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German plastic machine orders fall in H1 2020

The German plastics machinery sector "nosedived" in the first half of this year, with a 20% fall in orders compared to the same period in 2019.

VDMA, the trade organisation that represents
German machinery manufacturers, said that this decline in orders is a continuation of poor results for 2019 - when exports declined by nearly 7%.

"The pandemic was the stab in the back for customer industries that had already been performing badly," said Thorsten Kühmann, Managing Director of VDMA KuG. "However, we also notice that many machines are being supplied - particularly to the medical engineering and packaging sectors."

Exports for the first five months of this year were down by 19% compared to the same period in 2019, said VDMA. Sales to China and the US both fell by 3% due to the effects of the



Kühmann: "Pandemic was a stab in the back for industries that had already been performing badly"

Coronavirus pandemic.

However, while the decline in exports to the US is "only the beginning", VDMA said there were positive signs for future exports to China.

Exports to several
European markets were also affected, including Italy (down 31%), France (down 42%) and Spain (down 48%).
While there was also a 73% reduction in sales to India,

exports to Russia (up 28%) and Turkey (up 102%) both improved.

"The majority of manufacturers expect a turnover decline of up to 30% in 2020," said VDMA.

Most machinery manufacturers expect to wait until 2022 to see turnover volumes return to 2019 levels.

"For the second half of 2020, many expect incoming orders from Western Europe and China to recover, which indicates the first signs of a turnaround," said VDMA.

The organisation has also released full-year results for 2019 - which show 1% fall in sales and a 7% decline in exports.

Sales of core machinery slipped to €7.8 billion - the first fall in 11 years - but more ominously, orders fell by 14% (fuelled mainly by a 24% decline in orders from the European Union).

> http://kug.vdma.org

Technimark buys Irish moulder

Technimark, a US firm which makes custom rigid plastic packaging and components, has acquired Tool & Plastic Industries, an Irish supplier of injection moulded products for the medical device, pharmaceutical and consumer products sectors. Terms were not disclosed.

Previously privately owned by its joint founders, Tool & Plastic is based in Longford, Ireland, with another facility in Ostrava in the Czech Republic. Both of the facilities have ISO class 8 cleanroom environments for moulding and assembly operations.

The combined company will have 13 facilities and over 4,400 employees worldwide, including its existing sites in the US, the UK, Mexico, China and Germany.

> www.technimark.com

Fraunhofer IWU expands Zittau centre

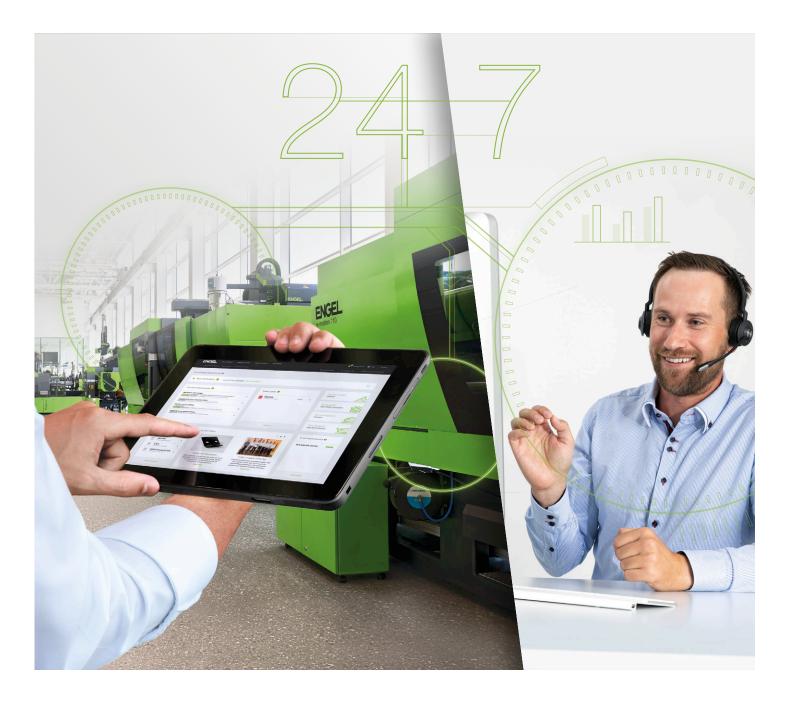


Computer image of how the Fraunhofer IWU centre will look

The Fraunhofer Institute for Machine Tools & Forming Technology (IWU) is investing €6m to add a large research hall with advanced processing machines and analysis equipment at its plastics technology centre in Zittau, Germany, by 2022. A formal ground-breaking ceremony took place on 21 August.

The investment will enable Fraunhofer IWU to significantly expand research into lightweight construction, industrial 3D printing and automation, the institute said. This will increase space there from 146 to 700 m². The number of researchers at the technical centre, which has been open since 2016, will double to 40.

> www.iwu.fraunhofer.de



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Nolato acquires GW Plastics

Swedish firm Nolato has agreed to acquire US-based medical injection moulding group GW Plastics for SEK 2bn (approximately \$230m). Subject to US regulatory approvals, the transaction is expected to be completed in September. It is expected to give a marginal boost to Nolato's earnings for the current year.

"This acquisition provides us with significant volumes and a strong position on the key North American continent," said Nolato President and CEO Christer Wahlquist. "It supports relationships with existing customers, while also creating additional opportunities for growth and expanding our customer base."



GW employs 1,100 people at seven facilities in three continents

GW is headquartered in Bethel, Vermont. It employs 1,100 employees at seven manufacturing plants in the US, Mexico, China and Ireland, which operate through a high-tech standardised global manufacturing platform. It has annual sales of SEK 1.8bn (about \$200m) with an EBITA margin of around 7%.

Medical devices account for about 80% of GW's turnover and vehicle systems the remainder. They will be reported as part of Nolato's Medical Solutions and Industrial Solutions business areas respectively. Nolato itself is mainly active in medical technology, pharmaceuticals, consumer electronics, telecoms, automotive and hygiene sectors.

Wahlquist added: "GW Plastics is a well-managed, well-invested company that is a great fit with our corporate culture. The business, which has historically demonstrated healthy organic growth, has extensive know-how in engineering and technology. Together with its size and geographic presence, this provides an ideal strategic combination with Nolato and enables significant market synergies over time."

- > www.nolato.com
- > www.gwplastics.com

IN BRIEF...

Switzerland's Beck Automation has broken ground and laid the foundation stone for its new building in Portugal. It is due to move in to the building in the spring of 2021. This will give the company an extra 2,800 m² of space, accommodating over 60 employees.

www.beck-automation.com

KraussMaffei's Austrian subsidiary is extending its sales cooperation with Luger Purkersdorf near Vienna to the firm's eponymous brand of injection moulding machines, with effect from 1 September. Luger had hitherto distributed the Netstal brand and Krauss-Maffei extrusion products. www.kraussmaffei.com

Greiner's not-so-hot pot

A noodle pot produced by Greiner for Nissin food group is injection moulded in heat-resistant PP copolymer and has design features to reduce heat further.

The pot is tiered to create a cushion of air between cup and cardboard wrap to decrease the temperature on the surface. Due to the tiered design, the cardboard sleeve is only in partial contact with the cup, so the sleeve doesn't get as hot. The noodles sold by Spanish supermarket chain Mercadona have another packaging benefit - a perforated PP lid for the consumer to drain hot water once the noodles are cooked.

> www.greiner-gpi.com



Mocom emerges from Albis

Otto Krahn Group has completed the split of its distribution and compounding operations, which was first announced back in October 2019, with compounding now operating under the new Mocom name and distribution

continuing under Albis.

The compounding business is headed by CEO lan Mills, formerly Chief Sales Officer within Albis. Mocom has three manufacturing operations in Germany and production sites at Duncan in South Carolina

in the US and Changsu in China. The Albis distribution business will be headed by CEO Horst Klink, former Vice-President of Distribution at Albis. It has 24 locations worldwide.

- > www.albis.com
- > www.mocom.eu



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Fakuma shifts to 2021

Fakuma organiser PE Schall has called off its 2020 show, which was due to take place in October in Friedrichshafen in Germany. The next event will take place on 12-16 October 2021.

"Together with all involved parties, we struggled for a

long time to amend the general conditions demanded by the corona pandemic in such a way that Fakuma 2020 could have been promoted successfully," said Bettina Schall, Managing Director of PE Schall.

The 2018 event attracted



47,560 visitors. Schall said a hygiene and security concept that met all the prerequisites was developed for the show but "current uncertainties amongst exhibitors and visitors...with regard to travel and sending employees to events" had convinced it not to go ahead with a 2020 event.

Over the past few months a number of major long-time Fakuma exhibitors had indicated they would not "actively participate" in the 2020 show, which was generally interpreted to mean no machinery exhibits and few, if any, staff.

> www.fakuma-messe.de

Moldworx combines facilities

Moldworx has opened a new 24,000 sq foot facility in Gilbert, Arizona, US, which combines two previous facilities for mould and equipment manufacturing, and for injection moulding. This, the company said, will enable it to achieve greater efficiencies and collaboration among departments.

The company also recently added two injection moulding presses, bringing its total to ten ranging from 55 to 400 tonnes. It now plans to offer white room moulding services for the medical industry.

Recently, Moldworx began making FDAapproved face masks from a pliable thermoplastic polyurethane material and has donated 2,000 to healthcare professionals in Arizona. The company currently employs 55 people.

> https://moldworx.com

Private equity buyer for IPL Plastics

IPL Plastics has agreed to be acquired by a specially set-up entity owned by the Chicago private equity firm Madison Dearborn Partners, subject to shareholder agreement and regulatory approval.

The agreed price of C\$10.00/share values IPL at C\$981m on an enterprise basis. During an interim period, the company will be able to solicit a higher offer, which the MDP funds will have the option of matching.

The largest shareholder, Caisse de Dépôt et Placement du Québec, will retain a stake of about 24.9% after completion and will continue to hold governance rights in respect of material modifications to certain IPL activities in Quebec.

IPL is active in sustainable packaging for the food, consumer, agricultural, logistics and environmental markets.

> www.iplglobal.com

US machinery market uptick in Q2

Primary plastics machinery shipments in North America increased by 4% from the previous quarter to reach \$263.4m, reported the Plastics Industry Association's Committee on Equipment Statistics.

The value of shipments of injection moulding equipment was up by 11.4% from the first quarter, but down

by 8.5% from the second quarter of 2019.

Plastics machinery exports in the second quarter totalled \$289m, a 21.0% drop from the previous quarter. Imports rose by 15.0% to \$649.5m.

Perc Pineda, Chief Economist at the association, said: "Although primary plastics machinery shipments are still lower than the previous quarters, the second quarter uptick is consistent with gradual improvement in the US economy."

The statistics committee's quarterly survey of plastics machinery suppliers regarding market conditions found 40.0% of respondents expect conditions to either

improve or hold steady in the third quarter versus 18.5% who felt similarly in the first quarter. As for the next 12 months, 24.0% of respondents expect market conditions to be steady or better, slightly above the 22.6% who felt similarly in the previous quarterly survey.

> www.plasticsindustry.org

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Sumitomo (SHI) Demag stays positive as orders increase

Injection moulding machinery manufacturer Sumitomo (SHI) Demag held a ground-breaking ceremony on 29 June for the next project phase in its growth strategy: a lightweight warehouse with 1,600 m² of floor space at its site in Schwaig, Germany. This will facilitate direct material flow from goods receipt and the dispatch loading zone to production.

Sumitomo (SHI) Demag has invested nearly €20m to modernise facilities and equipment at its two German sites. It has also completed the expansion and modernisation of the training centre at Schwaig. It now has a team of eight providing training in machine technology, application technology and robotics, plus media facilities for online training.

During the first half of 2020, Sumitomo (SHI) Demag reported separately, the value of incoming orders for

Senior staff at Sumitomo (SHI) Demag's expanded training centre in Schwaig, Germany



machines produced in Germany and China rose by almost 25% over the first half of 2019. It now expects the year as a whole to be 17% higher.

Gerd Liebig, CEO, attributed this mainly to the company's focus on the growing packaging and medical technology sectors. This helped the firm to weather difficult times in the automotive market and, to a lesser

extent, consumer products, where the "tense situation on the labour market and the declining propensity of consumers to buy" have constrained investment by moulders.

IMAGE: SUMITOMO (SHI) DEMAG

The other German site at Wiehe is now operating at full capacity and the company will start producing all-electric small machines there in November.

> www.sumitomo-shi-demag.eu

Investment progress at Talisman Plastics

UK injection moulder Talisman Plastics said that it is "well advanced with plans to increase capacity, efficiency and performance" in the second year of a five year-long series of investments. This involves

decommissioning older machines and bringing in new ones at its site in Malvern, in order to boost product precision, save energy and reduce time lost to maintenance.

The number of machines

has been reduced from 32 to 27 and will reach 24 after five years. Overall equipment efficiency and production capacity are both "significantly improved", Talisman said.

"Proof of the progress made is in a 12% saving in energy costs, despite a 14% increase in the actual number of days worked during 1H 2020," said Managing Director Shaun Champion.

The most recent machine to be added at the site is a 160-tonne Haitian Mars machine incorporating a robot and printer, thus providing a work cell capable of 24/7 continuous

production.

Talisman estimates it has manufactured 32 million of its clinical waste ties over the last year after increasing production to supply NHS trusts across the UK. James Mulvale, Business Development Manager at Talisman Plastics, said: "During the peak of the pandemic, understandably every NHS trust we supply wanted to maintain a full stock of our clinical waste ties. Thanks to the increase in our production capacity we were able to meet a monthly order of 30,000 of our Taliloc product." This was achieved while reducing lead time, he said.

