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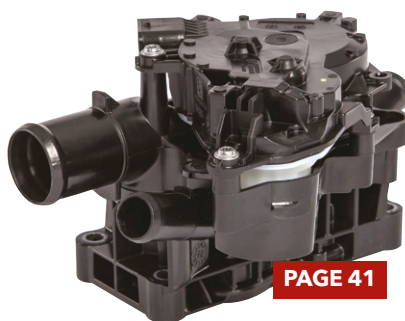
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Pretium acquires Olcott

Pretium Packaging, a manufacturer of plastic containers and closures which makes some 2 billion PET and HDPE containers/year from 17 sites across North America, has acquired its compatriot, Olcott Plastics. Based in St Charles, Illinois, and dating back to 1969, Olcott is mainly active in injection moulding and decorating of single and double wall PP jars, seamless PET jars and PP closures.

Pretium said that this would bolster its offerings in personal care, while giving Olcott a national platform for its blow moulded containers. Previous owners Joseph and John Brodner, the existing management team and the employees will all transition. Financial details were not disclosed. This is the sixth acquisition made by Pretium since private equity firm Genstar Capital acquired it.

➤ www.pretiumpkg.com

Visteon sees falling sales

Visteon, the automotive injection moulder and Tier One supplier, saw sales fall by 9.5% to \$737m in Q1 2019 from Q1 2018, due to a mixture of falling vehicle production volumes, and customer pricing net of design changes and currency movements, partially offset by new business.

The company's main markets in Q1 were Europe (33%), the Americas (24%), China, including for export (23%), and other Asia-Pacific countries (20%).

President and CEO Sachin Lawande said: "Sales were in line with our expectations, despite the challenging vehicle production environment. The operational challenges that affected our margins are expected to diminish and be largely resolved in the



PHOTO: PSA

Visteon has introduced a digital cluster displaying holographic objects on the new Peugeot 208, part of the carmaker's 3D i-Cockpit technology

second and third quarters."

Visteon's gross margin fell from \$129m to \$66m over the period, primarily due to lower sales, launch challenges with a curved centre information display, inefficiencies associated with a plant transfer in Mexico and timing of engineering expense, the company said. Net income

fell from \$65m to \$14m.

However, the company, which is based in Michigan, US, also secured an additional \$1.4bn in lifetime sales, driven by next-generation digital products, primarily all-digital clusters, advanced displays and its own SmartCore cockpit domain controller technology.

➤ www.visteon.com

Magna breaks ground in Morocco

Canadian automotive parts supplier Magna has broken ground for the construction of a new facility in Kenitra, Morocco, to make exterior and interior mirror systems. The facility covers 5,700 m² and will cost \$11.3m to build. Production is projected to begin in spring 2020. About 275 jobs will be created at the new plant.

This is Magna's second investment in

Morocco and follows on from the formation of a Casablanca-based engineering joint venture with Altran Technologies in October 2018. The Moroccan government has a target for the country to build 1 million vehicles/year by 2025 and has been actively attracting automakers and investment in new plants to achieve that goal.

➤ www.magna.com

Ineos Styrolution plans site for StyLight composites

Ineos Styrolution is planning to set up a new production site for its SAN and PP-based composite range, StyLight.

The production unit will be operational by 2022 and will probably be located in Germany, although that decision is yet to be finalised. StyLight was originally launched at K2016.

The products and processing were optimised in partnership with the Neue Materialien Fürth and Neue Materialien Bayreuth research institutes in Germany. Since then, partnerships with Roctool and ARRK Shapers have led to its full validation to the automotive interior specification of automotive OEMs.

Applications have been identified in electronics, sports and other applications where the material's combination of structural stiffness, aesthetics, processability, dimensional stability and near-Class A surface quality are in demand, the company said.

➤ www.ineos-styrolution.com



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TriMas buys Taplast in Italy

US diversified manufacturer TriMas has returned to Italy for its latest acquisition. The Michigan-based group (which operates in the packaging, aerospace, industrial and other markets) has acquired dispenser and closure producer Taplast from the Santagiuliana family, which founded the company. This follows on from its earlier acquisition of another Italian firm, Plastic.

Taplast produces dispensers, closures and containers

for beauty and personal care, household and food packaging markets. It has manufacturing sites at Povolaro, Italy, and Levice, Slovakia, plus offices in the UK, the US and France, and commercial representatives in Asia and South America.

Taplast had revenues of about \$32m in 2018. Following the takeover, it will be a wholly-owned division of TriMas's Rieke dispenser business and will be reported in the group's packaging segment.

In its 45 years of independent business, Taplast commercialised several award-winning products in the dispensing and closure packaging market, producing dispensers, foamers, single- and multi-body caps, child-resistant caps, jars and speciality coffee-dispensing pods, among other things.

Its capabilities include injection moulding for dispensers and closures, injection blow moulding for containers, and assembly.

➤ www.trimascorp.com



PHOTO: TAPLAST

Taplast produces dispensers, closures and containers

New TactoTek partnership

German in-mould labelling (IML) specialist BÖ-LA and TactoTek, a Finnish pioneer in injection moulded structural electronics (IMSE), have signed an agreement for BÖ-LA to market IMSE systems. The two said that this deal "brings together leaders in their respective technology domains to advance the market for integrating electronic functionality within moulded plastics".

BÖ-LA has been developing and commercialising techniques for adding electronic functions to surfaces, including integrating printed electronics in 3D-formed IML parts.

➤ www.tactotek.com

➤ www.boela.de

New RPC drip-free dispenser

RPC Promens has developed a new means of dispensing Brenntag's AdBlue diesel engine fluid, drip-free, from a 4l HDPE bottle in which the nozzle's three injection moulded PP components create a system that automatically dispenses when inserted into the filling hole.

This is said to reduce NO2 exhaust emissions



The design, which was highly commended in the Consumer Convenience category at the UK Packaging Industry Awards, has a distinctive shape that ensures that all the liquid drains from the pack, and an ergonomic handle to help in the pouring process. The pack is made from similar materials and can be easily separated for recycling at the end of its life, the company said.

The outer shell of the nozzle slides back and opens the dispensing and air return holes when it is inserted into the tank. Air is allowed to pass back into the bottle for plug-free dispensing. This automatically shuts off when the nozzle is withdrawn so as to avoid spillages. The outer shell then slides back over the dispensing hole, pushed by integrally moulded plastic springs, when the nozzle is withdrawn.

➤ www.rpc-group.com

Indiana expansion for Decatur

Custom injection moulder Decatur Plastics Products has announced plans to expand its operations in Jennings County, Indiana, US. This is being done to meet growing demand in the automotive, consumer products, electronics, medical, packaging, telecommunications and

consumer industrial markets, among others.


The firm will invest \$11.4m over five years to expand its 8,100 m² headquarters and production operations, adding about 9,200 m² in equal tranches: first by renovating and equipping a recently purchased shell building in

the North Vernon Industrial Park for additional warehousing and light assembly by July, then building a second facility adjacent to this by summer 2020.

Decatur currently has about 185 employees in the state and expects to add 70 through this investment.

➤ www.decaturlastics.com

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Milacron sells its blow moulding unit

US plastics machinery major Milacron is selling its Uniloy blow moulding business to investment firms Osgood Capital Group and Cyprum Investment Partners. It said the divestment allows it to concentrate on technologies in injection moulding, hot runners, moulds and extrusion.

The blow moulding business was reported as a discontinued operation, in accordance with US GAAP principles, in Milacron's Q1 results. It was part of Milacron's Advanced Plastic Processing Technologies (APPT) division, which also includes injection moulding and extrusion equipment. AAPT's sales fell by 12.2% from Q1 2018 to \$119.4m in Q1 2019, not including \$3.8m of unfavourable

currency movements. Adjusted EBITDA fell by 9.3% to \$14.7m.

During Q1, Milacron's sales were 13.0% down on Q1 2018 on an as-reported basis and 10.5% on a constant currency basis, at \$248.7m. Orders were 10.8% and 7.6% down respectively at \$275.3m, although they were 7% up on both Q3 and Q4 2018 orders. Operating earnings on a GAAP basis increased by 11.6% to \$25.9m, but adjusted EBITDA decreased by 23.5% to \$41.0m.

"Milacron's first quarter results were consistent with our expectations and the first half of 2019 is progressing as anticipated," said CEO Tom Goeke. "Our India equipment business continued to perform well with double

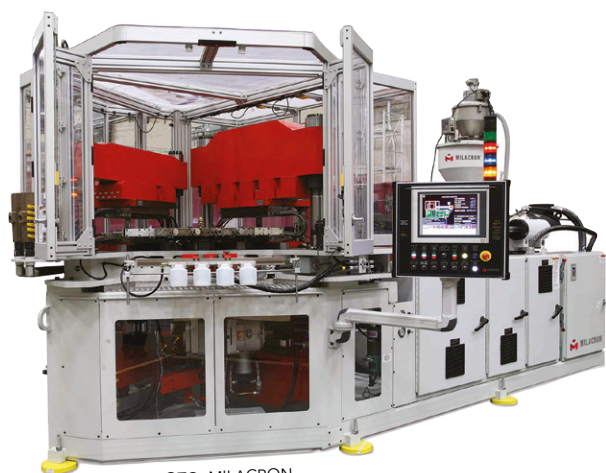


PHOTO: MILACRON

digit constant currency sales growth over prior year."

Melt Delivery & Control Systems saw sales fall by 10.2% year-on-year to \$100m, excluding \$4.6m of negative currency movements, while adjusted EBITDA fell 32.5% to \$25.8m. Fluid Technologies sales fell 3.8% on a constant basis to \$32m and adjusted EBITDA fell 9.9% to \$6.4m.

> www.milacron.com

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Wittmann positive in slowdown

Wittmann, the Austrian injection moulding machinery, robotics and auxiliaries group, said it increased its sales in 2018, but since the end of the year, there have been signs that orders are slowing down.

Wittmann Group increased sales by nearly 6% to €425m in 2018. According to Michael Wittmann, Managing Director and CEO of the group, this development was extremely satisfactory.

High order income during the first half of 2018 was followed by a decline in the second half, especially in the months of November and December. The company was still able to start the fiscal year 2019 with a good order backing, it said.

