing with standardised test specimens based on the Society of Automotive Engineers' SAE/USCAR2 Rev. 6 long-term hydrolysis tests, the compounds reached Class 4 or Class 5 - the top two ratings.

Rapid and extreme changes in temperature often cause stress cracks in components with over-moulded metal areas because of the differ-

**Below:**  
**Polyplastics**  
**is aiming at**  
**high-voltage**  
**applications**  
**with various**  
**PBTs**



# High performance from recycle

Serious consideration is now being given to using post-industrial and post-consumer recycle (PCR), even in mature E&E components, says Enrico Spini at Radici Group. He says the company has already done some scouting for possible sources of material – “We are already working on some sources of PCR that appear reliable in terms of quality and supply chain” – and has developed an HFFR

grade with a “significant” percentage of PCR polyamide. He says mechanical and electrical properties are both very promising. First serial applications are expected to be around two years away. Radici is evaluating materials with between 20 and 100% PCR.

Spini says the company can take advantage of experience it has already acquired in developing compounds containing post-industrial

material using scrap from its own plants producing fibres. “We have been selling into the automotive industry for years,” he says. “We know that you can’t reproduce reliably without knowing how to select suitable materials, how to measure properties, how to carry out compounding, and so on. If you don’t have this sort of experience, the results could be a disaster.”

ences between metal and plastic in terms of thermal expansion. Pocan XHR products have an elongation at break of up to 4.7%, to resist the formation of stress cracks. Moreover, the improved long-term temperature stability and hydrolysis resistance reduce susceptibility to stress cracks.

In thermal shock tests, says Ralf Heinen, application developer at the High Performance Materials business unit, metal over-mouldings in Pocan XHR “exhibit no stress cracks or, if they do, the cracks do not appear until after many multiples of the usual number of test cycles.” He says this makes the new products exceptionally well-suited to parts such as bus bars, connectors, power strips and main supporting frames.

The melt viscosity of all Pocan XHR variants remains constant for a long time at the injection moulding temperatures customary for PBT, providing process stability across a wide processing window. The improved flowability relative to comparable standard PBT materials makes it possible to implement thin-walled geometries, Heinen says. “Furthermore, over-moulding of metal parts can take place at lower filling pressures, which means that the metal inserts are not distorted or pushed out of position in the tool by the molten material.”

Standard PBT already has good chemical resistance, and in Pocan XHR it is even better, particularly when it comes to very strong alkalis. On vehicle underbodies in particular, a combination of road salt, cast iron, and moisture can cause a mildly alkaline environment to build up. “Our XHR compounds are therefore the material of choice in this application for electrical and electronic

components such as sensors, housings and connectors,” says Heinen.

Lanxess is currently adding more V-0 halogen-free flame-retardant compounds to the XHR product range. They are particularly well suited to live components in hot and humid conditions, which have to exhibit excellent hydrolysis stability and fire resistance at the same time. The flame-retardant compounds are reinforced with glass fibres (15, 25, and 30%). An unreinforced version of the product will also be available.

In addition to new applications in the powertrain of electric vehicles, Lanxess sees great potential for its Pocan thermoplastic polyesters, and also its Durethan polyamides, in the charging infrastructure—charging plugs and sockets in charging stations and wallboxes for example, as well as for components in inductive, wireless charging systems for high-voltage batteries.

Sarah Luers, project manager in E&E application development in the Lanxess HPM business unit, says that unreinforced materials are mainly used for charging plugs because they offer a high level of

dimensional stability and surface quality, are impact resistant, and are also available as flame-retardant compounds for applications in contact with live electronic parts.

She highlights a HFFR grade of PA6, Durethan B30SFN30. This achieves a UL94 V-0 rating at 0.75mm. “Durethan B30S, however, is ideal for thin-walled components such as plug handles, which do not necessarily have to be flame-retardant,” she says.

At DSM Engineering Materials, Global Marketing Director Tamim Sidiki highlights the importance of materials with high CTIs in high-voltage

**Right: Wallbox for charging electric cars, an application for which Lanxess sees great potential. Various materials are on offer for such applications**





charging and interconnect systems. "A high-CTI material has the advantage that the creepage distance [in components incorporating electrical contacts] can be kept the same or even reduced in order to miniaturise the application," he says. He says some DSM compounds based on ForTii PA4T can even achieve a CTI of 900V, making them a very promising potential solution for the upcoming 800V charging grid.