> www.talismanplastics.co.uk

Right: Nathan Flanigan, Senior **Project Engineer,** with some of Talisman's crucial clinical waste ties



MAGE: TALISMAN

AMI postpones European and North American plastics expos

AMI has announced that its plastics industry exhibitions - which were scheduled to take place in Germany in October and in the USA in November this year - have been postponed until June and November next year.

Ongoing uncertainty created by Coronavirus pandemic led to the decision to delay the Compounding World, Plastics Recycling

World, Plastics Extrusion World and Polymer Testing World Expos according to AMI, which publishes Injection World.

The four focused exhibitions will now be held at Messe Essen in Germany on 1-2 June 2021 and at the Huntington Convention Center in Cleveland, Ohio on 3-4 November 2021.

Rita Andrews, Head of Exhibitions at AMI, said: "We have been reviewing the fast-changing situations in Europe and America daily, and have been consulting with exhibitors, the venues, and local authorities.

Our primary concerns are for the



This year's events in Europe and the USA have been postponed until 2021

health and safety of all attendees at our events, and delivering the very best audience for our exhibitors. With these factors in mind, we have taken the decision to postpone both expos to next year."

AMI announced the decisions to reschedule the events in early August of this year.

Andy Beevers, Events Director at the company, said: "We felt it was important to make and announce these decisions now, in order to end the

Essen, Germany 1-2 June 2021 Cleveland, USA 3-4 November 2021

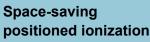
> current uncertainty and to allow exhibitors, speakers and attendees to plan effectively for the new dates. We have had tremendous support and understanding from the industry during this process and are now all looking to forward

to returning to Essen and Cleveland with successful shows next year."

Admission to the four expos and their five conference theatres will continue to be free of charge. Registration for the Essen event will re-open later this year, while registration for Cleveland will restart next year. Visitors who have already registered for the 2020 events will simply be able to renew their free tickets for the 2021 exhibitions.

Any companies interested in exhibiting at the Essen or Cleveland events should contact AMI's expo team (on exhibition_sales@ami.international).

> www.ami.international/exhibitions





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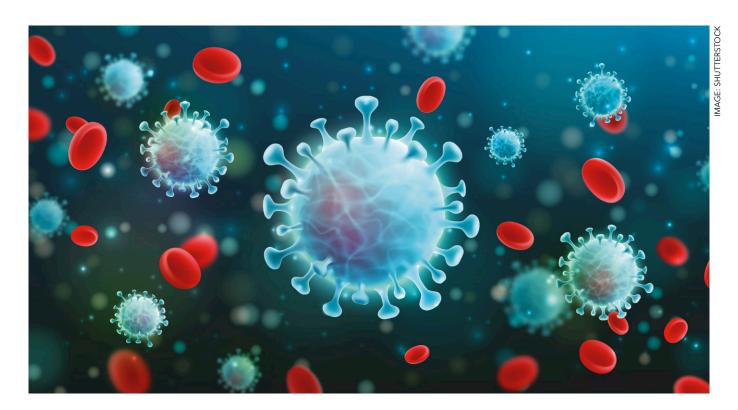












Gauging the business impact of the Covid-19 pandemic

The Covid-19 pandemic has hit the global economy hard. A new survey by Injection World publisher AMI measures the impact on the plastics industry and expectations for recovery

The global plastics industry has certainly not escaped the impact of the Covid-19 pandemic with more than 60% of businesses experiencing a reduction in activity of 10% or more over the first half of the year, according to the findings of a global survey of plastics industry business sentiment carried out by Injection World publisher AMI in the second half of June. However, the survey also reveals a high level of optimism among plastics industry players – more than 60% of respondents expect their business to have returned to per-Covid-19 levels by the end of 2021.

Unsurprisingly, the AMI survey confirms that the impact of the Covid-19 pandemic on the plastics industry was both sudden and significant. Most respondents experienced a negative impact on business activity during the first half of the year with a significant minority seeing their activity decline by 20% or more. It was also clear from responses that the impact of Covid-19 was felt at different points in time around the world - China in the first quarter, the rest of Asia together with Europe and North America around March, and South America and the Middle East and

Africa through Q2. Aside from the timing, however, the business impact appears very similar in each region.

For the majority of the participating businesses - some 70% - the impact on their business was negative in H1, with 40% seeing a reduction in activity of 20% or more. The data shows that resin producers and masterbatch makers experienced some of the biggest immediate hits, most likely as a result of processors taking the opportunity to de-stock and use up inventory (which may correspondingly mean they see a faster pick-up). Companies active in automotive and transport

were also hit hard, with 91% reporting a negative impact and more than 60% seeing a decline of 20% or more on H1 2019.

However, 14% of respondents reported no significant impact on their business, and 14% identified better than expected levels of activity. Businesses involved in flexible food packaging markets were the most bullish, with 30% of those experiencing an increase in business activity in the first half of the year compared to an industry average of 10%.

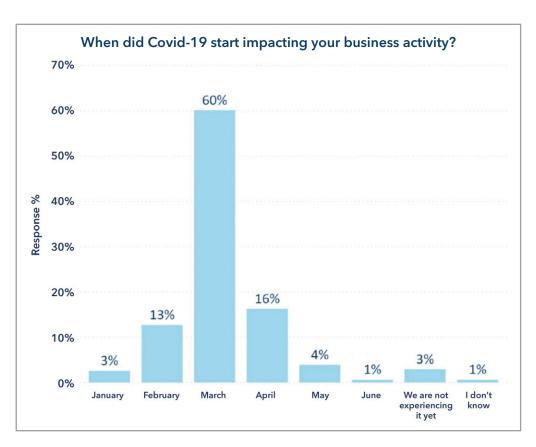
In terms of the challenges the pandemic presented to plastics businesses around

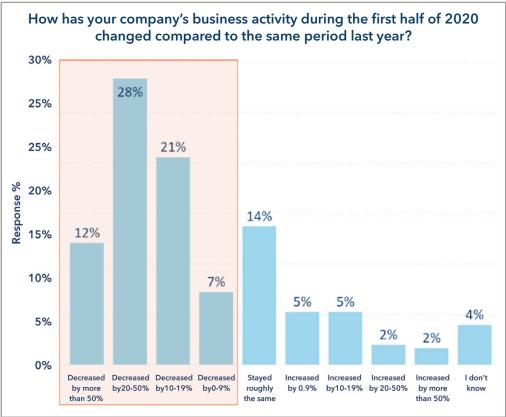
the world, the biggest by some margin was the sudden drop in demand, which was identified by 66% of respondents. Other key challenges included staff working from home (cited by 49%), implementing Covid-19 workplace safety measures (44%), logistical difficulties (31%) and material shortages (28%). For a minority of firms – 20% - the need to meet sudden demand spikes was a significant challenge.

Production impact

Given that the majority of these and other less commonly identified business challenges were negative, it is no surprise to see that production capacity was impacted. Almost half of respondents (48%) said production was reduced against just 8% that recorded increases. Capital investment plans have also been negatively impacted with more than 40% flagging an immediate or significant reduction. Spending on new product development and sales and marketing remain neutral across the surveyed companies (meaning any intended reductions are balanced by planned increases).

In terms of the response to the Covid-19 challenges, the most intense focus is identifying and targeting new market opportunities. This was cited as a priority by 49% of respondents. Other common actions mentioned by respondents included renegotiating supplier contracts (23%), reducing sales prices (22%), identifying alternative materials and components





(20%), and collaborating more closely with local companies (19%).

Other responses include reducing staff training

(16%), streamlining product lines (15%), extending maintenance schedules (14%), and delaying supplier payments (13%). Despite the disruption the pandemic caused to global supply chains, only 3% of respondents said reshoring of production was a priority.

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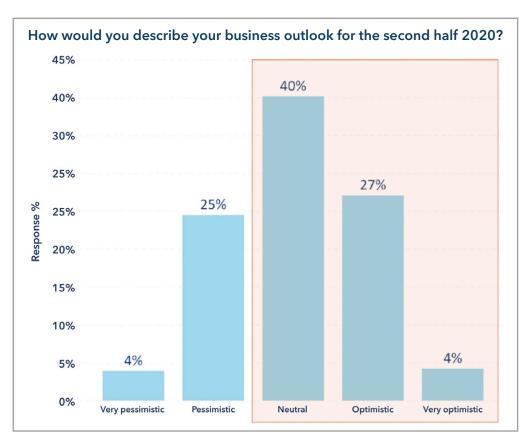
The number of respondents was too small to be certain on any sectorial trends, but companies involved in flexible non-food packaging and rigid packaging showed a slightly higher interest in localisation of production.

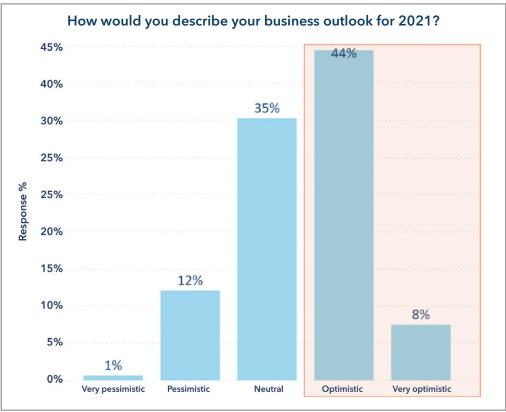
Optimism evident

The survey confirms that many plastics companies experienced business conditions and impacts on an unprecedented scale and with no forewarning. However, optimism remains intact across much of the sector. More than 30% of respondents said they were optimistic or very optimistic for their business in the second half of the year, rising to more than 70% when including those with a neutral (no better, no worse) view. Less than 30% held a pessimistic view while 21% expect their business activity to return to pre-Covid-19 levels during this year.

Extending that timeframe to 2021 reveals an even brighter outlook, with 52% of respondents holding an optimistic view against just 13% pessimistic. In fact, the survey reveals 64% of respondents expect their business activity to be back to pre-Covid-19 levels by the end of 2021. Of those expecting a slower return to pre-pandemic activity levels, 30% are forecasting 2022 and just 6% beyond that.

In terms of the strategic actions plastics business are planning over the next two years to realise this recovery to pre-Covid-19 levels, the majority of companies said they will maintain or increase their activity in research and development





(88%), sales and marketing (89%), and new product development (89%).

More than 60% of respondents said they would

also increase their efforts to develop new markets. In terms of market focus, the survey revealed a 5% swing among respondents to medical and 2% swings to non-food flexible food packaging and to construction/infrastructure. Automotive and transport,

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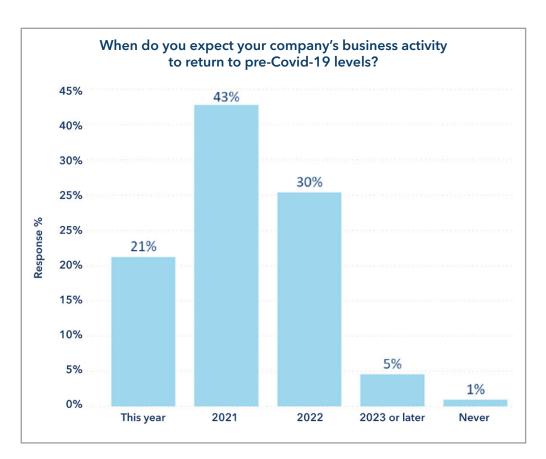
however, saw a -4% swing. That suggestion of the waning appeal of automotive is, perhaps, unsurprising given the stress the sector has experienced during the pandemic, with many car plants at a complete standstill.

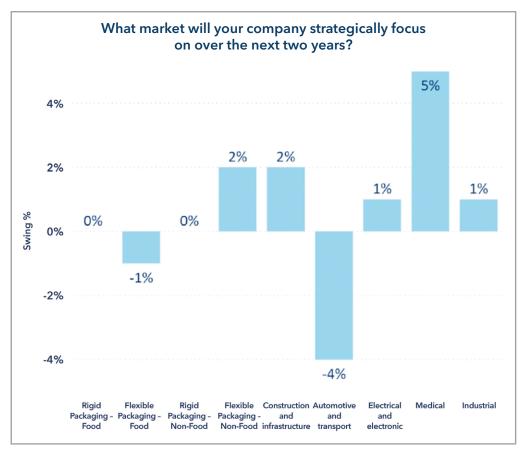
About the study

This article is based on a survey of the business sentiment, experiences and plans of 306 plastics companies around the world carried out by Injection World publisher AMI over the period from 24 June to 5 July 2020. Responding companies were located in all five regions of the world and covered the entire plastics industry supply chain.

Classified by geography, 57% of survey respondents were based in Europe, 21% in North America and 15% in Asia. Analysed by position in the plastics industry value chain, 27% were processors, 16% resin suppliers, 15% machinery suppliers, 12% additive suppliers and 12% compounders. Plastics end users accounted for 3% of the survey respondents and recyclers 4%.

In terms of principal plastics markets, 21% of survey participants were involved in flexible food packaging, 13% in automotive and transport, 12% in construction and infrastructure, 8% in rigid food packaging and 5% in electrical and electronic. Non-food rigid and flexible packaging accounted for a further 7%.





The data was reported and discussed online in AMI's Plastics and the Pandemic Virtual Forum on 21 July 2020. That can be viewed on demand HERE.