The group started the year 2019



PHOTO: WITTMANN

The showroom at Wittmann's new building in La Buisse, France

with an order income on a par with 2016. Michael Wittmann said: "Innumerable political and economic uncertainties and discussions now finally have a lasting effect on the investment behaviour in our industry, slowing it down. We were fully aware of the fact that the incredible succession

of record results over the last 10 years would eventually come to an end. The slowdown has now just started in the last quarter of 2018. We expect that the year 2019 will continue on the current level."

Wittmann carried out a number of building

projects in 2018, including a project at its Kottlingbrunn facility, Austria, in which 2,200 m² were added to its production area. Extensions were also completed at facilities in Germany, Czech Republic, Mexico and Italy. The company moved into a new, larger building in France at the end of April this year. Granulators are made at the new location in La Buisse.

➤ www.wittmann-group.com



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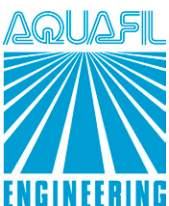
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Borealis is producing automotive compounds at Taylorsville in the US



Borealis starts compounding plant in the US

Borealis said its new, 30,000 tonnes/yr PP compounding plant at Taylorsville, in North Carolina in the US, is now onstream. The 4,650 m² facility has dedicated production lines for TPO- and short glass fibre-reinforced compounds, which will mainly be supplied to OEMs and Tier One companies in the regional automotive sector.

"Following the plant's mechanical completion in December, first samples were shipped in February and several projects with leading North American and European OEMs have already been secured," said Lucrèce Foufopolous, EVP of Polyolefins and Innova-

tion & Technology. The first products made there include interior and exterior materials approved by Daimler and Volkswagen.

Borealis has also recently added Daplen EE058AI to its low-density PP portfolio for automotive interior applications. The material is already in use in the lower dashboard, glove box and centre console of the new Škoda Scala.

Daplen EE058AI is a 10% talc-filled and elastomer-modified grade formulated to meet the latest OEM requirements for low odour, emission and fogging levels while offering up to 6.5% weight savings.

➤ www.borealisgroup.com

Seehars to head Grammer

The supervisory board of German car components and systems firm Grammer has named Thorsten Seehars, currently a member of the management board of Knorr-Bremse, as its new CEO, with a three-year contract starting from 1 August. He replaces long-time CEO Hartmut Müller, who left at the end of 2018. Interim CEO Manfred Pretschner will stay in place until Seehars starts.

➤ www.grammer.com

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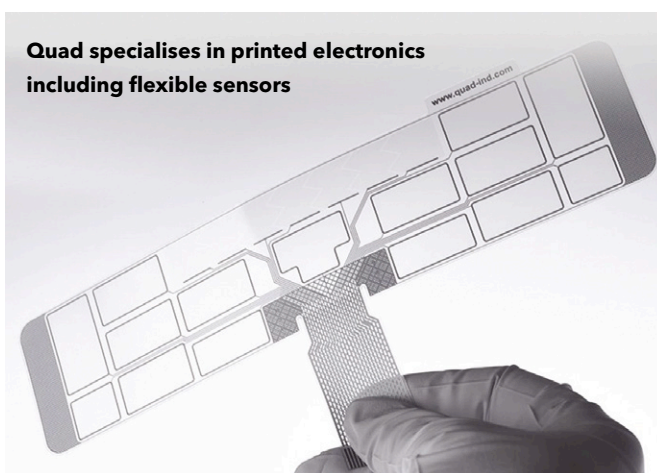


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Novares invests in Quad Industries

Novares Venture Capital, which was set up in 2018 to invest in fields adding value to Novares' activities in advanced automotive plastics, has taken a stake in Quad Industries, a Belgian company with a production site in Slovakia that is active in printed flexible electronics. The stated aim is "to create new systems with intuitive intelligent interfaces for all passengers and add to Novares Group innovative solutions for cars".

Quad is specialised in user interfaces and control panels for both consumer and industrial applications. In recent years, it has extended into printed



Quad specialises in printed electronics including flexible sensors

PHOTO: QUAD INDUSTRIES

electronics, particularly printed, flexible sensors. This will be the fourth start-up in which Novares Venture Capital has invested, after FlexEnable, APAG CoSyst and Actronika. The

investment amount was not disclosed.

This is part of a wider partnership between Novares and Quad, which have also signed a joint development agreement

and are collaborating within Novares' open innovation project focussed on the Nova Car demonstrator. Quad's technology is already integrated in the Novares 'Touch'N Play' concept, incorporated in the Nova Car #1 demo car.

Further work on intuitive intelligent interfaces using 3D-shaped electronics are to be incorporated in the Nova Car #2, which will be revealed at an event in Paris in June. Future co-developments could include proximity sensing, gesture control, vital signs monitoring or stretchable sensors, Novares added.

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TPE producers are designing new materials, such as elastomer hybrids, and refining established materials to meet precise needs in automotive, medical and consumer applications. By Peter Mapleston

Tailoring with TPEs

Advances in compounding technology are making it easier to create thermoplastic elastomers (TPEs) that better meet the needs of individual applications. Overall performance is improving too, with more progress being made in compounds that bond well with all sorts of thermoplastics in two-component injection moulding.

Kraiburg TPE has developed thermoplastic elastomer hybrid technology, or TEH. This allows it to compound TPEs made from more diverse combinations of elastomers and thermoplastics than before using TPV (thermoplastic vulcanizate) technology. The company says TEHs are "a new performance class for thermoplastic processors." It has implemented new compounding equipment to make the products and currently has capacity of around 100 tpa on a pilot line. "The concept for bigger lines is there," it says.

Thermoplastic elastomer hybrids are quite different from TPVs, which are in most cases compounds of polypropylene and partially vulcanised EPDM. "TPVs are good for temperatures up to 100-120°C and they have little oil resistance," says a representative. "We can select other elastomers to take long-term temperature resistance up to around 150°C and also provide resistance to oils and grease." In this case, the elastomers are fully crosslinked. Hardnesses range from 55 to 80 Shore A.

The new materials are said to be particularly suitable for use in internal combustion engine compartments, in heat management of drives and batteries for electric vehicles, as well as in lubrication and cooling systems of machines, process technology and buildings. Applications include seals and

gaskets, plugs and connectors, lids and covers.

Frieder Vielsack, Head of Advance Development at Kraiburg TPE, says the compounds can not only be used as an alternative to common crosslinked rubber solutions, but they also offer appealing options for multi-component applications when bonded with technical plastics such as polyamides and thermoplastic polyesters.

Vielsack says there has long been a need for a universal soft TPE solution capable of replacing rubber, showing high temperature resistance and chemical resistance. "Numerous so-called super-TPEs or super-TPVs entered the market and then gradually disappeared again," he says. He cites "super-TPVs" based on acrylate rubber as one example.

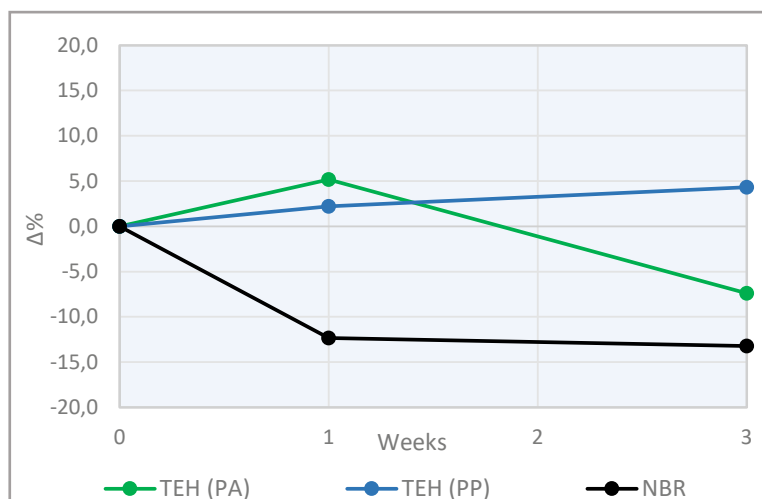
"There are many reasons why these developments were not able to really establish themselves on the market. It is noticeable, however, that these thermoplastic elastomers are each based on only one specific raw material. Attempts were repeatedly made to satisfy the needs of as many applications as possible with one TPE class and its special raw-material base. The desired 'universal solution' failed to materialise."

Kraiburg TPE's objective was to combine different thermoplastics and different elastomers using only a single manufacturing technology "and thus to achieve the maximum possible number of combinations with a low level of complexity in production technology," says Vielsack. He points out that the unique structure of the Kraiburg Group, which includes an operation making synthetic rubber (Gummiwerk Kraiburg) as well as Kraiburg TPE, has proved very useful in tackling this issue. ➤

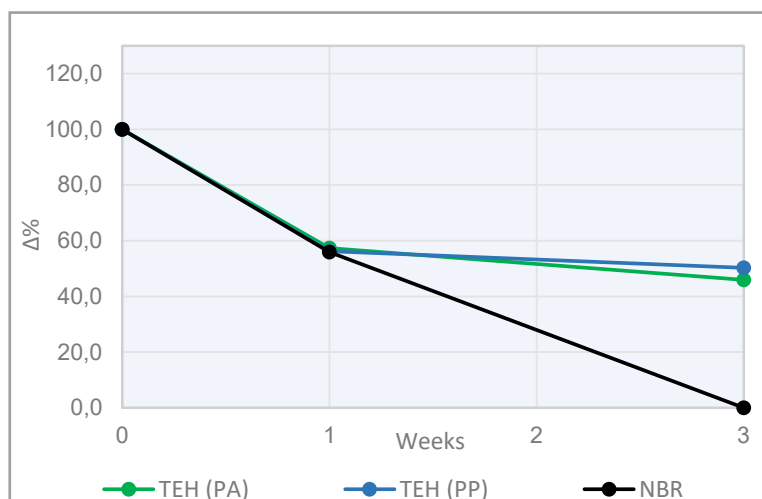
Main image:
Precision and customisation are growing features in TPE materials

	TEH (PA)	TEH (PP)
Hardness Sh A	73	67
Tensile strength N/mm ²	6.3	6.5
Elongation of break %	300	330
Tear resistance N/mm	18	19
Compression set 70°C/22 h	31	40
Compression set 100°C/22 h	35	37
Compression set 120°C/22 h	38	47
Adhesion N/mm	2.7	6.0

Basic property data for two Kraiburg TEH compounds, one developed for adhesion to polypropylene (TEH (PP)) and the other for adhesion to polyamide (TEH (PA)). Both show very low compression set



Swelling behaviour of Kraiburg TEH (PA) and TEH (PP) in ASTM reference oil IRM 901 at 120°C compared to that of a commercially available NBR-based rubber. The rubber compound shows a significant decrease in volume, which may present a problem for sealing applications. Both TEHs show lower volume change



Elongation-at-break behaviour in IRM901 at 120°C. Both Kraiburg TEH materials embrittle much less than the rubber

He also says that Kraiburg TPE has succeeded in implementing a technology platform that allows a large number of thermoplastic elastomers to be tested within a short period of time. "Whereas the initial developments took months to complete, conclusions about the suitability of a new raw-material combination can now be reached within a few test cycles and only few weeks of material testing," he says.