At K2019, **Ascend Performance Materials** unveiled an addition to its Vydene ECO series for E&E applications. ECO 500 is a reinforced HFFR PA66 for use in circuit breakers, power disconnects, and electric and hybrid vehicles. It has a V-0 rating at less than 0.4 mm, a glow wire flammability index of 960°C and a CTI of greater than 600 V. Depending on the application, ECO 500 will be available in 15%, 25% and 30% glass filled compounds designed with improved flow and reduced plate-out.

**Radici** has developed a grade specifically for the developing charging system infrastructure, for plugs and sockets. Radiflam ARV250 HF is a V-0 PA66 FR grade with 25% glass fibre reinforcement for sockets. For plugs, a special glass-filled V-2 grade, Radilon S ERV70T, has been developed in many colours, and fulfils requirements for outdoor installations, including UV resistance.

Experimental new orange grades that retain their colour after 1,000h at 90°C are based on halogen- and red phosphorous-free Radiflam PA66 and PA6 polymers.

In power electronics, Radiflam ARV 300 HF is said to be an interesting development for use in inverter bases that hold the IGBT (insulated gate bipolar transistor). The company is also starting to promote a V-0 grade that also offers some thermal conductivity to help dissipate heat developed in power electronics. "This could be an interesting material to replace aluminium," says Erico Spini, Market & Application Development Director at RadiciGroup. This is Radiflam SRV 100 FR, which has a thermal conductivity of 1W/m.K.

In applications such as cell management controller housings and covers, battery carriers, cell spacers, and related components, Radici is already promoting various grades of polyamide. "We believe use of polyamides could show fundamental advantages versus amorphous thermoplastics such as PC/ABS, which are not reliable when parts are subject to continuous loads or vibration, or when chemical resistance or creep resistance is required," says Spini.

One important E&E application, moulded case circuit breakers (MCCBs), still consumes a lot of

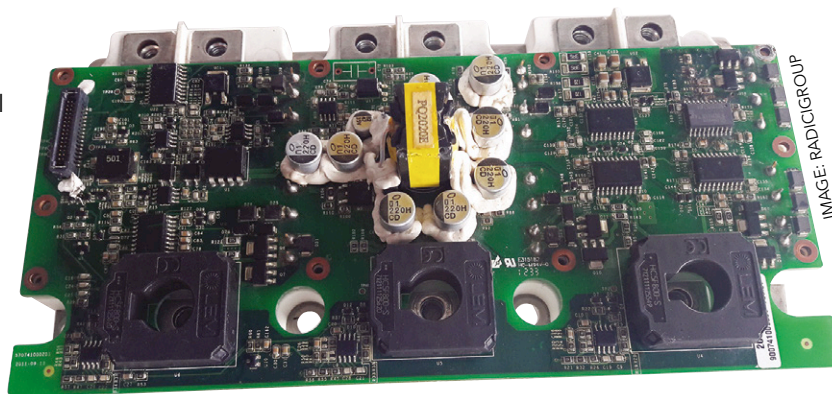


IMAGE: RADICIGROUP

thermosetting plastics. These need short-circuit breaking capacity above 10KA. "But today, an interesting thermoplastic material could fulfil these technical requirements," says Spini. He says Radici is currently working on a project to replace thermoset circuit breakers. Radiflam ARV 250 HF is a high-flow material that can guarantee integrity of the FR package and fill moulds with wall thicknesses down to 0.4mm.

For even more severe needs, Radici offers a HFFR grade based on its polyphthalamide (PPA), Aestus T2RV 300HF, which contains 30% glass fibre reinforcement. It performs to V-0 at 0.4mm.

### Beyond automotive

High-speed connectors are not just for automotive, of course. They also fit into a megatrend identified by Spini in virtual reality and the Internet of Things, where very small connectors are required in order to keep headsets small and light. Specifiers are calling for V-0 performance at 0.4mm, and this may even go to 0.2mm in the future. "This will be extremely challenging," Spini says. There is also the need to be able to fill multi-cavity moulds. In addition, many connectors need to withstand reflow soldering temperatures at up to 280°C.

BASF too has been extending its range of PPA materials that have potential in E&E applications. These include Ultramid Advanced N3U40G6, a 30% glass reinforced PA9T, which keeps a UL94 V-0 rating all the way down to 0.25mm. It has "enhanced" mechanical and electrical properties at elevated temperatures. Low water uptake means that parts do not blister in reflow soldering. Ultramid Advanced T2340 G6 is based on PA6T/66 and also contains 30% glass fibre. It has a V-0 rating at 0.4mm. The grade stands out for its very good flow properties.