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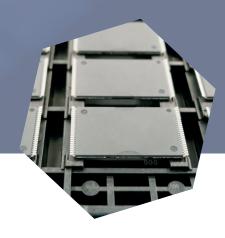
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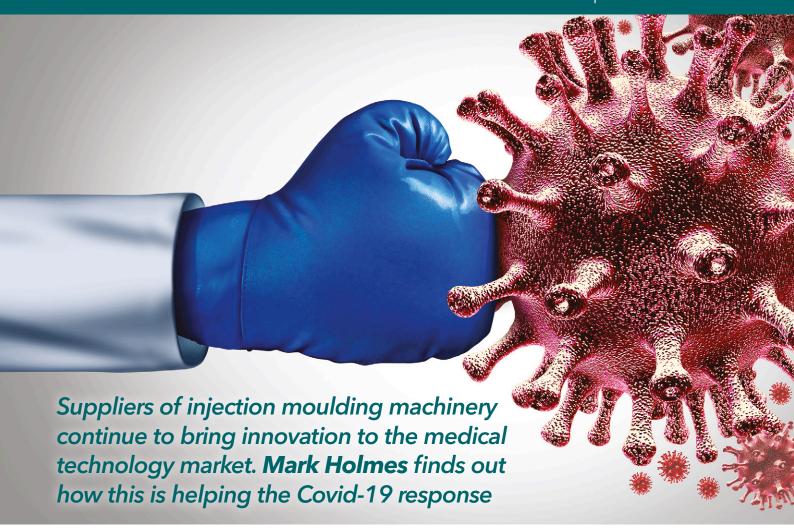
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Machinery manufacturers bring the fight to Covid-19

Due to the current Covid-19 pandemic demand for medical products, and personal protective equipment (PPE) in particular, has never been greater. Manufacturers of injection moulding machinery have been observing a rapidly expanding medical technology market for many years. However, events in 2020 have also meant the need for these suppliers to respond rapidly to changing market needs and meeting the global challenge.

The medical technology market continues to grow dynamically and offers opportunities for development in multiple directions, according to Arburg. "On the one hand, this is because new materials continually enter the market and expand the areas of application, while on the other we are constantly seeing technical advances in mould technology and in processes that can be applied to medical technology, for example in micromechanics and microfluidics," says Martin Manka, Senior Sales Manager Medical. "The operative terms in

this context are silicone processing, micro-injection moulding and multi-component processing."

He continues: "One trend is the increasing use of single-type materials instead of mixed materials. This also allows for an increased recycling rate. If you look at the amount of plastic waste generated in hospitals, for example, and their current recycling rate of only around 10%, we can clearly see that much more can be done to increase this percentage. In future, the increased use of biobased, recyclable and biodegradable materials will be of help in this respect."

The areas of healthcare and diagnostics are showing significant growth. "The general desire among people to monitor their health gives rise to an increased demand for pipette tips in diagnostics, for example," Manka says. "In addition, there are the areas of personal care and preventive healthcare. This includes smartwatches and other measuring devices that can be used to check and evaluate



Above: Arburg Allrounders and **Freeformers for** the cleanroom

information such as pulse, calorie consumption, movement and sleeping patterns at any time. Other popular products are insulin pens for diabetics and filters for dialysis. Another development step relates to smart devices with integrated electronics such as analysis chips that can communicate with smartphones. Lab-on-a-chip technology, which has revolutionised diagnostics, is also a dynamic development trend. It is increasingly replacing conventional laboratory diagnostics and also making it possible to realise more individual therapies."

In mass production, efficient processes are key due to the high cost pressures in this market. Arburg says that the hybrid and electric Allrounders are designed for efficient and high-quality series production for applications in the personal care, medical and pharmaceutical industries, producing items such as pipette tips, syringe barrels and closures. They offer short cycle times, reproducibility and reduced energy requirements, as well as process stability and a long service life. They also provide better emission ratings than hydraulic machines. In addition to the increasing automation of production processes, the use of high-speed, high-performance machines for pharmaceutical packaging is another key area. There are increasing synergies with the packaging sector, where Arburg adds that it also has a high level of expertise.

Manka says Arburg is also seeing a rising demand for turnkey projects in the field of medical technology. Integrating quality inspection and assembly equipment downstream of injection moulding is increasingly eliminating human intervention and product contamination.

The trend towards more individual therapies increasingly requires production of small-volume batches, down to one-piece flow. "For the implementation of such tasks, Arburg has the Freeformer in its portfolio, an industrial system for additive manufacturing," adds Manka. "Freeformers process qualified standard materials, enabling the use of a wide range of original materials as well as material and colour combinations. This includes medical

grade thermoplastic elastomers or resorbable polylactide (medical PLA). The parts are of high quality and stability. Droplet size and process control can be specifically influenced, resulting in individual customisation options. Potential applications include the individualisation of medication. A Freeformer could be used to produce individual medications that could be optimised in terms of dosage and type of release of the active substance, or even of combinations of active substances, to meet the requirements of patients and therapy."

One implant example involved resorbable, FDA-approved original material from partner **Evonik**, which is made to imitate human bone. A Freeformer 200-3X machine processed the Resomer LR 706 (a composite made up of poly L-lactide-co-D,L-lactide and B-TCP). The result was implant plates designed for use directly in the body as a means of repairing fractures. The polymer composite imitates human bone and contains 30% ceramic additives (B-TCP), making the resulting component more stable and adding calcium as a means of promoting bone formation. After a certain time has passed, the implant is then fully absorbed. Further applications include medical PLLA (Purasorb PL18) to produce facial and cranial implants or TPE (Medalist MD 12130H) to make individually adapted ventilation masks. The products can also consist of several components, such as a hard/soft combination, and be equipped with a support structure, if required.

Digitalisation of the entire medical technology sector in accordance with the specifications of Industry 4.0 can be achieved with Arburg's host computer system (ALS). "It is all about availability, traceability and the monitoring of validated process windows for product and process reliability," says Manka. "Due to the requirements of unique device identification (UDI), it is essential for



Above: Resorbable, FDA-approved original material from Evonik has been made to imitate human bone in a project involving Arburg's Freeformer technology











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Right: The LSR and PP nose and mouth mask developed by Arburg manufacturers of medical devices to provide proof of complete batch traceability. ALS ensures this shot for shot. Not only are process parameters being monitored, but also machine statuses and maintenance intervals."

Sensitive sectors such as medical technology require reliability. He says: "As a primary contractor, Arburg provides its customers with advice right from the outset, from concept design to the start of production. Whether it is implants, dental drills or syringe barrels, the company has found a suitable medical injection moulding solution for every application – for example by using the electric Allrounder A series, which offers the best cleaning conditions with regard to GMP and ISO 14644-1."

Arburg has Allrounders for medical micro-injection moulding of thermoplastics and elastomers, which it says are flexible enough to meet any customer requirements. Manka says: "As a system service provider, Arburg also offers its customers the support they need right from the start, for example, in the form of customer trials in our Customer Centre or cleanroom laboratory in Lossburg. Powder injection moulding (PIM) for dental applications is another field of significant interest for Arburg in medical technology. Examples of such injection-moulded metal (MIM) or ceramic (CIM) products are dental root pins (jaw implants) and dental crowns."

The flexible Arburg micro-production cell can produce the extremely small parts and micro implants required for minimally invasive procedures. At K2019, an electric Allrounder 270 A with 350 kN clamping force, equipped with a size 5 micro injection unit, an 8 mm screw and an LSR cartridge with a capacity of 290 ml, produced LSR caps for micro-switches, each weighing just 0.009 g. The cartridge contained the two-component material Elastosil LR 3005/40 (hardness 40 Shore A) as well as white pigment, pre-mixed precisely and homogeneously. The shot weight was 0.072 g. The

Below: An implant dures. A Allrounder 270 350 kN A produced micro ir delicate LSR cartridge caps for caps for micro-switches, each weighing just 0.009 grams produced implant implant in the produced micro and produced implant in the produced impla

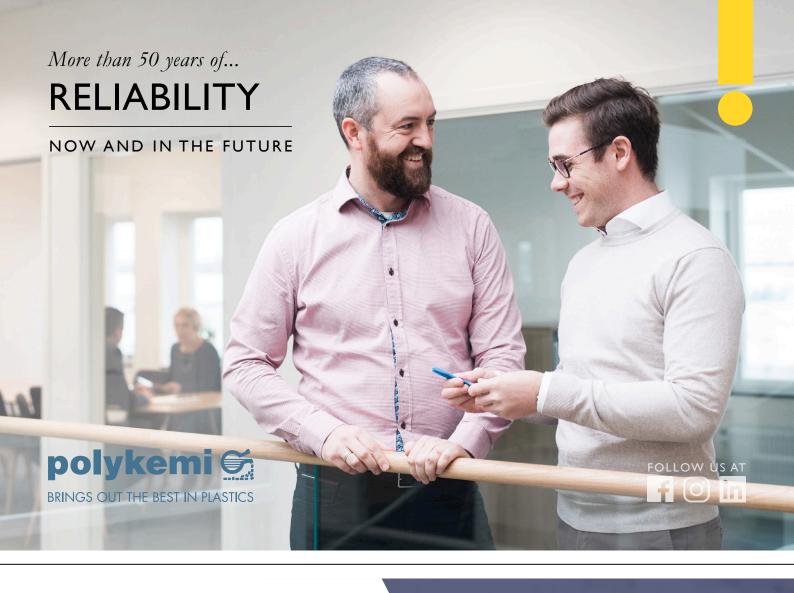




components were injection moulded directly in an 8-cavity mould using a cold runner system with shut-off nozzle. A clean air module with ionisation, situated above the clamping unit, prevented electrostatic charges. A sensor integrated in the feeder ensured additional process reliability. The recorded values were graphically displayed and monitored by the Selogica ND control system. The moulded parts were removed by a horizontally operating Multilift H 3+1 robot and were visually inspected and measured for complete filling directly in the gripper. After integrated camera inspection, the robot system transferred the good parts to a packaging station, where three shots of caps were individually packed in bags which were then sealed and ejected.

The company says that the Allrounder Cube machines, which are specifically adapted for use with cube moulds, are well-suited to the packaging sector and therefore ideal for the production of medical technology products. Their servo-electric toggle-type clamping unit allows for high-speed cycles with reduced energy requirements – an ideal basis for efficient high-volume production at reduced unit costs. The cube machines are used, for example, in the production of caps and pharmaceutical containers.

Arburg has produced high-quality LSR masks and safety goggles using four injection moulding machines in a speedy development at its head-quarters in Lossburg, Germany, to assist in the fight against the Covid-19 pandemic. The equipment has been distributed to employees, as well as to nursing staff in charitable and medical facilities in the region. It says that it implemented the safety goggles project quickly with Swiss speciality chemicals group **Ems-Chemie** and German protective and safety glasses manufacturer **Uvex**. Based on the fully automated production of sunglasses as a





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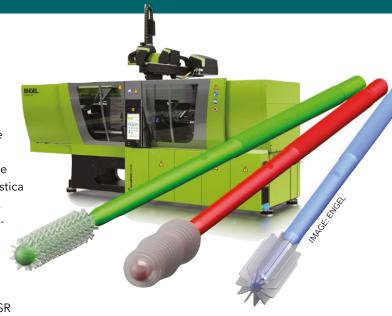


demonstrator at K2019, the safety goggles could be produced quickly using the same tools and design. Ems agreed to the use of the tool and Uvex made the goggles usable for the new application with quick certification. The goggles are produced in one piece on an electric Allrounder 570 A with the Gestica control system in a cycle time of about 50 s.

In May, the company also started production of LSR and PP mouth and nose masks for everyday use. The injection moulds for the LSR and PP components were built in five weeks. An Allrounder 570 A with a clamping force of 2,000 kN produces the LSR masks with a 4-cavity mould from Polar-Form in the Arburg Training Center, while an Allrounder 520 E Golden Electric with a clamping force of 2,000 kN and a 2-cavity mould from Foboha simultaneously produces the PP shields in the Customer Center. The larger injection moulding machine operates with an LSR dosing unit from Elmet and a six-axis robot from Kuka, which removes the flexible masks from the mould in a demanding moulding removal process and places them on a conveyor belt. In the second machine, a linear Multilift Select robotic system takes over the handling of the PP shields. Finally, the PP label is manually placed on the silicone mask with form closure, the mask is completed with elastic straps and packed.

Future developments in medical moulding will involve increased environmental awareness, according to Manka. "New solutions need to be found to reduce or recycle hospital waste," he says. "Leading pharmaceutical and medical technology manufacturers have set themselves the goal of making an important contribution in this respect. Wherever possible, biodegradable polymers are used that can be composted after use. A second approach is to avoid mixed materials, for example different plastics that cannot be used as recyclates, or composites made of metal and plastic. In the pharmaceutical sector, packaging is part of the product and must therefore also be approved.





Above: Engel and Hack Formenbau jointly developed and optimised the process for high-volume test swab production. The mould solution, injection moulding machine and automation are precisely tuned for maximum efficiency and quality

Many new medicinal products may no longer come into contact with conservative packaging materials, such as glass. This has led to a renaissance in the field of cyclic olefin copolymers (COC). In addition to its advantages in terms of weight and resistance to breakage, this material is also ideally suited for pre-filled syringes containing biological vaccines."

Engel has collaborated with mould maker **HaidImair** to develop and implement a new mould solution for the production of reusable masks, which is now being used by plastics processing companies worldwide, to help combat the Covid-19 threat. Engel says that it is delivering injection moulding machines geared for this, in record time.

The two-piece reusable masks produced by German company Providee, which are injection-moulded from TPE, provide protection for the mouth and nose for use in daily life and in certain work situations, for example in the construction industry. The masks can be cleaned and disinfected and different filter materials can be inserted. In countries that have exempted face masks from medical device legislation due to the Covid-19 pandemic, these masks can be produced and marketed by companies from a wide range of industries. "This solution allows us to help companies change their production at short notice in order to actively participate in the fight against the further spread of Covid-19," says Christoph Steger, CSO of Engel.