Kraiburg TPE has tested numerous thermoplastics such as PP, PE, EVA, PA, PBT and modified thermoplastics, as well as thermoplastic elastomers such as TPE, TPC, TPA and TPU as a thermoplastic phase. The elastomers that were used include NBR, H-NBR, EVM, AEM, ACM, SBR, IIR, BR, NR, EPDM and VMQ.

Regular TPEs continue to improve as well, many of them intended for over-moulding. **Albis Plastic**, for example, has revised and improved its Easyflow Alfater XL TPVs materials. The new Alfater XL 3EF0010 Easyflow series, in hardnesses of 50 Shore A to 40 Shore D, is a deep-black material with very good flowability. "This property makes it well-suited for thin-walled components, tools with long flow paths, or complex geometries," the company says.

The new compounds have very good weather resistance, surviving up to three annual cycles of the Florida and Kalahari tests (PV 3930 and PV 3929). They also adhere very well to filled, reinforced, and un-reinforced PP.

At SPE's Automotive TPO Conference in Detroit last October, **Trinseo** introduced no fewer than four new series of TPEs. They include 16 new over-moulding grades specifically developed for automotive applications, offering improved adhesion to Trinseo's Magnum ABS and Pulse PC/ABS product range.

Trinseo says that since it acquired Italian TPE compounder API in 2017, it has gained unique expertise in both the formulation technology and compounding processes of TPE materials. "The introduction of these new TPEs marks a milestone in the integration process as Trinseo works to further expand the synergies between its rigid- and soft-touch product portfolios," it says.

All TPE grades are produced at Trinseo's manufacturing site in Mussolente, Italy. The plant also contains a Specialised Overmoulding Centre (SOC), where the company can measure the adhesion between substrates in accordance with VDI 2019 standards.

Hexpol TPE points to the increasing need to provide materials with reduced emissions. It offers Dryflex Interior for such applications. On average, they offer a 75% emission reduction compared to

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Right:
Components in
car HVAC vent
systems are a
target for
Hexpol Dryflex
grades

other TPEs for interior applications on the market, Hexpol says. They display low odour with results 2.0 to 3.0 in standards such as VDA 270. According to gravimetric fogging standard ISO 6452, condensate levels are under 1.0 mg, while VOCs measured in the VDA 278 thermodesorption test are between 60 and 120 µg/g; fog is from 200 to 600 µg/g.

Dryflex Interior TPEs have passed additional interior tests for lightfastness, flammability and mechanical performance, the company notes. Good flow properties make possible finely structured surfaces and complex geometries in part designs. Available in customer specific colours as well as black and natural, they are currently offered in hardnesses between 25 and 85 Shore A.

Thomas Köppl, Group Product Manager at Hexpol TPE, says that for seals in HVAC systems, soft TPEs in the range of 25 to 60 Shore A are often used. This low hardness is necessary to ensure a reliable seal and to avoid rattling noises (a growing requirement with the move to EVs, he notes). The materials and components need to withstand high mechanical and thermal loads, and mechanical properties must not change appreciably, even after 1,000 hours at 90°C. The finished components must also function properly at both high and very low temperatures. This includes noiseless opening and closing of the vents, as very soft materials could produce noises as a result of sticking to the hard component. Hence the need for materials that do not become tacky, regardless of the temperature.

Additional mechanical properties include low compression set (typically <50% after 22 hours at 70°C) and tensile properties such as high flexibility, tensile strength and tear resistance. Components must withstand long-term cyclical loads, with no cracking after frequent loading and unloading.

Lubrizol Engineered Polymers says it is working on a novel technology to obtain thermoplastic polyurethanes (TPUs) with low volatiles. It cites a new 85 Shore A material which is designed to achieve extreme low emissions in accordance with VDA 278 (see table below).

Lubrizol says the material offers an adequate hardness, as well as excellent mechanical proper-



PHOTO: HEXPOL TPE

ties (36 MPa tensile strength, 593% elongation at break) and flow. A similar grade from the same Pearlthane series is being used in rolling shutters in centre consoles in automotive. The TPU is over-moulded on top of ABS. Its fast processing properties are essential in this case, the company says.

Away from automotive, **Teknor Apex** late last year introduced a new series of styrenic TPEs that provide the surface appearance and haptics of silicone rubber, which exhibit lower compression set than standard TPS compounds, withstand temperatures in excess of 100°C, and provide chemical resistance for food-grade, cosmetics, and other regulated applications.

Monprene RG-15100 Series TPEs meet US and EU regulations for single- and repeated-use applications with dry, acidic, aqueous, and alcoholic food types. Shore A hardnesses range from 30 to 80, and all grades are translucent. The compounds are suitable for injection moulding and extrusion applications such as: utensil grips; kitchen appliance seals, gaskets, and tubing; food-saver container seals; dropper bulbs; and cosmetics applications. These TPEs can be used with containers that must be microwave- and dishwasher-safe. They may be two-component moulded with polyolefins.

"Pre-compliance with regulations accelerates our customers' speed to market with new products," says Christopher Smith, senior market manager for the Thermoplastic Elastomer Division

	Gravimetric Fogging (ISO 6452), mg	VDA 278 VOC, µg/g *	VDA 278 FOG, µg/g *
Standard TPE	1.0-2.0	120-400	2000-3000
Low VOC TPE	0.3-0.7	60-120	200-2000
Low VOC 85 Shore A TPU	0.5	100	153

*VDA 278 requirements: VOC ≤ 100 µg/g; FOG ≤ 250 µg/g.

Source: Lubrizol Engineered Polymers

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PHOTO: TEKNO APEX



Above:
Syringes with
stoppers
shown in black

of Teknor Apex. He adds that the company can develop custom formulations if necessary.

At recent exhibitions in Europe, the company has also been showing off several new TPE families, notably types for over-moulding. At Plastpol, for example, it was highlighting materials for major TPE markets in Poland – large appliances, automotive, power tools and consumer products among them – and also drawing attention to what it says is a major investment to expand support for customers in Poland and throughout Europe.

The company has a new 15,000 m² complex under construction in Rothenburg ob der Tauber, Germany, due to start up later this year. Replacing a smaller compounding operation at a nearby site, the new facility will expand the company's Euro-

pean capacity to manufacture TPEs and also engineering thermoplastic compounds. It will include an extensive laboratory for developing new compounds and providing customers with design support, application development, and product/process training.

Among new compounds introduced at the show was Sarlink 14155 TPV, which shows Improved Speed of Elastic Recovery, or "snap," valued in components such as seals, gaskets, and hoses for large appliances. A new family of styrenic TPEs, PTS-Thermoflex E, are claimed to provide improved mechanical properties and abrasion resistance for applications that undergo repeated dynamic use or everyday wear and tear, such as soft-touch buttons and grips, hinges, and tool handles. The series includes Shore A hardnesses from 50 to 85. The compounds can be over-moulded onto polyolefins.

Also for over-moulding are PTS-Thermoflex A and PTS-Thermoprene A TPE. These adhesion-modified styrenic TPEs (PTS-Thermoflex) and PP/EPDM-based TPVs (PTS-Thermoprene) are formulated for strong bonds to a wide range of engineering thermoplastics. Six series are available, each with a range of hardnesses, performance capabilities, and applicable substrates.

Earlier last year, Teknor Apex introduced medical-grade Medalist TPEs for injection moulded plunger stoppers for syringes, saying they provide

Giving dogs something to chew on

US-based compounder Audia Elastomers says it is meeting the growing needs of the durable pet toy market with an extensive range of high-performance TPEs that deliver durability, tear strength, high clarity, and adhesion to other polymers. The company offers customised materials based on most TPE types, which it says allow brand owners to position their products at various retail price points from high-end, boutique products to mass market, big box store materials.

Kraiburg TPE has a similar story, of a Thermolast K compound tailored to the precise balance of hardness and flexibility for a durable dog toy in combination with superior adhesion to polyamide and excellent colourability. Its material is also made in the US, addressing the preferences of

many American pet owners for all-domestic products.

This supplier says there is a growing awareness in the pet toys market for safe and sustainable materials that do not contain any hazardous substances while offering enhanced aesthetics and durability.



"As a growing segment in the consumer market, pet toys require similar features of safety, sustainability and ruggedness as consumers would naturally expect from children's toys," says Kevin Gase, Sales and Marketing Director of Kraiburg TPE Americas. "At the same time, manufacturers need innovative materials that will meet their demands of cost-efficiency."

The natural grade selected for the toy can be coloured in brilliant, rich shades and delivers a highly attractive as well as scratch resistant surface, Kraiburg TPE says, and it also shows excellent UV, ozone and weathering resistance. "In terms of mechanical properties, we were able to customize the compound to the exact level of hardness and flexibility required to achieve the desired soft feel and resilience," notes Gase.

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Right: Hexpol TPE developed customised bio-based TPE materials for Emballator Lifestyle's Yoga water bottle



improved syringe performance, are less costly and easier to mould than natural and isoprene rubber, and provide processing advantages over TPVs.