"The new Ultramid and Ultradur grades mean that we are able to offer our partners from key industries solutions for the increasing regulatory requirements in the areas of electrical systems and fire protection," says Michael Roth, Product Developer at BASF Performance Materials. "The trend

**Above: Inverter base holding the IGBT is a potential application for flame retardant polyamides from Radici**

toward automation in production at our customers' plants also means that simple and stable manufacturing is essential. Ultradur B 4440 and Ultramid B3U42G6 make this possible."

Independent compounder **Akro-Plastic** says it is providing a family of products meeting the needs of consumers and industries in the E&E field. It has established a portfolio with materials ranging from unreinforced PA 6 FR to highly reinforced PARA (Polyarylamide) Akroloy GF 35 FR. Small housings for electro-magnetic interference filters can be made with a film hinge that is only 0.4 mm thin but still achieves UL 94 V-0, the supplier says.

Akromid C3 GF 25 1 FR, meanwhile, can be used to produce all the different connectors required to equip two-wheelers with electric drives. "This material is strong but still ductile enough to withstand the dynamic loads during operation," says a representative. This material property is essential for snap-fit locks securing the connection in the case of vibration and sudden impact both on and off road.

Industrial electric control cabinets can contain massive bus bars, which have to be very firmly mounted inside the cabinet, since they can be loaded with high forces by electromagnetic effects in the event of an electric short circuit. Akro-Plastic says Akromid B3 GF 30 FR is already a successful problem solver in this kind of application, while newer developments will use Akromid B28 GF 35 FR. The latest addition to the portfolio is a flame-retardant PPA, for use in applications where a safe operation of main switches and circuit breakers must be assured even at high surrounding temperatures.

**Celanese** says it is now offering key solutions to make 5G infrastructure and devices better and more powerful. Many of these solutions are based on liquid crystal plastics, LCPs, with low dielectric constant (Dk) and low dissipation factor (Df), critical for 5G applications.

The 5G technology platform will support services requiring high-speed connectivity with massive capacity and reliability. 5G uses two frequen-

cy bands, sub-6GHz and mmWave. Both of these, but especially mmWave, are putting increased demands on components used not only in devices, but the 5G infrastructure as well. "Without the right components, we will suffer from slower-than-expected data transfer, unstable connections, and signal loss," says Celanese. "So it is clear that there are many challenges to overcome in making 5G infrastructure and 5G-capable devices as efficient and effective as possible."

### LCPs for 5G networks

Celanese points to grades of its Vectra and Zenite LCP resins offering lower Dk/Df than rival LCPs and other aromatic thermoplastics such as PPS. These products have been widely used in high-speed communication applications such as connectors for many years, the company says, but 5G demands even better material solutions.

Zenite LCP 251 is one example. It has a very low and consistent Dk (~3.0 at 10GHz) and Df (0.003 at 10 GHz) across a wide range of temperatures and electronic frequencies (values are determined by the IEC 61189-2-721 method). The compound has low moisture absorption (around 0.02% in high humidity, determined via ISO 62) and high heat resistance (Heat Deflection Temperature, HDT, under 1.8MPa load, is 290°C (ISO 75-1)).

Celanese says that in high-frequency applications, the low moisture absorption requirement of thermoplastics is becoming increasingly important; this is because moisture uptake by a polymer can result in a substantial increase of Dk value, which can vary widely depending on humidity. This may lead to unexpected noise or malfunction in high-frequency devices. "This is one of the reasons why high temperature-resistant polyamide-based products can be replaced with this new LCP product," claims the company.

Another benefit of this new grade is its high flow, even in parts with very thin walls (down to around 0.2mm); this is due to its particular shear-thinning effect, which is higher than in other LCPs. This makes it possible, for instance, to create slim, fine-pitch connectors with thin walls.

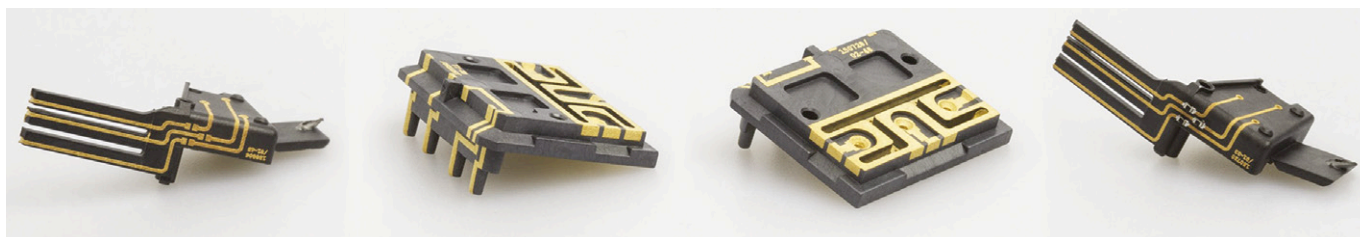
Apart from low-Dk Zenite LCPs, Celanese says it can also tailor the Dk/Df ratio in LCPs, making it possible to have a material with a Dk in the range of 4-25 at 2 GHz while maintaining the Df value as low as possible. The Dk value is closely related to the antenna function of a component. The Df value is directly related to signal loss: signal loss can be improved by maintaining a Df as low as possible. "The problem is that maintaining a low Df while substantially increasing Dk is difficult without