Engel adds that it offers injection moulding machines specifically tailored to Haidlmair's mould solution. These include an Engel Victory 330/80 for the single-cavity version, an Engel E-Victory 740/160 for the two-cavity version and an Engel Duo 1560/350 for the four-cavity mould. Engel plants are



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Above: The medical products manufacturing plant at Evco Plastics

Technical advances: a medical moulder's perspective

US medical injection moulder Evco Plastics says moulding systems are continuing to evolve with higher speeds and precision through the continued use and development of electric servo motors and controls. "We are seeing a switch away from hydraulic valve gates to pneumatic to keep the manufacturing floor free of oils," says Mike Busser, Innovation Process Engineer. "For high-heat applications, we are also using high pressure water temperature control units to cool moulds instead of oil heaters."

He adds that polymers are also improving. "Nuclear medicine and sterilisation methods are pushing the upper limits of polymers to withstand these harsh environments, so we are seeing more parts being designed with PEEK, PESU, LCP and LSR. Radiation sterilisation and dimensional stability are also major current market trends for plastics in medical applications at present, as well as the need for transplantable devices. Continued developments in the medical moulding area involve further expansion of Industry 4.0 and the utilisation of CT scanning of moulded parts to help facilitate validation during the IQ-OQ-PQ process."

Evco says that new solutions under development in medical moulding include automated systems for measuring and data analysis to help speed up validations. In addition, recently there has been the need for Covid-19 test kits and diagnostic testing supplies, as well as protective face shields.

"We are currently running 18 machines that produce Covid-19 related products," says Bruce Fallahi, MED Plant Manager. "Most of this capacity represents parts for Covid-19 test kits and diagnostic components, but we are also producing our own proprietary Evco medical face shields, which we sell both wholesale and on Amazon. One of our DNA testing customers recently pivoted their focus from commercial DNA test kits to a saliva-based Covid-19 test kit. We were able to quickly ramp up production of the individual components we were already producing for them, followed by a full kitting line to help meet the severe uptick in demand."

giving the highest priority to the production of machines ordered for Haidlmair's face mask moulds and the company's decentralised machine production ensures the shortest possible lead times.

In another Covid-19 initiative, Engel and Hack Formenbau are collaborating in the high volume production of test swabs, where the demand for nasal and throat swab tests continue to grow strongly. By providing an integrated system solution and process technology consulting, the companies say that they are helping plastics processors to launch high-volume production of two-component test swabs with a short lead time.

The test swabs have a stable thermoplastic handle and a head made of a thermoplastic elastomer to make the examination less uncomfortable for the patient. Hack Formenbau developed this two-component design, initially with three different head design proposals. "We adapt the handle length and shape, the design of the swab head and the materials individually to suit customer requirements," says Gunnar Hack, CEO and owner of Hack Formenbau. The development objective is to combine high product quality with high-volume output and cost-effectiveness. With a 32-cavity mould and a cycle time of 6-8 s, processors can achieve an output of up to 320 test swabs per minute and 460,000 test swabs per day with a single production unit.

The companies say that high efficiency is ensured by the integrated production process, which Engel specifically adapts to the mould solution developed by Hack. The process is based on a tie-bar-less, hydraulic, two-component Engel Victory machine with an integrated Engel Viper linear robot for fully automated removal and depositing of the swabs. The Victory machine is equipped with iQ weight control for high process consistency. The smart assistance system from Engel's Inject 4.0 program detects fluctuations in the raw material and ambient conditions, and automatically compensates for them shot by shot by adapting the quality-relevant process parameters.



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Right: The
Netstal Elion
Med: with the
numerous
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Engel and Hack Formenbau collaborate closely on many projects, with a focus on high-precision applications for medical technology. In the future, the mould and system solution will not be used exclusively for coronavirus test swabs. The companies are also jointly developing complete systems for the production of swabs for influenza tests or gynaecological examinations, for example.

The production of disposables for medical diagnostics is among the most demanding injection moulding applications, according to Wolfgang Zangerle, Head of Business Development Netstal at KraussMaffei. "The area of diagnostics is indispensable in today's medical sector," he says. "What do you treat if there is nothing for you to analyse? Our products help the field's leading manufacturers produce items like blood collection tubes, pipette tips, vials, tubes and plates. These products, the so-called disposables, are now made of plastics. They are single-use items that have to meet the highest standards. Several customers that produce the disposables for the new coronavirus mass test from Roche (Virus and Antibody detection) are currently using Netstal machines."

He continues: "In diagnostics, purity and cleanliness always come first. For example, the items have to be absolutely free of RNA and DNA when used for genetic testing, for example PCR (polymerase chain reaction) testing for the coronavirus. For us, this means that we have to ensure that it is very easy to clean the machine and the entire plant. All surfaces have to be designed in a way that prevents germs from forming as much as possible, which means that we also have to select inert materials. Not taking into account any of these things could lead to the contamination of the disposable and, ultimately, an incorrect or delayed test result or, even worse, the incorrect treatment of a patient."

However, as diagnostics has developed in recent years, this has changed the requirements of

Below: Test preparation: automated assembly of 96-well analysis plates





injection moulding machines. "Disposables for analytics keep getting smaller since modern testing methods only require small samples," says Zangerle. "This means that we have to build machines that, on the one hand, deliver top precision and on the other, offer a performance that allows for the controlled injection moulding of products that keep getting thinner. Not only that, but these machines also have to produce large quantities of them while meeting a zero-fault requirement. It's a classic field for our Netstal Elion series."

Controlled processing of medical grade polymers is essential to avoid material degradation, he says, and the company offers plasticising units that allow for the polymer to be strained as little as possible while providing the maximum level of homogenisation. One example, in particular in the area of PCR analysis, is the optical analysis of the light emission that passes through the disposable and the highly doped lysis and is crucial for an accurate result. This would not be possible without perfect homogenisation, dispersion and without preventing material degradation.

The new fully automated test from Roche is now making it possible to quickly analyse a large number of samples for the presence of the coronavirus. The plastic consumable materials required for this are produced under cleanroom conditions on machines from the Elion series.

A test kit for the fully automatic Cobas 6800 and 8800 diagnosis systems was developed by Roche within a short period of time. Following an expedited process, the company obtained approval for the new quick test from the FDA. In Europe, Roche completed a self-certification process on the basis of the data used for the USA. Hundreds of these systems worldwide are being used to test millions of patients per month to determine whether they have caught Covid-19. Roche is now aiming to deliver as many tests as possible and is pushing its



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Right: The
Netstal Elion
was commissioned and set
to manufacture
48-well deep
well plates in
Weidmann's
cleanroom
environment

production capacity to the limit.

Basic tools and plastic consumable materials are used to carry out the diagnostic tests. Specifically, these products include 96-well analysis plates with frames that are stacked in racks, as well as pipettes with filters manufactured in Switzerland by two Netstal customers. The applications run in cleanrooms (ISO 8 GMP C) on medically equipped Netstal Elion machines. During the production of these materials, ensuring maximum precision, perfect material homogeneity, high speeds and ultimate reliability is essential.

In another Covid-19 project, Netstal has succeeded in converting a second-hand Netstal Elion 1750 standard model into an ISO 7 cleanroom machine. The fully electric injection moulding machine was delivered to Weidmann Medical **Technology** at short notice within one month in order to help cope with the sharp increase in demand for consumables for Covid-19 testing. Weidmann manufactures high-quality plastic consumables for in vitro diagnostics, as well as pharmaceutical primary packaging and medical components, at Bad Ragaz in Switzerland. The contract manufacturer has been manufacturing deep well plates featuring 48 wells on a Netstal Elion 1750-530 in an ISO-7-class cleanroom for years. In order to cope with the increase in demand, the production output had to be quickly doubled. For this purpose, an existing and rarely used backup tool was first tested and optimised in the technical centre of the nearby LIBS training company in Rapperswil to determine whether it was suitable for continuous operation in the short term. LIBS had a fully electric Netstal Elion 1750-530 with an identical clamping unit, injection unit and control system, but being a standard model it was not suitable for a cleanroom environment.

The system underwent a 12-hour continuous test in the Netstal plant and was then modified by an experienced overhaul team within ten working



days so as to ensure compliance with the required ISO 7 cleanroom class through a reduced particle discharge. It was then delivered to Weidmann at the end of April. Following its commissioning in the cleanroom, it was ready for production within just a few days.

UK technical moulder Hi-Technology Group has

invested in five new 50-tonne **Sumitomo (SHI) Demag** IntElect machines during the past year that have subsequently been used to manufacture more than 2 million medical-related components a week since the start of the Covid-19 pandemic. The company has been continuously producing parts for powered personal respirators and hoods, intravenous infusion pumps and docking stations, wireless call buttons, medical PPE, stairlifts, and soap/handwash dispensers. Recently, Sumitomo (SHI) Demag has also installed a higher-specification 75-tonne IntElect2.

High-quality safety-critical components form a large part of Hi-Technology's medical, health and safety, marine, defence and aerospace product portfolio. From smoke detectors to breathing apparatus and respirators, the company's latest



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Above: UK-based Hi-Technology's dedicated precision moulding cell, with Sumitomo (SHI) Demag machines, provides additional flexibility to support customers in the critical respirator, PPE and medical pump sectors

machine investment gave it the flexibility to play its part in the global health crisis and support customers in the critical respirator, PPE and medical pump sectors. Recently re-certified to ISO9001: 2015 and ISO 14001 (Environmental Safety Standard), most of the Covid work, including industrial respirators, has been performed in the company's precision moulding cell. Housing the five IntElect systems, the facility also comprises several other precision, assembly and finishing machines, including heat inserters, pad printers and ultrasonic welding systems.

Given the volume and variety of technical components produced, reaching an output of 3.6 million mouldings in one week, precision and repeatability are critical. This is where the IntElect excels, according to Sumitomo (SHI) Demag's UK Managing Director, Nigel Flowers. "The combination of direct drives plus the IntElect's advanced toggle system ensures a more stable process," he says. "Any changes to force patterns are monitored and instantly dealt with. Because the injection process runs more steadily, the plasticised material flows more consistently into the mould cavities. This in turn helps ensure even weight distribution in each cavity and minimise part rejects."

Having performed several on-site energy studies, reducing energy consumption and achieving ISO 14001 certification formed part of the strategic rationale for opting for an all-electric system. With a dynamic motor design, the IntElect range offers a 60% reduction in energy consumption, while also significantly increasing production output, says Sumitomo (SHI) Demag.

In addition to its UK production plant, Hi-Technology Group has an extensive facility in Slovakia serving European clients and exporting components internationally. Comprising 20 machines, in summer 2019 the Košice plant added two Sumitomo (SHI) Demag Servo machines, including a large 280-tonne machine.

At present, the medical moulding market is Covid-driven, says Gerald Plöchl, Head of Medical and Micro Technologies at Wittmann-Battenfeld, and there is currently a high demand for plastics for diagnostic devices and ventilators. He adds that new technical developments in equipment and processes are also being driven by data collection, which is now possible through Wittmann 4.0 and the company's EMS solution TEMI+, as well as intelligent machine settings and artificial intelligence.

Plöchl says Wittmann 4.0 provides specific advantages in medical moulding. "Wittmann 4.0 means that robot and auxiliaries are integrated in the control unit Unilog B8. Moreover, an electronic data sheet is used in the Unilog B8 control system. This serves to configure a production cell integrated via the Wittmann 4.0 router in accordance with the selected mould dataset, including all necessary appliances such as robots, temperature controllers, metering devices, dryers and electronic flow controllers. Through the plug and produce mode,

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the production cell is ready for start-up in next to no time. All required data for quality management from the machine and the peripherals are available for documentation via Wittmann 4.0. In future developments, we will continue to work on a further increase in interlinking all the devices needed for injection moulding, including machines, robots and all other auxiliaries."

Fanuc has supplied Roboshot α -S100iA electric injection moulding machines to Crossen Engineering based in Belfast, Northern Ireland - a leading full-service manufacturer of custom-made metal and plastic parts to a number of sectors, including medical products. In a bid to increase productivity, it was the company's first electric injection moulding installation. Crossen - which was first established as a metal processor - has recently assisted in the development and production of colostomy solutions. The company moulds the seal rings which interface between the user's body and the stoma bag, before supplying them to the customer which secures them to the bag. "We'd known this customer for over 15 years, stemming back to our metal pressing days," says Peter Crossen, Business Development Manager at the company. "When they required a solution for sealing a colostomy bag, they knew that we had the design and prototype capabilities, as well as the production capacity, to provide an effective solution. We're now in the process of developing a second product with that same customer, and it is this increase in demand, especially from the medical sector, that prompted us to explore automation options."

In order to help meet growing demand, the company undertook research on how to increase

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Above: Peter Crossen, Business Development Manager at Crossen Engineering, with one of the new Fanuc Roboshot electric injection moulding machines at its facility in Belfast, Northern Ireland

productivity, while simultaneously reducing running costs. Electric moulding machines were highlighted as the ideal way to achieve this, offering the opportunity to introduce automation into the production process. Distributor **JL Goor** was identified to assist with finding and installing a turnkey manufacturing solution. The recommendation was made to opt for two Fanuc Roboshot α -S100iA high precision electric injection moulding machines.

As well as boosting productivity, the Roboshot can contribute to substantial energy savings. "The combination of CNC with the electric injection moulding technology ensures that the Roboshot uses between 50-70% less energy than hydraulic machines, and 10-15% less than other electric machines," says Michael Reynolds, Sales Manager at JL Goor. "It also has a compact footprint, especially when you consider the output capacities, which drastically reduces the factory floor space required. Combined with the reduction in energy usage, this significantly minimises the total cost of ownership."