"Stoppers must move smoothly against the wall of the syringe barrel, provide an exceptional seal to preserve the integrity of the drug, and be chemically inert to prevent interaction with the syringe contents," says Ross van Royen, senior market manager of regulated products.

Major India-based TPE producer **Zylog Elasto-comp** is after this market too. It says that, with growth in locally-made medical devices, it has commercialised a range of TPE grades from 10 to 60 Shore A hardness for applications in medical and healthcare. They meet requirements of ISO 10993 for biocompatibility, cytotoxicity and haemo-compatibility; they are suitable for gamma, EtO and steam sterilisation, and comply with FDA 21, REACH, and RoHS regulatory requirements.

Company CEO Aschak Damani cites Neoflex 8060, which is used for plunger seals for disposable syringes. He says it is successfully replacing NR, EPDM, EVA and PVC, scoring with its lower density and providing low breakaway and sliding friction force.

"Besides its low CoF, compared to other TPEs, Neoflex 8060 is designed with a combination of higher tensile strength, stiffness and low compression set to ensure compliance to leakage and aspiration requirements and is suitable for over-moulding onto polypropylene substrates," Damani says.

He also points to a translucent Shore A 30 Neoflex grade, 8135, for respiratory masks. "Respiratory masks come in direct contact with the skin for longer durations," he says. "This calls for a soft non-irritating TPE grade with non-tacky silky feel, enabling sealing of the mask onto nose and mouth areas. Neoflex 8135 is over-moulded onto the

edge of a rigid transparent mask, "easily replacing expensive silicones as well as PVC materials cost effectively," he claims.

"We're seeing that interest in bio-based materials has accelerated over the last few years and it's an upward trend," says Klas Dannäs, Global R&D Manager at Hexpol TPE. "Dryflex Green bio-based TPEs are being adopted for several applications previously using conventional TPE compounds, both as a drop-in substitution, without the need for mould or tool modification, and also for new developments."

Dannäs notes that since most commercial bio-based raw materials are quite hard on their own, a major challenge has been to develop compounds with high renewable content at low hardnesses, while at the same time maintaining mechanical properties at acceptable levels. Dryflex Green TPEs go down to 15 Shore A. Depending on the hardness, compounds with a renewable share of over 90% (ASTM D 6866) are possible.

Emballator Lifestyle of Sweden manufactures sports and water bottles. Hexpol TPE developed customised bio-based TPE materials for its Yoga water bottle. The complete bottle contains renewable content, with the lid and harness produced from a Dryflex Green TPE suitable for food contact. "It's important the lid is easy to open, even when wet, so we worked with Emballator to achieve the optimum surface finish and soft-touch haptics," says Dannäs. "The material also needs to be easy to colour, to support Emballator's creative design and branding possibilities."

CLICK ON THE LINKS FOR MORE INFORMATION:

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PHOTO: ZYLOG ELASTOCOMP



The Chinaplas spotlight focuses on recycling

Chinaplas returns to Guangzhou this month and is expected to draw some 180,000 visitors. In this preview, we take a look at the major exhibitors in the injection moulding sector

Chinaplas returns to Guangzhou this year (it alternates between the southern Chinese city and Shanghai each year). The show, which runs from 21-24 May, will again be held at the China Import and Export Fair complex at Pazhou. Around 3,500 exhibitors will be there and the organiser, Adsale, is expecting around 180,000 visitors.

Many of the traditional Chinaplas features return for the 2019 event with some, such as recycling, being elevated to a more prominent standing. Adsale says that this more intense focus is a response to changes that have taken place in the local recycling market since China banned the import of waste plastics in 2017.

"In the past, the waste processing and recycling industry relied heavily on imports - lacking a complete recycling chain - while recycling rate and proportion of large-scale recycling are both low," according to Adsale. "With the implementation of

the ban, it is bound to intensify the shortage of raw materials, and the recycling system of renewable resources is in urgent need of change."

Adsale says that China's ongoing productivity - and growth in plastics production - will also mean a necessary improvement in recycling. "It is predicted that by 2025, China will produce nearly a quarter of the world's total urban solid waste," an Adsale spokesperson said. "And we know that by improving the recycling rate of waste plastics, the development of a circular economy can be greatly promoted."

Other feature areas of interest to injection moulders include: Medical Plastics Connect; Tech Talk; Design X Innovation; and Industry 4.0 Factory of the Future. But for all these extra features, the main reason for visiting the show will be the exhibitors and products on show - see preview on the next page. ➤

Main image:
Some 180,000
visitors are
expected for
Chinaplas
2019, which
takes place in
Guangzhou
from 21-24
May

Right: Boy 35 E with Boy LR 5 robot

Amaplast's Italian pavilion at Chinaplas will include about 50 Italian businesses and occupy an area of 1,400 m² on the show floor. The Italian collective at Chinaplas 2019 includes a number of Amaplast members such as: Frigosystem, Gefran, Moretto, Piovan, Sacmi Imola and Tria.

"The massive Italian presence at the specialised fair in China confirms the strategic importance of this market," said Alessandro Grassi, Amaplast President, "which imported some €117m worth of Italian-made plastics and rubber processing technology in 2018."

He said: "Italian manufacturers, who are able to leverage the flexibility and ability to provide technologically advanced, custom-built machinery and auxiliary equipment that has always earned them worldwide acclaim, see China as a market whose potential has yet to be fully exploited."

➤ www.amaplast.org

Arburg says it will be presenting the digital future of plastics processing at Chinaplas 2019 by highlighting its new customer portal, the potential of augmented reality for service purposes and digital injection moulding assistance systems.

The new customer portal, presented in Guangzhou for the first time in a Chinese version, has central apps that include: the "Machine Center", which contains important information and documents for each machine; the "Shop" for ordering spare parts; and the "Service Center". Visitors can also find out about the six digital Arburg assistance packages for starting, setting up, optimising, producing, monitoring and servicing Allrounder injection moulding machines.

The application highlight of the Arburg stand is a complex turnkey system that produces ready-to-use LSR/LSR wristwatches within the injection moulding cycle. Other exhibits are an electric Allrounder from the Golden Electric series for a medical application and a Freeformer 200-3X for industrial additive manufacturing. The three

Right: The "Shop" app for ordering spare parts is one of the features of the new Arburg customer portal

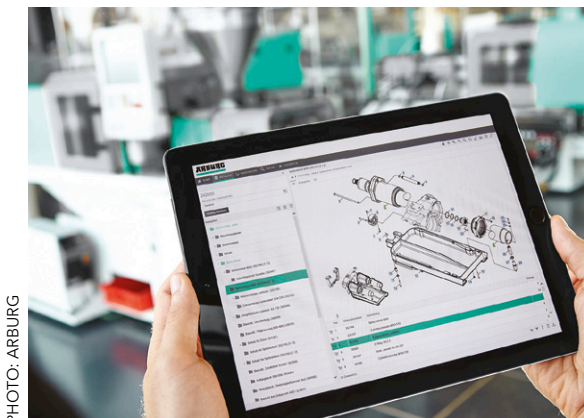


PHOTO: ARBURG



PHOTO: BOY

exhibited machines are networked via the Arburg ALS host computer system.

➤ www.arburg.com

Boy is showing its 35 E injection moulding machine in a demonstration which the company says underlines its versatility. It is equipped with the Boy LR 5 robot and an integrated packaging machine. The application is a delicatessen tray which is moulded and shrink-wrapped directly in a foil. The highlight of this complete production cell, says Boy, is the new telescopic axle of the LR 5 part removal robot, which has a much lower overall height.

Boy's other demonstration features a 22 A machine manufacturing hygienic LSR baby bottle nipples in a six-cavity mould from EMDE MouldTec. The machine has clamping force of 220 kN, a footprint of 2.1 m² and a free-standing cantilevered two-platen clamping unit for easy accessibility and individual extensions or automation equipment.

Both exhibits are equipped with Boy's Procan Alpha machine control system. The integrated help function is being shown in the local language.

➤ www.dr-boy.de

Engel is showcasing LSR injection moulding at Chinaplas. On a tie-bar-less E-victory 310/120 machine it is moulding LED headlamp lenses in an automated cell to demonstrate how geometrically highly complex LSR products can be manufactured economically in large quantities.

Engel says tie-bar-less machines offer advantages for processing LSR. As the robot can reach the cavities directly from the side without having to circumvent any obstacles reduces the handling time, and therefore the mould opening time. Also the tie-bar-less technology allows for compact

production cells. Because there are no tie bars in the way, the mould mounting platens can be fully used up to their edges. This means that the high-volume lens mould necessitated by the complex component structure fits on a comparatively small 120 tonne injection moulding machine.

The E-victory is equipped with Engel's iQ weight control to ensure the required precision during injection. The control analyses the pressure profile during injection of the polymer melt, compares the measured values with a reference cycle and adjusts the injection profile, the change-over point and holding pressure shot by shot to the current conditions.

➤ www.engelglobal.com

At Chinaplas, **FCS Group** is showing FA Series injection moulding machines, a newly released servo hydraulic technology. The group has upgraded previous machines, including a 30% improve-



PHOTO: ENGEL

ment in platen strength, and use of high-performance servo energy-saving oil pump for precision, stability and to improve the mould lifetime. The FA machine design

combines ergonomic and aesthetic features, and can operate in an Industry 4.0 environment.

FCS will also demonstrate other machines in its portfolio. An FB-280R machine is going to produce infusion caps for a medical appliance in a cycle time of 30s in a 24 cavity mould. An FB-280T machine will produce a three-color toothbrush grip. An energy-saving HN-280p machine is producing yoghurt cups with IML in a cycle time of 5-6 s in an 8 cavity mould.

➤ www.fcs.com.tw

Fomtec Plastic Machinery is a specialist in vertical injection moulding machines. It produces the FT, FC, FK and FD series of machines with clamping force ranging from 12 tonnes to 650 tonnes, and injection

Left: Engel tie-bar-less E-victory injection moulding machine

High barrier rigid packaging - The global market 2018

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shot capacity ranging from 35 g to 8 kg. The two-plate heavy duty injection moulding machine it is showing at Chinaplas features multi-clamping cylinders on the moving platen, which effectively reduces the overall height and operator working platform height. Its hydraulic servo system ensures fast, accurate and stable injection and yields energy savings up to 71%, says Fomtec.