**Akromid C3 GF 25 1 FR from Akro-Plastic is suitable for different connectors on two-wheelers with electric drives. This material is said to be strong but still ductile enough to withstand the dynamic loads during operation**



IMAGE: ENSINGER



compromising mechanical strength, because a high filler content may be required," says Celanese. High-Dk Zenite LCPs are said to overcome the problem through a combination of a proprietary filler, compounding, and LCP resin technology.

Staying with LCPs, **Ensinger** has a new compound for laser direct structuring (LDS): Tecacomp LCP LDS 1049426 black is designed for thin-walled 3D MID (Moulded Interconnect Device) components with very fine conductor paths. The supplier says the material is particularly suitable for high-frequency applications in the fields of industry automation, electronics (consumer, networks) and the automotive sector.

"The requirements being placed on integrated electronics components are increasing: on the one hand, installation spaces are getting smaller, while on the other, more and more functions are having to be accommodated even on micro-components," says Thomas Wallner, Head of Sales and Marketing of Compounds at Ensinger. "5G is also increasing the frequency requirements for circuit carriers. Our new compound permits very good fine pitch performance and metallisation that is not too rough. Both these things are basic prerequisites for high-frequency applications. Tecacomp LCP LDS is also reflow-solderable up to 260°C."

Wallner says an innovative filler concept used in the new compound increases the reliability of the conductor structures when exposed to varying stresses, both climate-related and mechanical. The first achievement is a low level of moisture absorption, and the second an adapted coefficient of thermal expansion (CTE) comparable to that of copper. Mineral fillers with a particle size of under 10µm permit very fine conductor path structures, so that very narrow pitch widths of less than 70 µm are made possible in 3D.

"Beside the very wide range of solutions for the E&E markets we have now a very unique solution for the so-called 'no-flame test' which is already mandatory for many applications ... and maybe electrical vehicles if they happen to be considered as unattended devices." That's according to Alexis Chopin, head of technology at, **Eurostar Engineering Plastics**.

Compliance with the IEC 60335-1 standard for household appliance applications has always been

challenging to achieve, due to stringent GWIT (Glow Wire Ignition Temperature, IEC 60695-2-13) requirements, Chopin says. "As a result, many halogenated flame retardant solutions are still in use for applications that need to pass this standard."

He says: "Eurostar has developed Starflam PA630VNF3, a 30% glass-filled, easy-moulding PA6 with outstanding fire resistance in glow wire tests."

Chopin says the grade makes use of new flame retardant synergies that make it possible to outperform current market solutions with a GWIT value of 800°C, exceeding the well-known "775°C" standard requirements. These results have been confirmed by the German VDE and two appliances manufacturers selected as industrial validation partners. This new technology is based on an additive package that is free of halogens, red phosphorous, zinc borate and antimony trioxide, and is fully compliant with restrictions of Hazardous Substances (RoHS) and Waste Electrical and Electronic Equipment (WEEE) directives.

**Mocom** is the new name of the compounding business that was until recently a division of Albis Plastic. It has developed Altech PP, Tedur L PPS, and Alfater XL TPV compounds with very high purity to provide long service life and performance of fuel cell systems. The company says stationary fuel cell technology is playing an increasingly important role. "Converting electricity from renewable resources such as wind and solar power into "green" hydrogen, store it and converting it back into electrical power with no emission could be one of the main technologies of the future," it says.