The Roboshot electric injection moulding machine can also be used with robotics, to automate machine tending, loading and unloading. Crossen Engineering is already using robots to help with part removal, further increasing the productivity gains associated with the machine. It has also recently taken delivery of a further two Roboshots, which are being used to manufacture face shields due to increased demand for PPE during the Covid-19 pandemic.

Hekuma has developed an automation solution to enable manufacturers to respond to the increasing number of single-use laboratory parts now required. The company says that in recent months the demand for laboratory vessels and vials have grown significantly due to the Covid-19 crisis. These medical consumable parts are also used for pathogen and antibody detection. In addition to Covid-19, there are around 3,000 different types of virus being researched worldwide. In order to be able to cope with these increasing volumes in the medical market, manufacturers must continue to automate and increase their work processes.

The HEKUlab is a fully automated production line for the manufacture of laboratory parts, such as reaction vessels, cuvettes and microtubes. The company says that the system guarantees a high output. A prerequisite for this is that the take-out gripper is able to handle up to 128 cavities from the injection mould.

Cycle time reduction can be achieved through short mould open times of less than 1 s when using a horizontal injection moulding machine. In order to accomplish this, Hekuma investigated the mould position through additional displacement sensors on the machine clamping unit. The start signal for the entry movement is now given earlier as it is triggered by the sensor. Cycle times of 5 s are now possible with this high speed system.

Hekuma adds that absolute precision and cleanliness are required in the manufacture of medical devices. The fewer contact points and the more precise the production, the lower the risk of contaminating the vessels and vials. The fully automated production line with clean surfaces and sophisticated technology requires minimal intervention by the operating staff. The system also offers the option of Unique Device Identification to guarantee complete traceability of the production process and therefore increases safety.

The entire production cell requires only a minimal footprint, so that the compact design offers potential for savings in material and space. The design of the system also aims to offer a great deal of flexibility so that it can be modified according to the manufacturer's requirements and quickly converted. The flexible design of the take-out gripper allows quick reaction to different mould layouts and cavity pitches to vary the laboratory product or product specification, as well as the number of cavities.

The HEKUlab solution is also able to integrate various packaging modules, which means that the medical devices are delivered in up to 500 pieces directly, 100% contact-free in a tote, bag or any other packaging. In addition, the packages can be also labelled.



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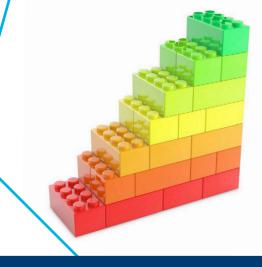
Above: Cycle times of five seconds are now possible with Hekuma's high speed HEKUlab system

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iQ weight control

Process validation and dynamic controls

Engel has worked to integrate its adaptive iQ weight control for medical manufacturing compliance

Injection moulding machines with assistance systems open up new possibilities for even higher process accuracy and product quality, particularly for medical moulding. Such intelligent software solutions adjust the process parameters cycle by cycle based on current conditions. One example is iQ weight control by **Engel**, which automatically compensates for external influences, such as fluctuations in the raw material. However, the challenge for medical technology is to integrate this dynamic process control into the validation process. Different approaches have been examined and a procedure designed which makes it possible to validate processes with iQ weight control in compliance with both EN-ISO and FDA.

Engel adds that for medical products, the regulating groups of the EU and the USA require detailed documentation during the entire product development, process planning and manufacturing process. The requirements can be found in the European standard EN ISO 13485:2016 - Quality management systems for medical devices and in the US FDA regulation 21 CFR Part 820 - Quality Systems Regulations. Both regulations stipulate that a company must validate critical production processes of results that cannot be verified by subsequent monitoring or measurement. This includes injection moulding processes in mass production, where 100% inline inspection is usually not logical. However, the implementation of the validation is not specified either in the US regulation or in the European standard. Only the tasks to be performed by the manufacturer are recorded in various directives and guidelines.

According to Engel, it is common practice to validate injection moulding processes on the basis of machine parameters. However, changing ambient conditions that influence the viscosity of the melt can lead to rejects that are not taken into account. It says many processors are asking how the new dynamic process control can be integrated

without iQ weight control

change in material moisture

PA key panel: variations of material moisture are automatically compensated

into a validation strategy for the manufacture of medical technology products in compliance with

medical technology products in compliance with current laws and standards. The key lies in the definition of process windows and the validation of these process areas.

Engel says that iQ weight control offers the possibility of limiting the scope of readjustment. Based on experience or test results, limit values are determined for the adjustable parameters switch-over point, injection profile and holding pressure, respectively, and are stored in the control system. This ensures that the process parameters do not fall outside of the validated range despite dynamic process control, and that the process complies with the regulatory requirements.

The validation strategy must be adapted to the product. First, product requirements must be defined by measurable acceptance criteria. This is usually done based on the risk analysis and is described in a validation master plan (VMP). The VMP contains the validation strategy of a company and should clearly define the key elements of the qualification and validation program. To this end, the VMP must describe specifically which validation principles are implemented in the company and how, and who assumes the responsibility at which level and in what form. This task should be per-



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formed by a group of experts, known as the Task Force, consisting of product and process engineers at the plastics processor.

Every product has critical quality attributes (CQA), which in injection moulding production can be, for example, a linear measure or the surface quality. In the validation, it is necessary to find the corresponding critical process parameters (CPP) that affect the CQA. The experts define these critical injection moulding parameters on the basis of data sheets and figures based on experience with comparable injection moulding processes. In the case of critical components such as functional elements of a drug delivery system, the statistical design of experiments (DoE) is used to determine the process limits.

For the majority of applications, simplified planning based on empirical values is sufficient to define a permitted parameter window. If the CQA are within the accepted limits, parameter ranges in which the process can be adapted can be set. In addition, the stability of the process is examined in this phase.

The iQ weight control assistance system is a real-time control software that adjusts process parameters during production to ensure consistent

high part quality. The software compares the injection pressure above the screw position with a reference pressure curve and identifies deviations in injection volume and viscosity. The automatic adjustment of the switchover point, injection profile and holding pressure compensates for target deviations shot by shot. Consequently, the switchover point and holding pressure level must be defined as CPP in the validation strategy.

The limit values for the switchover point and holding pressure determined in the DoE are adopted in the CC300 controller of the Engel injection moulding machine as the limit value for process control by iQ weight control. If it is necessary to regulate the parameters outside of the validated limits in order to achieve the specified product quality, a corresponding procedure can be defined in the control system. For example, the respective shot can be declared as scrap or the production process can be stopped if the limit values are exceeded. Simplified rules are also possible. For instance, by keeping the switchover point constant and adjusting the holding pressure, or vice versa, keeping the holding pressure constant and adjusting the switchover point.

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- Mitutoyo PJ-3000 Profile Projector

- Geiss Type 2000x1000 Five Axis CNC Milling Machine (1997)
- Pacer 1250 HD Type 2500 Columbo 3 Axis CNC Router (2002)
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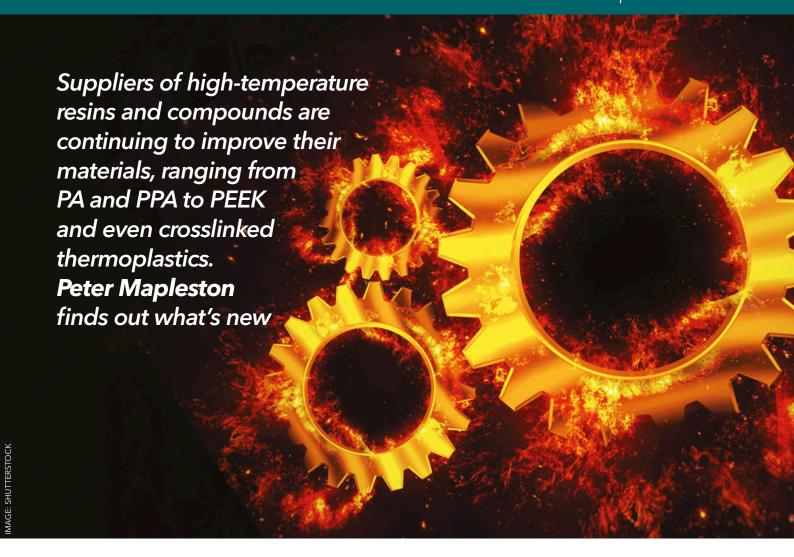


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Competition heats up in temperature resistance

When it comes to thermoplastics with high temperature resistance, processors and application specifiers have never had as much choice as they have today. Offerings in semi-crystalline and amorphous materials continue to improve and expand. That's especially true when it comes to polyphthalamides (PPAs), the so-called high temperature nylons, but not only these materials. Polymer producers and compounders have in recent months introduced new polysulfones, polyphenylene sulphides, polyesters, polyaryletherketones, and even crosslinkable thermoplastics.

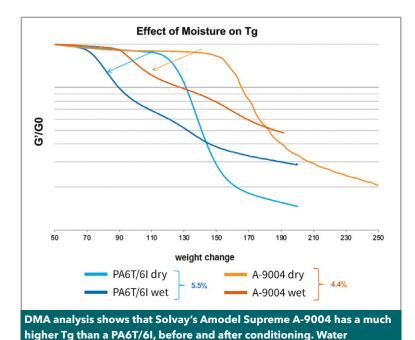
Solvay was the first company to market with a PPA, branded Amodel. Thirty years on, its newest material is Amodel Supreme, a PPA polymer that is claimed to offer the highest performance on the market. The original Amodel was based on polyamide 6T (the T stands for terephthalic acid). Solvay does not say what type of PPA the new Amodel is.

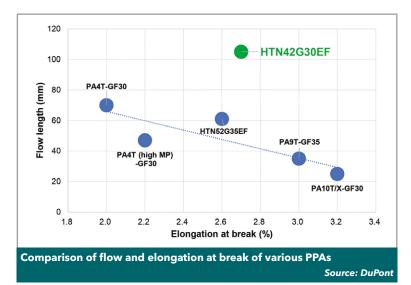
"Amodel Supreme PPA features the industry's highest glass transition temperature (Tg) of 165°C, and it delivers superior mechanical performance between 140 and 200°C," says Brian Baleno, Head of Marketing and Business Development, Solvay Specialty Polymers global business unit.

The new polymer also improves electrical property performance, including volume resistivity and dielectric strength above 150°C. Solvay says this creates new opportunities for PPA to be used in higher voltage rotating electric systems, such as next-generation traction motors, inverters and power electronics.

Amodel Supreme PPA products are built on Solvay's new 9000 Series base resin. They are available in 33% and 50% glass fibre-filled resins for standard grades (metal replacement), structural grades (thicknesses over 3mm) and grades targeting automotive electrification. All materials

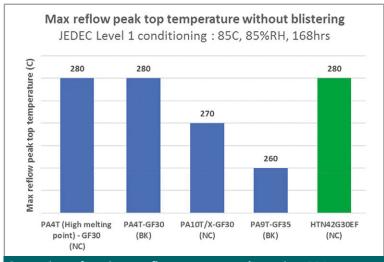
Main image: **Ever-higher** temperature demands are being made in automotive, E&E and aviation markets





Source: Solvay

absorption is 20% less



Comparison of maximum reflow temperature that various PPAs can withstand without blistering Source: DuPont

provide excellent glycol resistance.

As automotive electronics become more complex and compact, surface mount technology (SMT) and reflow soldering is growing in use, demanding connector insulation materials that can withstand higher temperatures than in the past. Another important factor is the prevention of corrosion of the metal contacts in the electronics assemblies. To address these issues, several connector material suppliers have in recent years developed high-heat grades that prevent electric corrosion by using organic heat stabilisation additive packages.

DuPont is one of them, with its Zytel HTN Electrically Friendly (EF) portfolio, which continues to grow. Latest addition is Zytel HTN42G30EF, a 30% glass fibre-reinforced, PPA grade with 22% renewable content (the company does not divulge the exact nature of the polymer). "In addition to the signature electrochemical corrosion resistance and high temperature resistance of all DuPont's EF grades, this product features high flow and improved reflow performance," the company says. "Together, they enable thin-wall, miniaturised designs such as multi-pin, fine pitch and low height connectors, and contribute to accelerated cycle times."

DuPont also points to the ability of Zytel HTN42G30EF to withstand reflow soldering temperatures with minimal discoloration. "This can help automotive tier suppliers achieve greater outputs of high-quality PCB and FAKRA connectors," it says.

Other key properties of the materials are high impact resistance, which helps minimise breakage during assembly, and high weld line strength. The comparative tracking index (CTI) for both natural colour and black (laser markable) versions is 600V.

Also aiming at electronics applications is **Kurarary**. Several months ago, it expanded its Genestar E&E grade portfolio with halogen-free, UL94 V-0 30% glass fibre reinforced compounds based on PA9T. Kuraray says the grades combine a good processability with JDEC MSL 1 blister resistance. In addition, they have high weld-line strength and a CTI of Performance Level Categories PLC class 0 (ASTM D3638) and Material Group I, of over 600V (IEC 60112).

Additions include Genestar GP2300S, which has V-0 properties for the thickness range from 0.15 up to 3.0 mm, and which Kuraray says "is the ideal solution for different types of surface mount reflow connectors that require V-0 flammability."