➤ www.fomtec.cn

A highlight for **Haitian Group** at Chinaplas is the Zhafir Jenius, a new series of hybrid machines which combine electric drive technology and a two-platen servo hydraulic system. The Jenius has been developed to address the specific quality requirements for industries such as white goods and automotive.

The Zhafir subsidiary now offers electric options on machines in a clamping force range from 400 to 33,000 kN. The new power range is complemented by various performance variants, such as "F" (Fast Cycling) for short cycles or application-oriented packages for precision multi-component jobs.

➤ www.haitian.com

At Chinaplas, **KraussMaffei** is presenting a locally produced all-electric injection moulding machine for the first time. The new all-electric PX Agile is being made at the new Sanming location in China, where the company has started machine manufacturing under the auspices of its majority shareholder ChemChina.

KraussMaffei says the site operates a special stock machine programme for delivery of standard machines, while machines with specified options will be available for delivery within four to six weeks of ordering. Also due to the local production of the PX Agile, the company says spare parts and service response times will be very short.

The PX Agile 80 and PX Agile 160 machines are being launched at Chinaplas. KraussMaffei says both exhibits show the advantages of the new PX Agile series: stability, precision, short cycle times and maximum flexibility for various applications. The PX Agile 80 is shown using the inductive mould heating technology of Roctool making a TV box finisher with varied design options.

The PX Agile 160 is shown moulding a medical application, pipette tips, in a 32-cavity mould. Both PX Agile machines are equipped with the new LRX Agile from KraussMaffei. This new linear robot



PHOTO: KRAUSSMAFFEI

series, which is also produced at the KraussMaffei plant in Sanming, is designed for simple pick-and-place applications and is suitable for all injection moulding machines. Three different programming levels are available.

➤ www.kraussmaffei.com

Powerjet Plastic Machinery is showing its new fully electric JE200 injection moulding machine at

Chinaplas. The Powerjet JE series is aimed

at demanding markets such as home appliances, consumer electronics, food packaging, medical equipment, automotive and electronics.

Driven by servo motors and with a high-precision heavy-duty screw, the machine has better performance coordination and more stability, says Powerjet. The injection repetition accuracy is controlled to 0.3% to ensure stability and consistency. The machine also reduces electricity and water consumption by 40%.

➤ www.powerjet-machinery.com

Wittmann Battenfeld will demonstrate an LSR application from the automotive sector on an all-electric EcoPower 160/350 with 1,600 kN clamping force, equipped with LSR technology from Nexus, Austria. The injection unit in open design allows easy integration of the LSR feeding and blending elements.

A medical clamp with a part weight of 0.003 g will be moulded from POM supplied by Ticona in a cycle time of 5s on a MicroPower 15/7.5 with a 4-cavity mould from Microsystems UK. The parts will be removed by a W8VS2 Wittmann robot, which has been specially designed for the highly dynamic and precise removal of small and micro parts. The parts will be passed on to a camera integrated in the production cell and in the machine's control system for quality inspection.

➤ www.wittmann-group.com

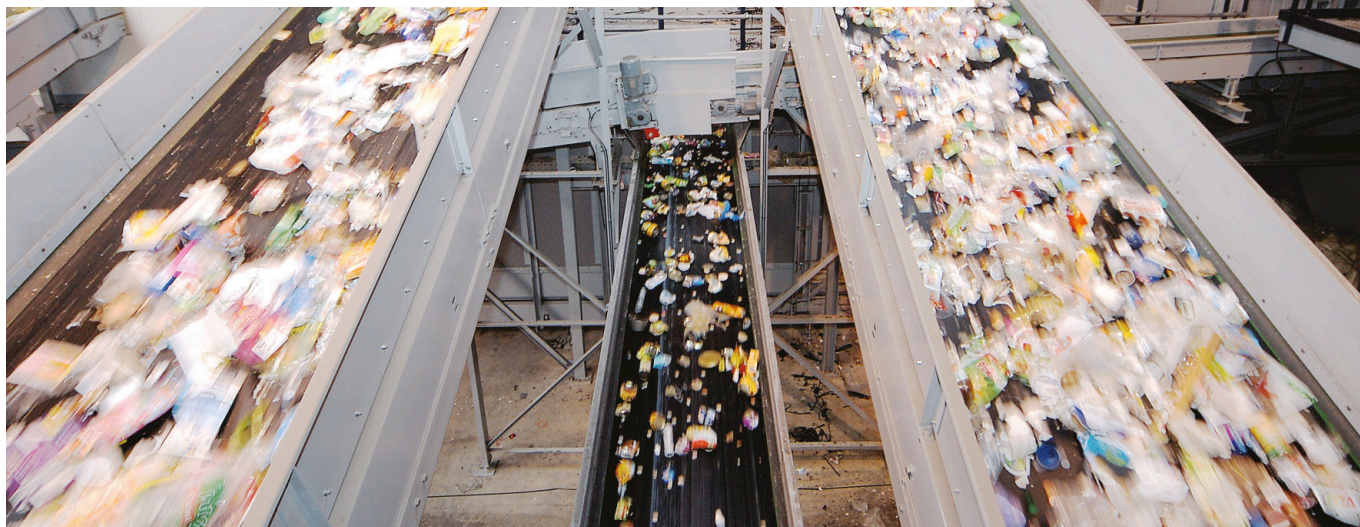
Left:
KraussMaffei's new PX Agile 80 machine is using the inductive mould heating technology of Roctool to demonstrate surface design variations

Below:
Powerjet JE200 fully electric machine



PHOTO: POWERJET

With pressure being exerted on the plastics supply chain to recycle more plastics and add value to reclaimed materials, we preview AMI's second Plastics Recycling Technology conference taking place in Düsseldorf in June



Key plastics recycling stakeholders share insights

After the hugely successful launch event in 2017, *Plastics Recycling Technology* returns in 2019 and examines the latest technologies for increasing the volume of plastics being recycled. It also explores ways to improve the quality of reclaimed materials so that they can be used in higher value applications. This two-day event takes place on 18-19 June 2019 in Düsseldorf, a city which has always been a centre of innovation and progress.

Experts at *Plastics Recycling Technology* will provide an analysis of the European recycling market, innovations driving the recyclability of packaging and will discuss strategies to optimise plastics recycling lines. In addition, the conference covers the circular economy and relevant regulations, the growing importance of additives and delves into developments in chemical recycling, including case studies of exciting new applications across these various topics.

The opening session kicks-off with **Lizzy Carroll**,

Research Analyst at **AMI**, who analyses trends in the European plastics recycling market with a closer look at the key findings of her new AMI study. **Mike Baxter**, External Affairs Director at **RPC-BPI Group** in the UK, then discusses the impact new EU regulations on plastic packaging will have on the European plastic recycling industry. A study on the use of recyclates by European plastics converting companies is presented by **Alexandre Dangis**, Managing Director of **EUPC** in Belgium.

Innovations

The next session takes a closer look at what is happening with regards to packaging and **Gian De Belder**, Packaging Technologist from **P&G** in Belgium, showcases the standardisation of tracer/watermark-based sorting technologies for plastic packaging. This is followed by a talk focusing on recycling technology for plastics in packaging material given by **Mikael Hamskog**, Recycling Spe-

cialist at **Tetra Pak** in Sweden. The third paper of the session is presented by **Dana Mosora**, Founder of **Dana Mosora Consulting** and a consultant for the European Ceflex consortium, based in Switzerland, who will provide insights from Ceflex.

The conference's third session opens with **Gerold Breuer**, Head of Marketing & Business Development from **Erema Group** in Austria, who discusses the next level of plastics recycling and its contribution to the circular economy. A technology presentation on innovative granulator designs to maximize profits in scrap recovery is given by **Marco Bellotti**, Sales & Marketing at **CMG** in Italy. **Jürgen Morosz**, Sales Manager at **MAS** in Austria, then explores recycling and compounding in one step and delves into tailor-made plastic compounds. After the refreshment break **Carl Pöpel**, Head of Product Management Compounding at **Kraussmaffei Berstorff** in Germany, closes the session with a paper on innovative extrusion and injection moulding applications.

The fourth and final session of the day features **Bernhard Gabauer**, Head of Segment Plastics, Business Area Digital Technologies from **Bühler** in the UK, talking about the crucial role of optical sorting in the plastic recycling industry. The last paper of the day is given by **Jürgen Schoenherr**, CEO of the **Zittau Institute for Technology Development, Peat and Natural Material Processing Research (ITN)** in Germany, who focuses on developments in "thermo-sensitive sorting" of mixed plastics.

To round off the first day, a networking drinks reception will be held in the exhibition room.

Value propositions

Day two of *Plastics Recycling Technology* 2019 is opened by **Kim Ragaert** from **Ghent University** in Belgium and **Mark-Olof Dirksen**, Project Leader Technology & Function Creation at **Philips** in the Netherlands, who give a joint presentation on their work in turning WEEE plastics into high-quality EEE products. A paper on a new innovative process for recycling end-of-life PMMA wastes is then given by **Jean-Luc Dubois**, Scientific Director, Catalysis,



Speakers at the conference include (from left to right) Gian De Belder from P&G, Mike Baxter from RPC-BPI, Mark-Olof Dirksen from Philips and Lizzy Carroll from AMI

Processes, Renewables and Recycling at **Arkema** in France. **Henning Albers**, Director of Institute for the **Hochschule Bremen (HSB) - City University of Applied Sciences** in Germany, discusses a new conceptual approach to implement recycling options for reinforced plastics in rotor blade systems.

Tarquin Crouch, Technical Services and Market Development Manager at **Imerplast** in the UK, begins the second session of the day with a look at creating a value proposition through compatibilisation of mixed polyolefins. This is followed by **Rudolf Pfaendner**, Division Director, Plastics at **Fraunhofer Institute for Structural Durability and System Reliability LBF** in Germany, investigating a new generation of stabilisers for high quality recyclates. Enabling polymer modification with polar and no polar polyolefin chemistry is then explored by **Isabel Arroyo**, Senior Research Scientist at **Dow Chemical** in Spain.