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**Ensinger has**  
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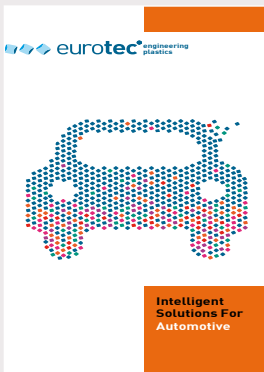
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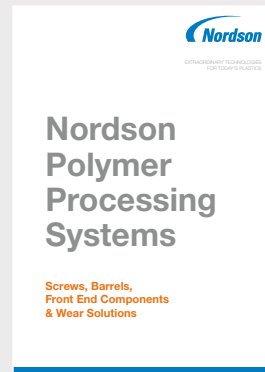
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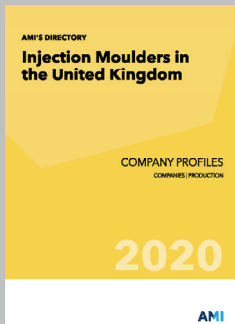
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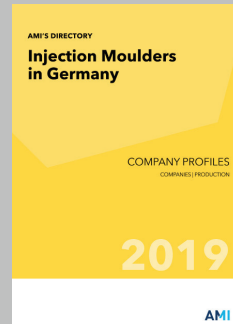
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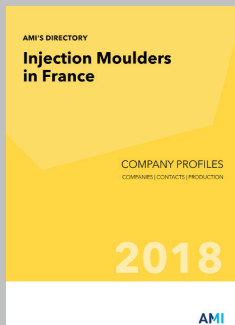
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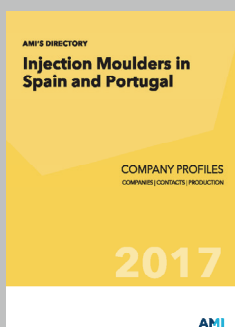
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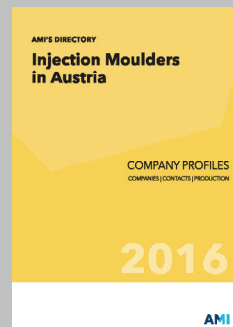
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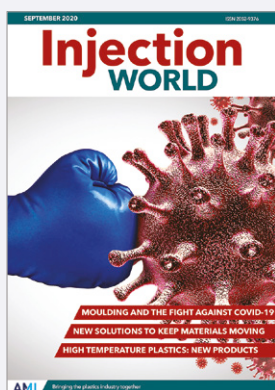
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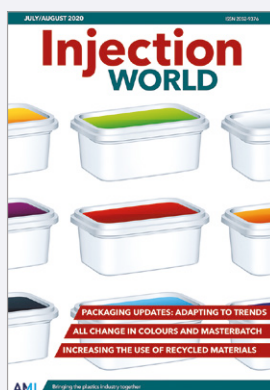
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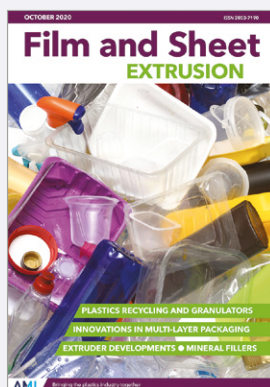
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	5-8 December	Plast Eurasia, Istanbul, Turkey	<a href="http://www.plasteurasia.com/en">www.plasteurasia.com/en</a>
2021	9-12 January	Arabplast 2021, Dubai, UAE	<a href="http://www.arabplast.info">www.arabplast.info</a>
	11-14 January	Plastimagen, Mexico City <b>NEW DATE</b>	<a href="http://www.plastimagen.com.mx">www.plastimagen.com.mx</a>
	4-8 February	PlastIndia, New Delhi, India <b>POSTPONED</b>	<a href="http://www.plastindia.org">www.plastindia.org</a>
	13-16 April	Chinaplas 2021, Shenzhen, China	<a href="http://www.chinaplasonline.com">www.chinaplasonline.com</a>
	4-6 May	Kuteno, Rheda-Wiedenbrück, Germany <b>NEW DATE</b>	<a href="http://www.kuteno.de">www.kuteno.de</a>
	4-7 May	Plast 2021, Milan, Italy	<a href="http://www.plastonline.org/en">www.plastonline.org/en</a>
	17-21 May	NPE 2021, Orlando, FL, USA	<a href="http://www.npe.org">www.npe.org</a>
	1-2 June	Compounding World Expo Europe, Essen, Germany <b>NEW DATE</b>	<a href="http://www.compoundingworldexpo.com/eu/">www.compoundingworldexpo.com/eu/</a>
	15-18 June	FIP, Lyon, France <b>NEW DATE</b>	<a href="http://www.f-i-p.com">www.f-i-p.com</a>
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	12-16 October	Fakuma, Friedrichshafen, Germany	<a href="http://www.fakuma-messe.de">www.fakuma-messe.de</a>
	3-4 November	Compounding World Expo USA, Cleveland, USA <b>NEW DATE</b>	<a href="http://www.compoundingworldexpo.com/na/">www.compoundingworldexpo.com/na/</a>

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2-3 December 2020	Thin Wall packaging, Cologne, Germany
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