Laurent Hulpiau, Genestar sales engineer at Kuraray subsidiary Eval Europe, says recent studies using an adapted test set-up at Kuraray's R&D

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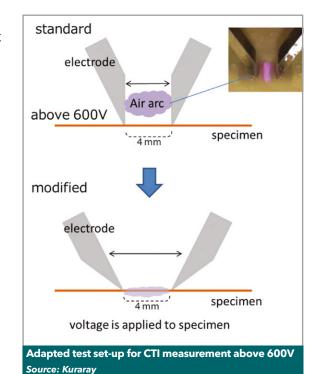
centre in Japan have proven that this grade can reach a CTI up to 1,000V. "The standard set-up (IEC 60112) can cause the creation of an air arc that inhibits the CTI measurement at voltages higher than 600V," he says. "Therefore, the electrodes were rotated through 180 degrees to prevent this air arc from being formed and to allow voltages up to 1,000V to be applied."

Different colouring options are available for Genestar GP2300S. As a first option, Kuraray has developed a UL-registered V-0 masterbatch together with what was Clariant Masterbatches, now Avient. This masterbatch is available for sampling in various colours, including RAL2003 orange for high-voltage applications. Kuraray has also developed an in-house coloured compound, available for sampling.

"This combination of CTI up to 1,000V and colour availability makes Genestar GP2300S the ideal solution for high voltage connector applications," says Hulpiau. "It solves problems like electrical breakdown due to tracking to prevent safety issues and will help to downsize parts by lowering the creepage distance, for low and high voltage connectors."

Independent compound producer Akro-Plastic has developed compounds of its own based on PA9T (it does not say which polymer supplier it uses). These are halogen-free, flame retardant Akromid grades, with various levels of glass fibre reinforcement and UL94 V-0 from 0.4mm and GWIT of 800°C from 0.4mm up to 3.2mm. The range includes a special grade in RAL 2003 orange. The colour shows no drift even after 3,000 hours at 120°C. "More important for the moulding process the grade is not only showing a very easy flowability, it provides the processor a very wide process window with stable colours and good surface finish," says Tilo Stier, Global Sales Director & Innovation Manager.

For sensors such as Denox sensors used in automobile exhaust systems, which require housings with high dimensional stability and chemical resistance, the compounder developed Akromid T9 GF 40 LT black (7827). This grade has a very wide process window and, unlike PA6T, almost



no deposit while moulding, Stier says. "Processors can run this laser-transparent black grade with higher output and better quality," he claims. "It enables complex welding geometries with very low scrap rates in the joining process." Akro has built up extensive know-how in laser welding, Stier says, and its grades enable very high weld line forces between the laser transparent and laser absorbing

PA9T has traditionally been quite an expensive polymer (over €10/kg), but this is changing as availability of the polymer from more than one source increases, notes Stier (BASF, for example, introduced its version, Ultramid Advanced N, at K2016).

Options in PA4T

components.

The **LehVoss Group** recently introduced the Luvocom 25 line, based on **DSM's** ForTii Ace PA4T-based polymer. "Luvocom 25 offers high glass transition temperatures up to 160°C, extreme stiffness and strength, low water uptake, excellent chemical resistance to moisture, salt, oils, acids and others," says the company. "Furthermore, it offers

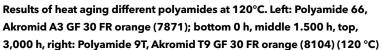
> retention of performance in under-the-hood applications. The LehVoss Group offers compounds, including customised solutions, for demanding metal replace-

ment applications. To achieve outstanding properties carbon fibres, nano additives and tribological additives are added in the respective compounds."









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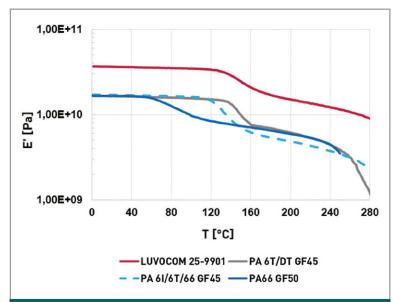


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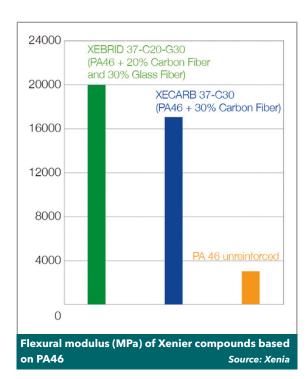
Contact us sales@ami.international www.ami.international/market-reports





LehVoss says customised Luvocom compounds based on DSM's ForTii Ace PA4T provide outstanding mechanical properties at high temperatures. Graph compares variations in shear modulus with temperature in one grade, Luvocom 25-9901, and compounds of other high-temperature polyamides.

Source: LehVoss



LehVoss says that cooperation between it and DSM, together with automotive systems supplier CarNaTrix, is helping accelerate metal replacement in transmission components. "In this partnership materials and part designs have been optimised to enable new ground-breaking automotive systems," says Thomas Collet, Director 3D Printing Materials & Marketing, in the Customised Polymer Materials business unit at LehVoss. The latest development is material solutions for e-mobility. "In the powertrain

of electric cars, parts needed in decoupling units and the gear box demand high-performance materials," Collett notes. "Luvocom 25 products have been customised and are available now for this area."

Based on DSM's Stanyl PA46 (not a PPA, but still with excellent heat resistance), XECARB 37 and XEBRID 37 are two families of carbon fibre and hybrid carbon/glass fibre reinforced compounds launched last year by **Xenia** in Italy. The company says PA46 is known for its unmatched performance and value for demanding applications in which superior heat resistance, design stiffness, wear and friction, and process flow qualities are required.

"Thanks to the application of structural reinforcements the new grades XECARB 37 and XEBRID 37 exhibit high tensile modulus, tensile strength at break up to 275 MPa, improved HDT, good fatigue resistance, higher dimensional stability and better surface hardness. Furthermore, the use of carbon fibres within the XECARB 37 family provides improved electrical properties and better resistance to UV and chemical agents like oils and hydrocarbons."

Xenia says that with the development of the new grades XEBRID 37 hybrid carbon/glass reinforced compounds, the impact properties have improved, "always maintaining a high crystallinity level and a great flow behaviour, typical for the polymer's aliphatic molecular structure."

The company expects the new compounds to find use in a wide range of structural and conductive applications characterised by high operating temperature resistance, together with good chemical resistance and low friction.

Back at Akro-Plastic, another new high-temperature product is Precite E GF 50 natural (7300), a 50% glass reinforced crystalline PET. Thilo Stier says PET is "widely undervalued" for engineering applications. "This grade has extremely low creep and excellent mechanical properties," he says. "With a melting point of 255°C and a high Tg, Precite E can be a cost-efficient alternative to PPA grades. At 120°C, mechanical properties are just as good as PA6T, but at a much lower price."

He says: "Comparing the stress strain behaviour of PET and PA 6T, both 50% reinforced, shows almost equal values at 120°C. The flex modulus at room temperature reaches 21 GPa and tensile/flex strength is 225 MPa/350 MPa."

These impressive properties are independent from any moisture pick up - a big advantage versus conventional PPA grades, says Stier, who adds: "We will soon see some parts weighing well over 1kg in Precite substituting diecast magnesium." Akro is

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Above: BASF's Ultrason P2010 (left) has improved flow now promoting Precite for centre consoles. "It has really outstanding properties for this application," says Stier.

PESU and PPSU

BASF is launching an engineering plastic that is particularly suited for automotive parts that come into contact with hot oil. Ultrason E0510 C2TR is a new polyethersulfone (PESU) that the company says shows very good tribological properties, high oil resistance and excellent dimensional stability,

even when temperatures fluctuate widely. The 10% carbon fibre reinforced grade can be used within a temperature range that starts at -30°C and goes all the way up to +180°C. "It is easy to process because of its low viscosity and therefore its very good flow properties," says BASF.

Ultrason E0510 C2TR is being pointed at the manufacture of various car parts that come into contact with oil: oil pumps, oil control pistons, pressure valves and high-speed components in automatic and manual gearboxes. It can also be employed in new applications for alternative drive technologies. "Due to its good flow properties, parts with wall thicknesses of less than one millimetre can be injection-moulded without compromising on their stability, durability and oil resistance," says the supplier.

The material's low coefficient of thermal expansion (10.4x10⁻⁶/K) makes possible parts that are dimensionally stable and that can withstand rapid temperature changes from cold to hot without any damage. Tests according to ASTM G137 have shown that the sliding friction performance outperforms that of other "tribologically optimised" high-performance thermoplastics, BASF says: even

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Carbon fibre PA wins against magnesium

The highly elaborate centre console for Porsche's new Taycan EV pictured below is made of Akroloy PA ICF 40, a 40% carbon fibre reinforced grade of PA6T/66/6I from Akro-Plastic.

After evaluating the mechanical

properties of different materials, Porsche chose the compound as a replacement for the originally intended magnesium die casting. Due to the density difference (1.35 g/cm³ vs. 1.81 g/cm³), a weight saving of 25% in the

component could be achieved. The material retains a very high stiffness (>33,000 MPa) and strength (360 MPa) even after conditioning. Despite the thin-walled construction, this enables very high sustainable natural frequencies and dynamic load capacity.

ICF compounds are made by using gravimetric feeding of short carbon fibres sourced from textile off-cuts. Gravimetric feeding provides much more precision in dosing of the fibres than rival systems, enabling Akro-Plastic to offer its material with exactly the same specifications as compounds made using virgin carbon fibre.



at high wear rates, test components show only low wear with virtually unchanged mechanical stability and chemical resistance.

PESU is already known for its very high chemical resistance, inherent flame retardance, high rigidity and strength combined with temperature stability over a large operating temperature range and outstanding hydrolysis resistance.

BASF also recently announced that it was expanding its Ultrason P range of polyphenylsulfones (PPSU) with a particularly low-viscosity grade. According to the company, Ultrason P 2010 shows improved flow behaviour in injection moulding while maintaining the excellent mechanical properties of "regular" Ultrason P. BASF has largish, complex-shaped components in its sights, including catering dishes and heat-resistant containers with sophisticated, thin-walled geometries, for land-based and aircraft applications. Ultrason P 2010 comes in transparent and opaque grades.

The new material combines what BASF describes as the outstanding notched impact strength and stability of the already available Ultrason P 3010 with high chemical resistance, good steam sterilisation at 134°C and inherent fire resistance. The Charpy notched impact strength is almost ten times higher than that of another well-known amorphous high-temperature thermoplastic. "Even the combination of aggressive cleaning agents and disinfectants, water and extreme heat does not affect Ultrason P 2010," says the company. The material is approved for food contact in the EU and

Catering and aircraft equipment are among the

most important application areas for Ultrason P 2010. In hotels, restaurants and canteens, containers and pans made of the BASF PPSU can be used to prepare food as well as to transport meals and keep them warm. Here the demands on sterilisation and resistance to cleaning agents are very high. In aircraft construction, fire resistance is of particular importance. Therefore the inherently flame-retardant specialty plastic, which in the event of fire releases little heat and hardly any harmful substances, offers optimal conditions, not only for serving dishes, but also for seat and lighting cladding, air vents and overhead luggage compart-

Similar abbreviation, but quite a different polymer, polyphenylene sulphide (PPS) is the base for compounds widely used in metal replacement applications destined for challenging environments, as in situations characterised by permanent contact with hydrocarbons and solvents, or in the presence of strong inorganic aggressive agents.

"Few other polymers are able to offer the same level of resistance to such a wide range of chemical substances, even at high temperatures," says Luc Posca, Technical Service and Marketing Director at Italian compounder Lati.

"Another recognised advantage of PPS is that it can be used successfully even at operating temperatures touching 200°C, a circumstance that can arise both in the working environment as a whole and locally (for example, parts situated close to electric motors, or in the automotive and industrial applications)," he says.

According to Posca, moulded items in rein-

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Right: Victrex CT was selected by **Advanced Engineering** Valves for use in cryogenic and severe service ball valves

forced PPS, as opposed to other semi-crystalline polymers, "offer remarkable, even unique, dimensional stability, thanks to a very limited differential shrinking, and consequently minimal deformations, similar to those typical of amorphous plastics."

An interesting application cited by Posca for a PPS compound supplied by Lati is vanes injection moulded by VP Plast in Italy and installed on the rotors of rotary pumps built by the French company Mouvex, part of the PSG group and a leader in the construction of compressors and pumps for the handling of liquids.

In rotary vacuum pumps, the performance of the system depends largely on how well the vanes work. They have to guarantee a tight seal between the rotor and the internal jacket, so as to prevent fluid leaking into the pump chamber and causing a loss of pressure. Since they must also slide radially along the rotor without wearing the metal, the surface hardness and finish are crucial. Mouvex uses Lati's Larton G/40, a 40% glass fibre-reinforced PPS compound, in addition to stainless steel and

Polyplastics in Japan counts PPS among a range of thermoplastics aimed at high-heat applications. Tunenobu Satoh in the company's sales planning department says Polyplastics' Durafide PPS "is used for more than 150°C of high-heat resistant purposes. Components which are mounted on the engine directly are targeted PPS applications. Examples include engine speed sensors, thermal management components, and inverter housings of EV components."

PEEK for hot and cold

Belgium-based Advanced Engineering Valves (AEV), which is a leader for cryogenic and severe service ball valves, has selected a Victrex high

Evonik drops PPA

Evonik is another company well-known for its high-performance thermoplastics, including Vestakeep PEEK and Vestamid polyamides of various types. However, it recently stopped offering PPA as part of a reorganisation of its business for high-performance polymers within the polyamide group. Noting that it had begun construction of a new PA12 facility complex and is expanding its production of transparent polyamides, it said it would be concentrating its activities on high-performance materials for attractive growth markets such as the automotive, oil and gas, 3D printing, and optics industries. Ralf Düssel, the head of the High Performance Polymers Business Line at Evonik, says that for customers, the move will mean a more intense focus on developing sophisticated specialty solutions.



performance cryogenic PEEK polymer to help its customers operate applications more efficiently and safely. The company's 2XC* C-ball valve products require zero maintenance in cryogenic service.