After the lunch break, the session is continued by **Stefan Viering**, R&D Engineer, Project Leader UFGM / Metal Tracer at **LKAB Minerals** in Germany, who discusses how ultra-fine ground magnetite is the natural dopant for plastics recycling.

The final session of the conference looks at advances in chemical recycling and starts with **Outi Teräs**, R&D Program Manager, Recycled Feeds at **Neste Corporation** in Finland, discussing ideas in building a circular value chain for chemical recycling of plastics. Closing the conference is **Isabelle Ydens**, Technical & Marketing Manager, Business Development Renewable Feedstock Polymers Europe at **Total Refining & Chemicals** in Belgium, presenting a new path for polystyrene recycling.

Plastics Recycling Technology 2019

Don't miss this opportunity to learn from the experts. *Plastics Recycling Technology* on 18-19 June provides the perfect forum to discover new ways to create a circular economy for plastics. This is your chance to join leading players from across the plastics recycling industry in Düsseldorf to discover the future of plastics recycling. For more information please visit the [conference website](#)

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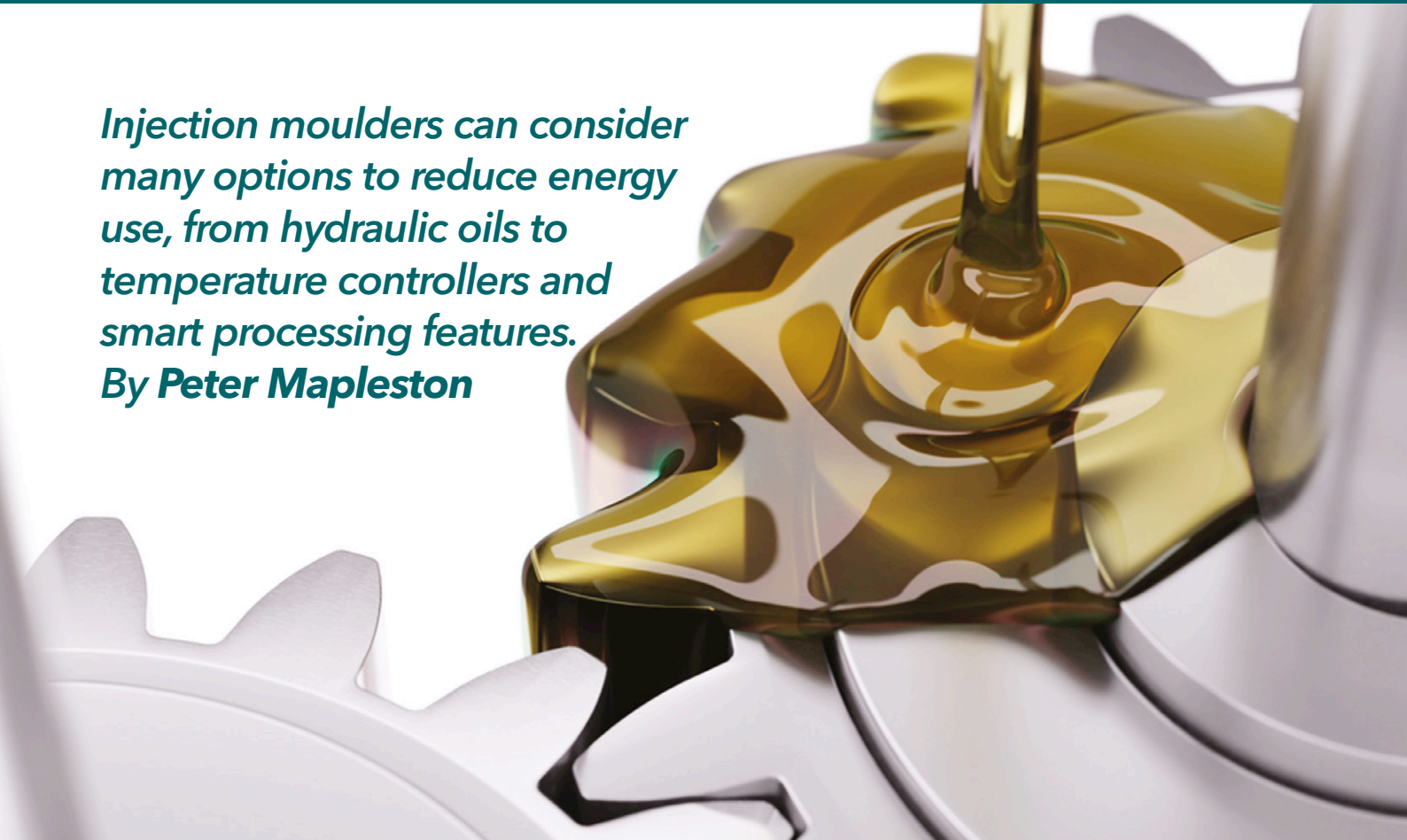
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Injection moulders can consider many options to reduce energy use, from hydraulic oils to temperature controllers and smart processing features.
By Peter Mapleston



Oiling the wheels of energy efficiency

Sometimes it's the simplest things that make the biggest difference. When it comes to improving the energy efficiency of an injection moulding operation, new "smart" technologies certainly play their part, in collecting and interpreting data from equipment in new ways – a few of those technologies are described in this article. But maybe the first thing to consider should be the hydraulic oil. Just like with a car, some oils work better than others. Just like with a car, many of us go for the budget option, pour it in, and forget about it until the little red light comes on. Mistake.

The role of high-performance lubrication is often overlooked, "with 55% of manufacturing businesses admitting that lubrication is rarely a priority maintenance task," says Shahina Kazi, **Shell Lubricants UK B2B Marketing Manager**. "This is a missed opportunity given advanced lubrication can help to protect hydraulic systems from deposits and wear, therefore increasing energy efficiency."

Kazi cites the case of a Hungarian processor that worked with Shell. By trialling injection moulding

machines with Shell Tellus S4 ME 46, coupled with the Shell LubeAnalyst oil condition monitoring program, the company achieved an average reduction of electricity consumption of 9.5% over a year. "Oil lifespan also increased five-fold, illustrating how increased productivity can be delivered alongside reduced energy costs," Kazi says.

A major factor in how a lubricant can help reduce energy consumption is its formulation, Kazi notes. "For instance, choosing a high-performance hydraulic fluid with superior filterability and air release properties can help to ensure a cleaner oil, lower pressure loss in the system and a more efficient operation."

"However, in order to get the most from the oil, product choice must be paired with effective lubrication management. This includes trained maintenance teams ensuring correct storage and handling to avoid contamination and to preserve the product's key characteristics; the correct frequency of oil change to avoid accelerated equipment wear; and regular monitoring of oil

Main image:
Using premium oils in injection moulding machines can lead to energy savings

Right: Exxon-Mobil works with injection moulders to optimise machine performance

condition to diagnose potential equipment problems before they occur.”

Another major oil company offering specialist hydraulic fluids suitable for injection moulding machines is **ExxonMobil**. It cites the case of a switch to its Mobil DTE 10 Excel hydraulic fluid helping MPact Polymers in South Africa reduce the energy used by processing equipment at its Pinetown site by 7%. Once again, the move also helped optimise equipment performance, which reduced unscheduled maintenance, while the hydraulic fluid's long life cut waste oil disposal costs.

ExxonMobil also recommended that MPact Polymers implement Mobil Serv Lubricant Analysis. The used oil analysis program can detect issues before they become problems.

The oil's high shear stability and wide operating temperature range helped deliver a 7% average reduction in energy consumption. Data from Mobil Serv Lubricant Analysis confirmed the oil's long in-service life, which reduced hydraulic fluid consumption by 200 litres. This extended oil drain intervals, reducing the time taken for manual interventions by 27 hours over the space of a year.

To help plastics processors achieve their energy saving goals, ExxonMobil several months ago produced a free 'Energy Saving Guide for Injection Moulding Companies', in partnership with *Injection World* and Tangram Technology, which consults on energy management (see box, page 38, and *Injection World* December 2018).

A third oil supplier, **Chevron**, notes that the formulation of a high performance premium hydraulic fluid has a direct impact on whether or not it can improve the productivity and/or energy efficiency of the application. "One way that premium hydraulic fluids are able to increase the efficiency is their ability to stay in the 'sweet spot' of the viscosity curve in the overall hydraulic



PHOTO: EXXONMOBIL

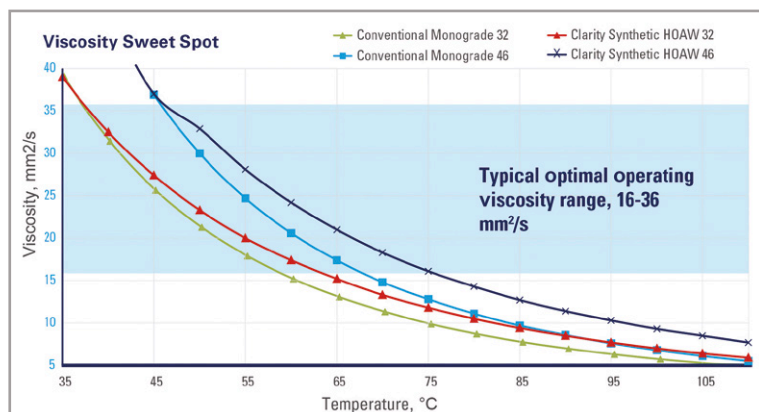
system," it says (see graph below).

"Other properties of the premium hydraulic fluids also contribute to this phenomenon through lower fluid friction and/or even lower boundary friction of the moving components. All of these elements together benefit the overall hydraulic system, not only in its gains in efficiency, but also in wear protection, and potentially lower overall operating temperatures."

Chevron cites a field trial conducted to evaluate Clarity Synthetic Hydraulic Oil versus a monograde hydraulic oil in a Husky XL 300 machine. The equipment, which had been well maintained, was operating 24/7, producing PET bottle preforms. The machine was equipped with additional sensors and instrumentation to capture data that could not be obtained from the system computer. This included pressure transducers for each pump; temperature sensors added on the pump outlets, reservoir and ambient; and electric motor three-phase amperage and voltage. Two fluids were evaluated: Clarity Synthetic Hydraulic Oil AW 32, and an AW 46 monograde oil as a reference. Use of Clarity Synthetic Hydraulic Oil AW 32 resulted in a 4.2% reduction in power consumption.

The concept of the sweet spot also crops up in discussions at **Evonik**. It says its Dynavis technology offers a promising approach for hydraulic injection moulding machines. Compared to conventional fluids, those formulated with Dynavis technology can lower the energy consumption of some injection moulding machines by more than 10%.

The technology improves the flow characteristics of hydraulic fluids by widening the temperature range and efficiency of hydraulic units. Normally, hydraulic equipment works with high efficiency in just a particular temperature range; at temperatures that are too high or too low, the performance of the machine can drop. "Oils formulated with Dynavis technology have optimised viscosity: at low temperatures they flow better, while at higher temperatures they remain more viscous", says Rolf



Chevron says: "One way that premium hydraulic fluids are able to increase the efficiency is their ability to stay in the 'sweet spot' of the viscosity curve in the overall hydraulic system"

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Fianke, Global Marketing Manager for Dynavis.

Injection moulding machines not only use less drive energy, the fluids with Dynavis also don't get as hot and can withstand shear forces more effectively, he says. "Thanks to fluids formulated with Dynavis technology, it is not only possible to increase machine efficiency, it is also possible to actively conserve resources and lower CO₂ emissions." One simple step that can be taken is to change the hydraulic fluid from a standard ISO 46 viscosity grade to an ISO 32 formulated with Dynavis.

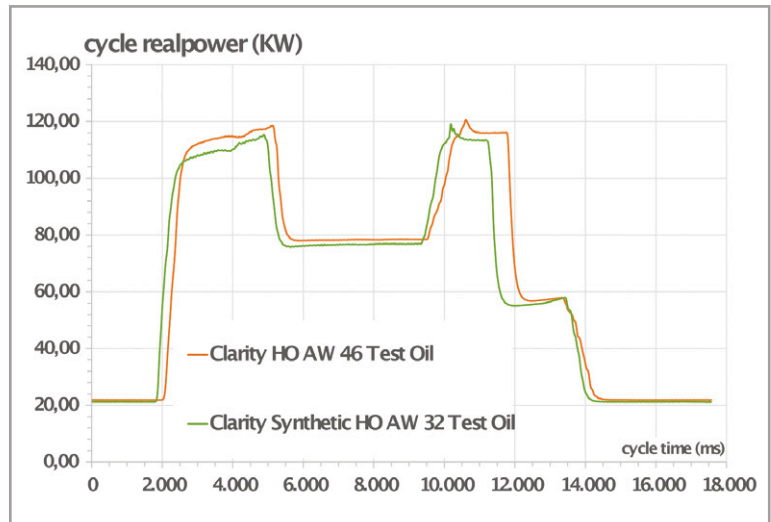
Evonik has tested fluids formulated with Dynavis technology on machines from various suppliers. Fluids reached the optimal temperature range faster and maintained it more precisely, it says. This resulted in energy savings of 7 to 10%, corresponding to cost savings of about €400 per year, for a Boy 35E machine, for example; and energy savings of 6.2% of the drive energy (about €1,200 per year) for an Engel Victory 330/120 machine.

Mould temperature

Improved control over mould temperatures is another obvious way of cutting energy bills while maintaining – and often improving – part quality.

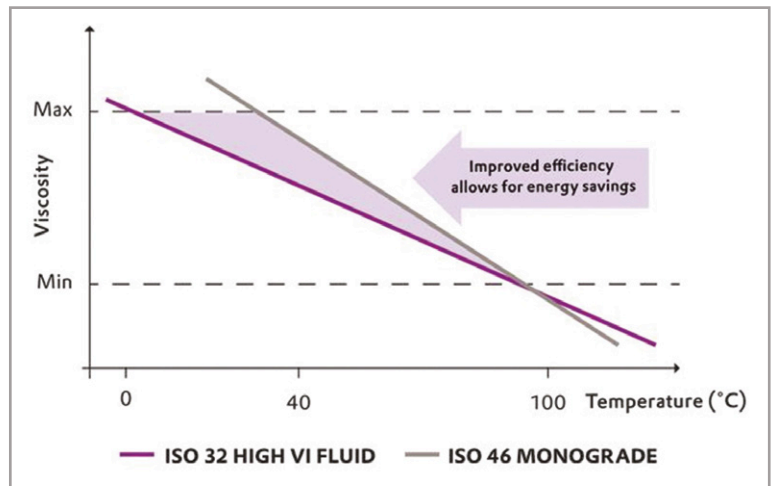
GWK Gesellschaft Wärme Kältetechnik, a leader in the field, says that following its takeover of the assets of Hahn Enersave last July, it is now offering the Protemp series, a highly efficient series of compact temperature control units which, according to the manufacturer, deliver the highest level of energy efficiency currently available on the market.

This is achieved by the use of centrifugal pumps in combination with frequency-controlled drives. In comparison to the standard impeller-type periph-

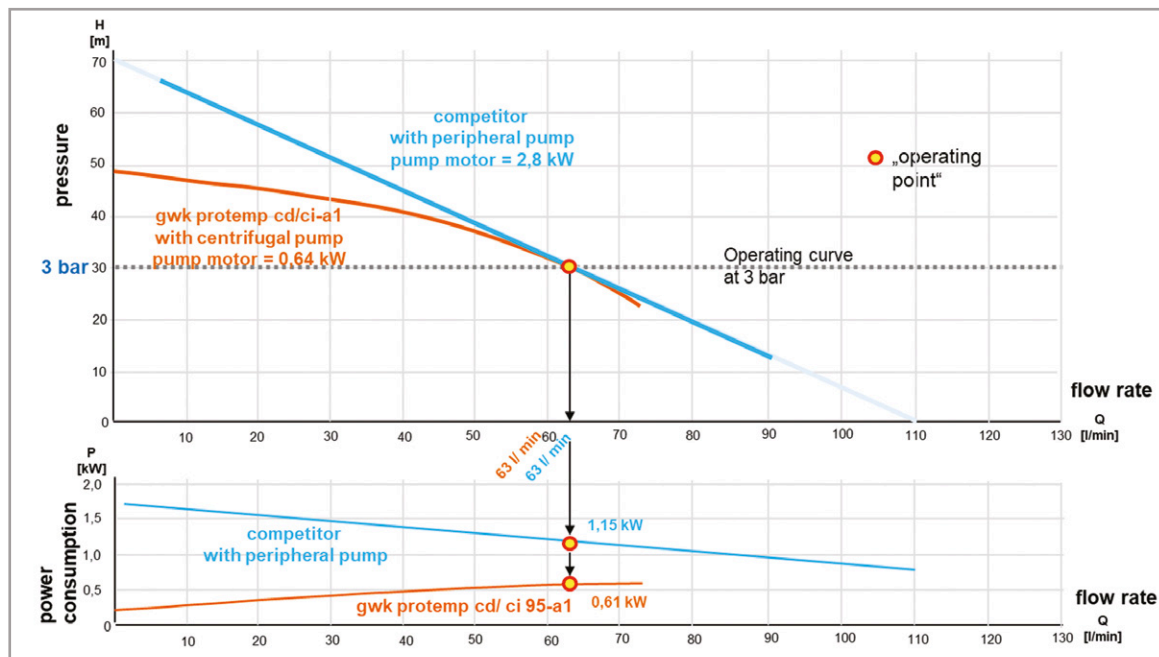


Comparison of cycle power of two different hydraulic oils

Source: Chevron



Evonik says Dynavis technology provides substantial energy savings in a wide range of injection moulding machines



Comparison of the energy consumption of a peripheral pump (1.15 kW) and a centrifugal pump (0.61 kW) with the same operating points

Source: GWK

Management needs to get serious about energy consumption

Robin Kent, Managing Director of **Tangram Technology** in the UK, consults widely on energy management in plastics processing. He made a few pointed remarks to *Injection World* on the subject:

“One of the biggest changes in the world of energy efficiency is the impact of the Industry 4.0 data revolution. Data are now so easy to obtain from low-cost sensors that the biggest problem is how to handle the mass of data being generated.

The issue here is not getting the data (which are just a set of numbers) but how to translate the available data into information (which can be used for assessment, comparison and management action). The techniques of data handling and treatment (either simple software or more complex cloud-based algorithms) are relatively well-known and easy but attracting, and retaining, management attention to the resulting information is still a major problem.

Most plastics processing companies still do not regularly report on their energy performance at board level and, even when they do, they tend to use the fatally flawed 'kWh/kg' value as a monthly performance metric. (KWh/kg is unduly influenced by the production volume: increasing the production volume in a month will automatically decrease the kWh/kg, due to the effect of the base load being amortised over a larger process load.)

These companies inevitably spend more time discussing how to increase sales or manage debtors than they do on how to decrease costs. Perhaps this is because they regard energy costs as fixed and uncontrollable which is wrong on both counts.

One of the most exciting new developments in energy efficiency is the ABB Ability Smart Sensor. This can be fixed to the frame of any standard LV induction motor (they use about 60% of the energy in plastics processing) to continuously monitor the rotor health, the temperature, the bearing condition and vibration. This data can be transmitted via Bluetooth to a secure cloud-based server where it is analysed to calculate the instantaneous power, operating hours and a host of other operating parameters, which can in turn be sent to a smart phone or dedicated application to advise on service intervals and maintenance as well as energy consumption.

There are equally exciting developments in areas such as retro-fitted servo motors, improved hydraulic oils and improved drying controls. These all have the capacity to change and reduce how we use energy in processing plastics. But none of them will make any real impact unless we start to convert the data they generate into meaningful management information and then convince management to take the necessary action.

These technology advances are vital but real change is still needed at management level so that management sees energy as a key operational financial indicator and not simply a number that is relegated to the annual 'Sustainability Report'. ”



Left: GWK Proteмп temperature controller fitted with Proflow ultrasonic water distributor

eral pumps available on the market which are installed in most temperature control units, these can achieve enormous potential savings of up to 86% under the same operating and series production conditions, GWK claims.