The cryogenic Victrex CT 100 polymer was specifically developed by Victrex for insert applications. After successfully passing Design Validation Testing (DVT) at AEV, the polymer is now used in the company's class 900 ball valves ranging from ½ through to 18 inches. It is specified for a temperature range of -196°C to +150°C and offers structural strength at elevated temperature without compromising low-temperature performance.

"Many sealing applications in cryogenic temperature ranges have typically been made with fluoropolymers. However, our polymer products such as the Victrex CT series provide a unique range of properties over a broader temperature range, from +200°C down to -196°C, which fluoropolymers cannot meet," says James Simmonite, Director Energy at Victrex. In this temperature range, chemical resistance is still important, but other aspects such as creep resistance, low temperature toughness and tribological performance, and thermal properties such as conductivity and expansion, are the most important to applications such as valve seats and packings.

Back in 2005, Gharda Chemicals (GCL) in India sold its polymers division to Solvay, giving Solvay an entry into the PEEK business. But GCL is still in the very high heat resistant thermoplastics picture: it claims to have pioneered manufacturing of ultra-performance and high temperature resistant polymers at competitive prices. Its commercial

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offerings include PEK, PEKK, and Poly(2,5-benzimidazole) (ABPBI), which can resist continuous temperatures from 250 to 300°C.

G-PAEK polyetherketone (PEK) has a glass transition temperature of 152°C and melting temperature of 373°C, offering extended high temperature performance together with toughness, strength, and chemical resistance. It is available in unfilled as well as filled forms. GCL says it crystallises quickly, so requires less cooling time than materials with comparable performance, reducing cycle time. Typical applications include gears, seals and connectors.

GAPEKK polyetherketoneketone (PEKK) combines high temperature stability, strength and stiffness, and ease of processing. It also has very high load bearing capacity, creep resistance, and inherent flame retardancy. GCL is the only company in the world that can offer PEKK with ratios of the two ketone monomers terephthaloyl and isophthaloyl (the so-called T:I ratio) starting at 60:40, passing through 70:30 and 80:20, to 100:0, says Jaimin Zaveri, General Manager, Marketing and Application Development. PEKK can be injection moulded from 305°C to 400°C depending on the T:I ratio.

T:l ratio	Tm 0C	
100:0	390	
80:20	369	
70:30	335	
60:40	305	

Melting point of PEKK varies according to the T:I ratio. Tgs are in the range from 160°C to 173°C

Source: Gharda Chemicals

Zaveri says GAPEKK has the highest compressive strength of any polymer in the ketone family, while retention of mechanical and physical properties up to 300°C is higher than any other engineering polymer. Target applications include nozzles, powertrain components, aerospace parts, gears, and seals.

GAZOLE 6000 grades are ABPBI-based blends and alloys offering high mechanical performance up to 300°C, well above the glass transition temperature of 160-170°C. ABPBI is blended with PEK to make it melt-processable. Offered as replacements for metals and sintered carbons in parts requiring very high wear resistance, they are inherently lubricious, giving parts with a very smooth surface finish and exceptional abrasion

Eurostar Engineering Plastics has a unique

view on high-temperature-resistant injectionmouldable plastics, says Alexis Chopin, the company's head of technology. "We are converting an engineering resin into a high-heat resin," he says. "New applications are rising even for structural parts linked to engines and submitted to heat and mechanical stress." All developments are covered by NDAs.

For some time now, as an alternative to high heat plastics, Eurostar EP has been proposing speciality radiation-crosslinkable polyamide compounds with core products very well suited for demanding E&E applications such as circuit protection equipment or contactors for parts running in tough electrical arc environments (see E&E feature in Injection World October 2017).

"As part of this product line, Eurostar EP is now launching a new crosslinkable polyamide product line based on very high glass fibre content that is very well suited for metal replacement," says Chopin. These new grades (Staramide PF0012K with a glass fibre content of 60% is just one) offer extremely high rigidity (tensile modulus above 20GPa), good impact resistance (Izod unnotched impact strength above 50KJ/m²), outstanding dimensional stability, and very low creep in the temperature range of -40°C up to +130°C. "They can withstand peak temperature even above the melting points of standard high-heat polyamides such as PPA. These products are well suited for structural UTH automotive applications where all these requirements are needed."

Crosslinking is carried out (normally by a specialist external service company) on moulded parts via beta or gamma irradiation (typically 50-100kGy). Eurostar EP is also developing a new concept based on thermal crosslinking that would enable moulders to carry out this secondary process in-house.

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New solutions for keeping materials moving

Materials handling equipment and systems are increasingly required to be cost-effective, efficient, trouble-free, and easily controlled. Mark Holmes reports on recent developments

MAGUIRE

IMAGE: MAGUIRE

Moving materials around the injection moulding plant needs to be seamless and efficient. Auxiliary machinery manufacturers are designing simplified conveying systems to streamline production that ensure raw materials are where they need to be, at the right time and in the required state for processing. In addition, remote and efficient control of the process and maintenance of the system is essential for eliminating downtime and feeding data into management systems, increasingly governed by Industry 4.0 protocols.

Maguire Products has developed a new vacuum pump that simplifies conveying of raw materials to blenders, dryers and machine hoppers. The company says that the NVRBE pump is easy to install, operate and maintain. It simplifies conveying of raw materials from storage and can be configured in automated "mini-central" conveying systems with extremely compact LowPro receivers mounted on multiple blenders in injection moulding facilities.

According to Maguire Products, multiple units of the NVRBE vacuum pump may be used in a single system and it offers a number of user-friendly features. These include the Clear-Vu dust collection bin, allowing the operator to easily see when cleaning is required, as well as a filter safety switch, which minimises dust contamination. The switch initiates an alarm and stops the blower if the filter becomes clogged. There is also a pressure differential switch that acts as a clogged filter sensor, stopping the blower if the filter is clogged over 90%. In addition, a temperature safety switch

prevents overheating of the blower. When the blower temperature exceeds a limit, an air bypass valve is opened to cool the blower. This valve prolongs pump life and minimises power usage by allowing the blower to keep running when no vacuum is called for. Finally, operation is quieter in comparison with positive displacement pumps.

"The automatic features of the NVRBE vacuum pump and its simplicity of use make it especially compatible with Maguire's LowPro receivers," says Frank Kavanagh, Vice President of Sales and Marketing. "Besides having an up to 80% lower profile than traditional receivers and being easier to configure, LowPro receivers are autonomously controlled, making them suitable for deployment in

automated mini-central systems for

conveying to multiple blenders." Conair has also introduced a new hybrid vacuum pump that combines quiet operation, long distance conveying

power, energy savings and wave conveying capability. The company says that the multi-stage regenerative impeller design of the new

Conair HRG Series vacuum pumps is the key to developing deep vacuum power for conveying plastic pellets over long distances, while keeping noise levels comfortably

Right: The new HRG Series vacuum pump from Conair combines quiet operation, long distance conveying power, energy savings and wave conveying capability

Left: Maguire **Products has** developed the NVRBE pump, a new vacuum pump that simplifies conveying of raw materials to blenders, dryers and machine hoppers





Above: New SmartServices sensor kits from Conair can connect operating, performance and alarm data from non-computer controlled auxiliary equipment to the SmartServices platform

low. An optional variable-frequency drive is available to save energy and makes the new pump ideal for use in Conair Wave Conveying systems.

"Until now, processors have had to accept various trade-offs when selecting a central vacuum pump for their conveying application," says Nick Paradiso, Product Manager - Conveying and Bulk Storage Products. "They have had to choose from three options: single or dual-stage regenerative pumps, positive-displacement pumps, and longdistance positive-displacement pumps. Singlestage regenerative pumps are quiet and inexpensive, but limited to short-distances, while dual-stage regen pumps handle moderate distances, but are noisy and can be limited in throughput. Positive displacement (PD) pumps can offer greater power, but low-cost versions don't handle long distances are very noisy. Long-distance pumps (LDP) are special positive displacement pumps that convey over long distances, at high rates, with low noise levels, but they can be quite expensive."

Paradiso adds that Conair's new hybrid regenerative (HRG) pumps offer many of the best features of the other pump types, but at a price that is about 30% lower than a comparable LDP pump and in line with higher-end PD pump packages. He says that the key to the HRG's power is in its tightly toleranced, three-stage impeller design, which smoothly cuts, captures, and compresses air with minimal draft or vibration. Similar to twin turbochargers on car engines, the vacuum becomes deeper and more powerful at each stage, allowing the HRG Series pumps to sustain vacuum levels up

to 18 inches Hg and convey material up to 1,000 linear feet (305 m). The same hybrid regenerative design also makes the HRG Series pumps extremely quiet. Operating at 60 Hz, the average sound level ranges between 74 and 77 dBA, a comfortable range that does not require hearing protection.

In many conveying applications, the new HRG pump also makes it possible to implement Conair's Wave Conveying System at a substantially lower cost. Up to now, customers implementing Wave Conveying - Conair's low-speed, dense-phase conveying technology - had to do so using the more costly LDP Series pump. But now, when equipped with an optional variable-speed drive motor, Paradiso says that new HRG Series pumps can support Wave Conveying in many situations.

"Instead of conveying plastic materials in dilute-phase at speeds of 5,000 ft/min (1,524 m/ min) or more and creating dust, angel hair and equipment wear, the Wave Conveying System allows for gentle, low-speed conveying at speeds of 300-2,800 ft/min (91-853 m/min)," says Paradiso. "This gentle, dense-phase conveying method moves material in compact slugs, waves or streams that virtually eliminate material breakage, dust, and angel hair without reducing throughput capability."

According to Conair, the optional variable frequency drive also saves energy by allowing the HRG pump to operate using only the amount of power necessary to achieve the desired material speed and throughput. In fact, an HRG pump, running in a Wave Conveying System, was shown to save as much as 50% on energy compared to similarly sized positive-displacement pump at equivalent throughput rates. Even in standard (non-Wave) operation, savings of up to 25% were observed.

Sensor kits

The pumps are available in three different sizes: the HRG-10 has an 11.5 hp motor and is intended for 2.5 inch (64 mm) conveying lines; the HRG-15 (16.9 hp); and the HRG-30 (42.9 hp) service up to 3 inch (76 mm) line sizes. The new HRG pumps are also virtually maintenance free. The direct-drive system eliminates drive belts that wear and require constant adjustment. No lubrication is required.

New SmartServices sensor kits from Conair now make it possible to connect operating, performance and alarm data from non-computer controlled auxiliary equipment to the SmartServices platform, Conair's cloud-based Industry 4.0 solution for auxiliary equipment monitoring, management and analysis. The user-installed sensor kits are now available for use not only with

Conair auxiliaries, but with a range of competitive auxiliary equipment including temperature control units (TCU), positive-displacement vacuum-conveying pumps, single- and dual-stage regenerative vacuum pumps, portable loading/conveying systems and desiccant dryers.

Conair says that these kits were created so auxiliary equipment that does not utilise computerised controls could be equipped with digital sensors and communications capabilities and linked to the cloud-based SmartServices platform with the same ease as newer equipment. Each user-installed kit contains common digital hardware, plus fluid-system fittings, sensors and wiring specific to the equipment type. Digital hardware includes a SmartServices expansion box that receives sensor inputs via wiring and a SmartServices hub that securely exchanges data with the cloud-based analytics platform.

After installation, the new sensors monitor the performance and operating/maintenance status of each auxiliary, collecting data and operating information specific to the auxiliary type. For example, sensors on the TCU can monitor coolant pressure, temperature and flow rates, while those on vacuum pumps and conveying systems will monitor air flows and speeds, vacuum levels and the like. At the same time, sensors will also monitor for operating alarms, track maintenance alerts, and observe the vibration and temperature status of motors for anomalies that could signal possible problems.

"Adding a SmartServices sensor kit to an auxiliary unit that does not have a computerised control dramatically simplifies monitoring and saves maintenance," says Alan Landers, Product Manager. "Consider maintenance of a vacuum pump, for example. With SmartServices, you can establish a norm for pump vibration, then build high and low limits around that norm. The system will then track vibration automatically, offering regular reports or sending a text or e-mail alert to designated personnel if the level begins moving out of limits. Timely data like this can help save preventive maintenance by clearly indicating when maintenance is required. The alternative is to manually observe, measure, then 'quesstimate' when preventive maintenance is needed."

Conair has also developed the TrueRate system for automatically tracking changes in resin inventories, which simplifies dispensing. The company adds that the new TrueRate intelligent inventory tracking system automatically monitors changes in the inventories of up to 500 different user-specified resins or flowable powders in a processing plant. Developed as an alternative to the use of single-

component batch blenders for resin inventory measurement, the new TrueRate system utilises highly accurate gravimetric measurement.

The TrueRate system is available in two sizes, consisting of an 8 inch weighing ring equipped with two load cells, or a 12 inch ring equipped with three. Both configurations connect to a separate electrical control panel containing a PLC. The weighing ring is mounted below a material loader or receiver but above a container or bin, where it uses resin information provided by the user to calculate the change in weight of the loader/receiver precisely before it discharges the material through the ring and into the container.

Monitoring and metering

The system can operate in two modes. In default or "totaliser" mode, the TrueRate system continuously and automatically measures the total resin flow through the receiver to a bin or container below. While doing so, it can display the weight for each load cycle, tabulate a running total (in lb or kg), and calculate the total throughput rate for a period of time (lb/hr or kg/hr). In job (active) mode, the system adds an optional discharge valve to the weighing ring. This enables the TrueRate system to meter and dose a specified amount of material from the receiver mounted above into a bin or vessel located below. The system senses the amount of material accumulating in the vessel and uses a pneumatic cylinder to close the discharge valve as soon as the correct amount has been dispensed. The cylinder reopens the valve and the receiver cycle resumes when the TrueRate is ready to measure the next batch.

The system can be programmed and controlled in three ways. Firstly, with an optional 4.3 inch touchscreen built into the system's electrical control panel; with a Windows-based PC running a virtual network client viewer connected via Ethernet cable to the panel; or with both. Mode selection and programming is simple. So too is connecting

IMAGE:

Right: The weighing ring in Conair's
TrueRate system is mounted
below a material loader or
receiver but above a container or
bin, where it uses resin information
provided by the user to calculate
the change in weight of the
loader/receiver precisely before it
discharges the material through the
ring and into the container



the TrueRate system to SmartServices, Conair's cloud-based Industry 4.0 solution for auxiliary equipment monitoring, management and analysis. All that is needed is a SmartServices hub and an Ethernet cable connected to the TrueRate system's electrical control panel.

"TrueRate is a new and elegant way to track and regulate the receipt, flow, and usage of valuable resins and flowable powders throughout a plastics processing facility," says Landers. "In totaliser mode, the system can, for example, accurately measure and validate the quantity of resin conveyed from a process bin that was loaded from a silo. Or, it can track the dispensing of that resin to the plant, leaving the processor with an accurate, running inventory. In job mode, an operator can program the system to measure out a precise amount of material into a bin. For example, you can unload 400 lb of material into a Gaylord, 25 lb into a mixer, or 65 lb into a container that is used to manually fill a rotational mould. Just put the container in place beneath the TrueRate system, and input the desired weight on the control

interface. The system will dispense exactly the right amount and stop, so there is no need for manual weighing and no guesswork or error in tracking the total throughput."

Koch Technik has installed a complete central conveyor system from the silo to the plastics processing machine for Netherlands-based Tacx. The new energy-efficient EKON dryer system was also used. Tacx is a manufacturer of training systems and

equipment for cyclists, especially exercise bikes and rollers for racing drivers, as well as drinking bottles and bottle cages. The company is best known for its bottles, with which it has been equipping several professional teams in cycling for years. The company recently set up a new production site in Oegstgeest, close to its headquarters.

The Dutch representative of Koch Technik, Thiele & Kor Plastics Machinery, installed the complete central conveying and drying system from the silos to the dryers and pipe systems to the plastic processing machines. The system supplies around 20 fully electric injection moulding machines, on which technical parts are moulded, and four blow moulding machines, on which drinking bottles are produced. The main materials used are polyamides and polycarbonates, both in granular form and as regrind.

The EKON dryer unit (introduced by Koch Technik at K2019 - see *Injection World* March 2020 issue) combines the advantages of the company's existing two dryer concepts CKT and EKO. EKON dryers are available in eight different sizes from 110-2,000 m³/h. For the system for Tacx, the EKON 1100F (for the generation of 1,100 m³/h of dry air) was selected, together with a total of 16 drying containers of different sizes.

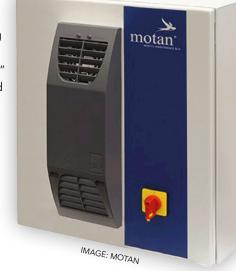
Tacx says that there is currently increased demand for exercise bikes for home use, due to the coronavirus pandemic, so production expansion for the cycling equipment supplier was well timed.

Motan-Colortronic has developed a compact remote maintenance box that can keep a system running no matter where it is located in the world – a simple and secure solution for digitally maintaining and caring for system controls. The company adds that modern raw materials handling systems require complex controls to run efficiently. In the case of a problem or an update to the

control, a specialist service person is usually required to get the system up and running again and to keep operational downtime to a minimum. However, in today's challenging times, it is not always possible for qualified service personnel to be present when they are needed most.

The maintenance box contains a powerful industrial PC with comprehensive software packages for

Right: Motan-Colortronic has developed a compact remote maintenance box for digitally maintaining and caring for system controls anywhere in the world



remote access, debugging, analysis and logging tools for control and network components. All the tools required for configuration and administration are also included in the package as standard. Built into a compact wall cabinet, the remote maintenance box makes it possible to access all Motan CONTROLnet controls remotely using internet or company-internal intranet. The operating language is determined according to the monitored modules, making it possible to operate the system from anywhere in the world.

Movacolor has launched a configuration wizard for its touch screen controller software for gravimetric and optometric feeders. The wizard provides a guide through the configuration process of the software step by step, ensuring that loaders are configured, the right dosing tool is selected and the initial load-cell calibration performed, for example.

The company adds that the controllers offer optimum control through an 8 inch multilingual full colour touch screen with intuitive operation. The start-up wizard can be used for installation and configuration, and the controller can store up to 1,000 recipes and materials. The unit has a robust,

stainless steel housing and one controller fits all gravimetric units. There is a VNC remote operation option.

The controllers play an important role in the reliability and stability of the dosing process, says Movacolor. The controllers are easy to operate under all circumstances in injection moulding and extrusion. The controllers do not require external ventilation. This ensures a reliable operation in the most troublesome environments. The touch screen controller can operate up to 15 gravimetric units in any configuration. Any change of dosing units can be configured simply without any software cost. The touch screen controller can interface with almost all machine controllers or central monitoring systems and fully integrates with the company's MCSmart monitoring and control software.

Vismec has developed a number of small and large conveying systems and products and options for materials handling. These include the common VB42 with a 5.5 kW double stage side channel blower and three stage double cyclone filter suitable for running with different types of materials and different sizes of stainless and glass receivers. The DR double cyclone filters are

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claimed to never stop the conveying system - not even for regular maintenance. In addition, the new Visibus system can be completely managed by the Halo control to guarantee a trouble-free fully automated conveying process. The new single station three phase blower Solo includes a new fabric filter with automatic filter cleaning.

Wittmann Group has developed a number of new initiatives for materials handling in injection moulding. The M7 control for central material conveying systems can be used universally and is ideally suited for practically all requirements for the preparation and supply of plastic

granulate. In addition to the fixed displays and input options of the M7 network control, the control also offers a VNC server option. With the VNC option, the user gets a quick overview of

the individual components without having to visit the production site directly. It is also available for retrofitting.

The company has also developed the HiQ-Flow process control to determine precisely any deviation from the material's nominal value and corrects it in real time. The basis for this process control is the recording of a high number of measurement points along the

injection stroke. This results in time and cost savings, a more stable process and also helps to save energy.

The swivelling hopper adapter developed for Wittmann conveyors ensures easy cleaning due to its flexible swivel mechanism. The hopper guarantees fast and easy handling, because the laborious handling and removal of conveyors and material hoses is completely eliminated. The conveyor is simply swivelled to the side, cleaned, brought back into position and the machine is then ready for use again. This is also available for retrofitting.

Gravimetric dosing units have a local material and recipe memory. These recipes can be easily transferred between several dosing units via a PC solution from Wittmann, called GraviLog. In addition, GraviLog can remotely control all these connected devices and also document their data graphically and in tabular form.

Moretto has introduced the DPK continuous loss-in-weight colour feeder, which is suitable for injection moulding applications. The DPK dosing unit is a compact, precision feeder, suitable for

dosing small quantities of colour or additives into a flow of base material. The masterbatch or additive to be dosed is contained in a hopper made of a specific transparent, shock-resistant acrylic material that makes the material contained and the level of the load immediately visible. The hopper is easily removed without tools for replenishment or additive change.

The company says that the precision of this machine is guaranteed, even at low rates. The load cell technology and control algorithm make DPK immune to vibrations, achieving higher dosage

> precision without risk of overdosing the additive or masterbatch. The control of this dosing unit is supplied with a simple and intuitive touch screen interface, where it is possible to store and recall product recipes. DPK has ethernet, RS485 connections and is arranged for MOWIS.

Brabender Technologie

has developed a feeder specially designed to tackle recycled materials. The company says that shredded carbon and natural fibres can form into uneven flakes and fibres that snag mechanically on product bridges and do not reach

feed screws. The FiberXpert FX50 has been specifically developed for feeding recycled materials like carbon and natural fibres, recycled PP, PET and bottle flakes, shredded plastic and other fibre products like cellulose, acrylic, aramid, PPS, polyamide, polymer or polyester fibres. Long, unevenly cut and non-flow-capable fibres can be fed reliably with the aid of a special fibre screw, hopper design with large inflow cross-section, large, steep-walled hopper and special agitator geometry and positioning.

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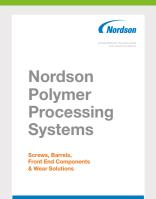
EUROTEC: AUTOMOTIVE COMPOUNDS



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

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NORDSON PROCESSING SYSTEMS



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

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

Optimise your industry knowledge with AMI's recommended databases

Injection Moulders in the United Kingdom



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

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Injection Moulders in Germany



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

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Injection Moulders in France



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

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Injection Moulders in Italy



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

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Injection Moulders in Spain and Portugal



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

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Injection Moulders in Austria



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

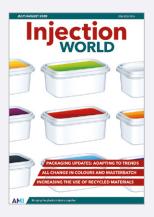
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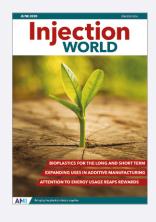
AMI publishes five process-specific FREE plastics industry magazines. Simply click on the cover below to read each magazine. Or download the issue in the relevant Apple or Android app



Injection World July/August 2020

The July-August edition of Injection World has two articles on challenges and trends in rigid packaging. Plus there are features on increasing the use of recyclate in new injection moulded products and developments in colour masterbatch.

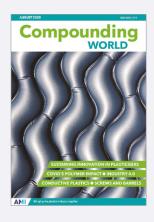
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Injection World June 2020

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

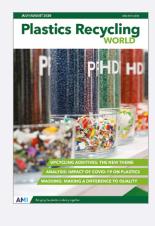
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Compounding World August 2020

The August issue of Compounding World delves deep into thermally conductive additives and production data usage, plus the latest on development of sustainable plasticisers and what's new in screws and barrels.

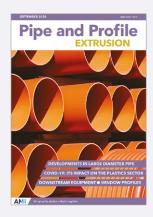
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Plastics Recycling World July/August 2020

The July/August edition of Plastics Recycling World looks at additives for "upcycling" recycled polymers, recycling of WEEE/ELV plastics, and washing technology. It also includes unique AMI data and analysis on recycling demand and the global impact of Covid-19.

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Pipe and Profile September 2020

The September issue of Pipe and Profile Extrusion looks at how growth in sizes is affecting developments in large diameter pipes. Another feature covers new materials playing a role in improving performance of window profiles. Plus downstream extrusion equipment.

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Film and Sheet July/August 2020

The July/August 2020 edition of Film and Sheet Extrusion magazine looks at developments in shrink and stretch films. It also explores the latest in bioplastics, masterbatches, film conversion technology, and progress in European PVC recycling.

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Compounding

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Pipe and Profile



Injection Plastics Recycling

GLOBAL EXHIBITION GUIDE

1-3 September	Kuteno, Rheda-Wiedenbrück, Germany POSTPC	ONED www.kuteno.de
8-10 September	Feiplar, Sao Paulo, Brazil CANCELLED	www.feiplar.com.br
9-13 September	Taipei Plas, Tapei, Taiwan POSTPONED	www.taipeiplas.com.tw
21-25 September	Colombiaplast, Bogota, Colombia POSTPON	ED www.colombiaplast.org
29 Sep-1 Oct	Interplas, Birmingham, UK POSTPONED	www.interplasuk.com
6-9 October	Plastpol, Kielce, Poland NEW DATE	www.targikielce.pl
6-10 October	IPF Japan, Tokyo, Japan CANCELLED	www.ipfjapan.jp
7-8 October Compound	ding World Expo Europe, Essen, Germany POSTPONED	www.eu.compoundingworldexpo.com
13-17 October	Fakuma, Friedrichshafen, Germany CANCELL	ED www.fakuma-messe.de
4-5 November Compo	ounding World Expo USA, Cleveland, USA POSTPONED	www.compoundingworldexpo.com/na/
10-13 November	Plastimagen, Mexico City POSTPONED	www.plastimagen.com.mx
1-5 December	Equiplast, Barcelona, Spain CANCELLED	www.equiplast.com
5-8 December	Plast Eurasia, Istanbul, Turkey	www.plasteurasia.com/en

9-12 January	Arabplast 2021, Dubai, UAE	www.arabplast.info
13-16 April	Chinaplas 2021, Shenzhen, China	www.chinaplasonline.com
4-6 May	Kuteno, Rheda-Wiedenbrück, Germany NEW	DATE www.kuteno.de
4-7 May	Plast 2021, Milan, Italy	www.plastonline.org/en
17-21 May	NPE 2021	www.npe.org
1-2 June Compoundir	ng World Expo Europe, Essen, Germany NEW DATE	www.eu.compoundingworldexpo.com

AMI CONFERENCES

26-28 October Plastic Closure Innovations, Barcelona, Spain

2-4 November Plastics Regulations Europe, Cologne, Germany

24-25 November Single-Serve Capsules, Berlin, Germany

30 November - 2 December Thin Wall Packaging, Nuremberg, Germany

30 November - 2 December Fire Resistance in Plastics, Dusseldorf, Germany

1-2 December Conductive Plastics, Munich, Germany

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

www.ami.internationa





1 - 2 June, 2021 **ESSEN, GERMANY**





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

www.ami.international/exhibitions