This is because a centrifugal pump has a significantly higher flow rate at the operating point than a comparable impeller-type peripheral pump, with low energy input at the same time. “In terms of performance, therefore, this means that up to four conventional temperature control units can be replaced by just a single GWK Proteмп,” the company says.

A Proteмп Connect communication interface allows Proflow water distributors with electronic flow and temperature measurement units to be connected to the Proteмп temperature control unit, so that measured values for up to 12 temperature control circuits can be monitored in the temperature control unit controller and shown on the device display.

“The preferred solution for measuring the flow rate in the Proflow distribution system is by means of maintenance-free and contactless ultrasonic flow measurement,” says GWK. “The control pump adjusts the flow rate of the unit in response to changes in production conditions, to individually meet the specific requirements of each process.”

In combination with its Integrat Direct controlled water distribution system, the company says, this means that not only can the flow rates of individual circuits be adjusted to thermal requirements, at a higher level the entire flow rate for the tool can also be adjusted to the minimum overall flow required for the process and hence the minimum possible energy input. The energy consumption of the pump in each case is shown on the display of the temperature control unit.

“A perfectly coordinated system of pump hydraulics, motor and frequency inverters, with power reserves, allows a continuous boost function with permanent utilisation of the maximum pump speed, without any notable increase in pump wear,” GWK claims. Using the OPC UA interface, the speed can even be predefined from the injection-moulding machine controller or any other

controller connected in the OPC UA network via the Euromap 82.1 protocol.

On a similar theme, **Engel** says Procter & Gamble Manufacturing has improved the transparency and consistency of temperature control processes using its E-Flomo and iQ flow control. "This not only results in reproducible component quality, but also in significantly higher levels of efficiency," it says.

"Temperature control was a black box for us," says Andreas Franz, process engineer at P&G in Marktheidenfeld, Germany. For a long time, only the supply temperature was known. It was only possible to investigate how the temperature was distributed over the individual heating-cooling channels during injection moulding using thermography, a complex process that does not give more than a snapshot.

Three years ago, the Molding Technology division in Marktheidenfeld began to analyse and optimise temperature control in the injection moulding process. The plant focuses on oral hygiene products such as Oral B electric toothbrushes. The moulding shop currently includes 100 injection moulding machines in the 500 to 5,000 kN range.

Engel says that with its Flomo electronic temperature control water manifold system, introduced at K 2010, it laid the groundwork for more transparency and consistency in the temperature control process. Flomo replaces the maintenance-intensive cooling water distributors, and even the basic version can individually monitor and document all cooling and temperature control circuits. The latest generation E-Flomo can control the flow rates or the temperature difference (ΔT) in all individual circuits.

With iQ flow control, introduced at K 2016, Engel took a further step. This automatically compensates temperature differences in the cooling water manifold circuit, based on the measurements determined by E-Flomo, and adjusts the pump speed in E-Temp electronic temperature control units to the current process conditions.

Engel developed the E-Temp units in collaboration with temperature control unit manufacturer, HB-Therm. These enable integration of temperature control into Engel's CC300 control unit. P&G was the first company to adopt them.

A mould with 56 heating-cooling channels (for production of toothbrush charger housings) was used for testing the new temperature control technologies. The complex structure of the housing makes high demands on precision and process consistency during injection moulding. "In the past, we frequently experienced warpage due to uneven temperature control," says Andreas Spitznagel, who

manages the Process Technology Group for P&G in Marktheidenfeld. "But what exactly was causing the fault was difficult to determine because there was simply too little information."

The stack mould has a total of 32 cavities in two parting surfaces. Since the polymer melt is routed through the first parting surface to the second, a lot of heat is generated on the centre mould plate. Ten temperature control units were used in the original set-up.

In collaboration with Engel, P&G planned a new production cell with a mould design optimised for the use of E-Flomo. The cell was planned from the outset with just three temperature control units, instead of the ten used before. Each mould plate now has its own temperature control unit. Initially, three-quarters of the 200 l/min flow rate available on each device was still used, but it has been possible to reduce the flow rate to 40 l/min in the course of system validation. "This is significantly less than we expected", says Christian Rieb, Equipment Engineer at P&G. Fewer temperature control units and smaller flow rates mean lower investment costs, compact systems and, above all, significant savings in energy consumption.

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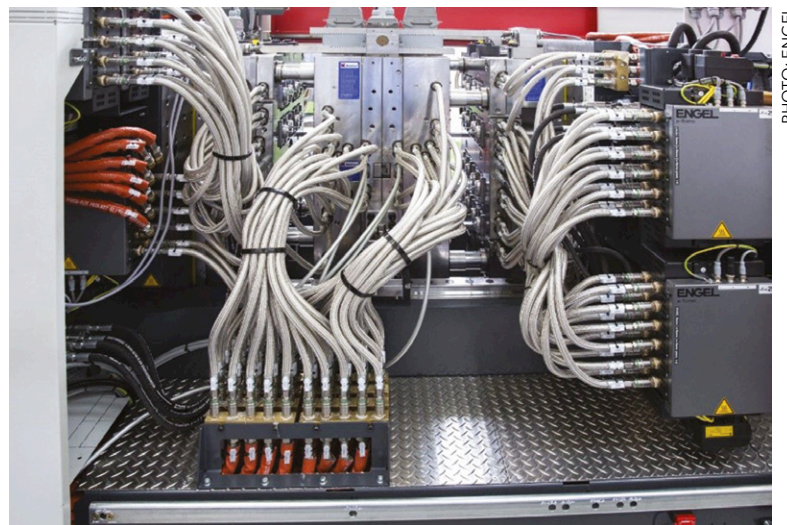


PHOTO: ENGEL

The stack mould for manufacturing the charger housings has 56 heating-cooling channels, which can be dynamically controlled using Engel's E-Flomo. The difference between the media temperature in the flow and return lines of a temperature control channel is a measure of the uniformity of the temperature distribution in the mould

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FIND OUT MORE

Reducing weight in automotive under-the-hood applications is no longer just enough. Plastics are now providing additional properties for the engine designer to exploit, writes Mark Holmes



PHOTO: ARBURG

Meeting the E-mobility challenge

Lightweighting in the automotive industry has been prevalent for some time and is continuing in under-the-hood applications in conventional vehicles with internal combustion engines. However, the continued move towards electric vehicles is providing new opportunities for plastics and injection moulders. Resin manufacturers, compounders, masterbatchers and additive suppliers are all developing new materials with under-the-hood applications in mind that both reduce weight and deliver other properties that E-mobility demands. In addition, manufacturers of injection moulding machinery are adapting their equipment to process more complex materials, but still meet expected higher levels of productivity.

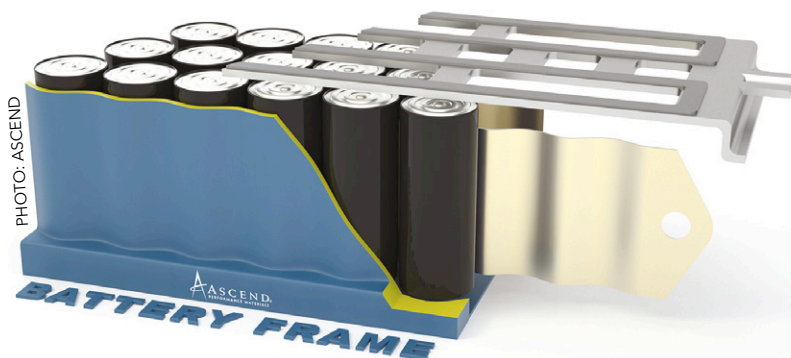
The main trends that **Ascend Performance Materials** is observing in automotive under-the-hood applications currently are higher thermal loads and greater electrification. "Fuel efficiency and electronic features are really driving the automotive industry right now," says Vikram Gopal, Senior Vice-President, Technology. "Turbocharging smaller internal combustion engines continues to drive up the thermal load under-the-hood. Simultaneously, metal-to-plastic replacement continues apace in order to reduce weight and manage

precious space in the powertrain. We are also finding that automotive OEMs are beginning to crossover and look at electrical and electronic specifications for their materials. We are getting greater calls for more flame retardant materials to support electrification and increased electronics associated with sensors, entertainment systems and on-board computers."

Electric vehicles (EV) are also presenting a number of interesting material challenges. "Range anxiety still exists for many consumers, even as EV range continues to increase," Gopal says. "Lightweighting will become a greater concern for EV manufacturers in the not-too-distant future as Li-ion battery technology plateaus and they seek other opportunities to extend range. Aside from range, safety is another area vitally important to EVs and high-voltage hybrid vehicles. Ensuring that the electrolyte is contained and the battery is protected in the event of a crash is a new challenge with a number of material and system possibilities.

"Lightweighting without sacrificing noise, vibration and harshness (NVH) performance in automotive is another interesting technical area. OEMs are attacking weight throughout the vehicle, with the body-in-white (BIW) and chassis of particular interest

Main image:
Arburg has demonstrated the production of magnetising rotors directly in the mould for E-mobility applications



Above: Ascend Performance Materials is increasingly supplying material for electrical under-the-hood applications

currently. Downgauged steel and aluminium can save considerable weight, but they sacrifice safety and comfort if not properly supported."

Ascend says that its new Vydyne R433H is used to make structural supports in the BIW. The company says that polyamide 66 already exhibits good creep and fatigue resistance, so it maintains well under the persistent stresses in that application. However, R433H is specially designed for energy absorption to withstand impacts. In the end, OEMs shave substantial weight from the BIW without sacrificing passenger safety or comfort.

"We continue to work with OEMs on addressing their needs in terms of improving battery and electrical systems safety, reliability and performance," says Gopal. "We have our Vydyne J series for electrical connectors, which resists corrosion under high voltage, as well as a number of grades designed to encase and protect Li-ion battery cells. PA 66 works well in these applications because of its temperature, chemical and impact resistance, and electrical properties.

"Faster charging of EV batteries and autonomous vehicles are exciting future developments that we feel Vydyne PA 66 solutions can support quite well. In terms of fast charging, the materials used throughout the charging infrastructure need

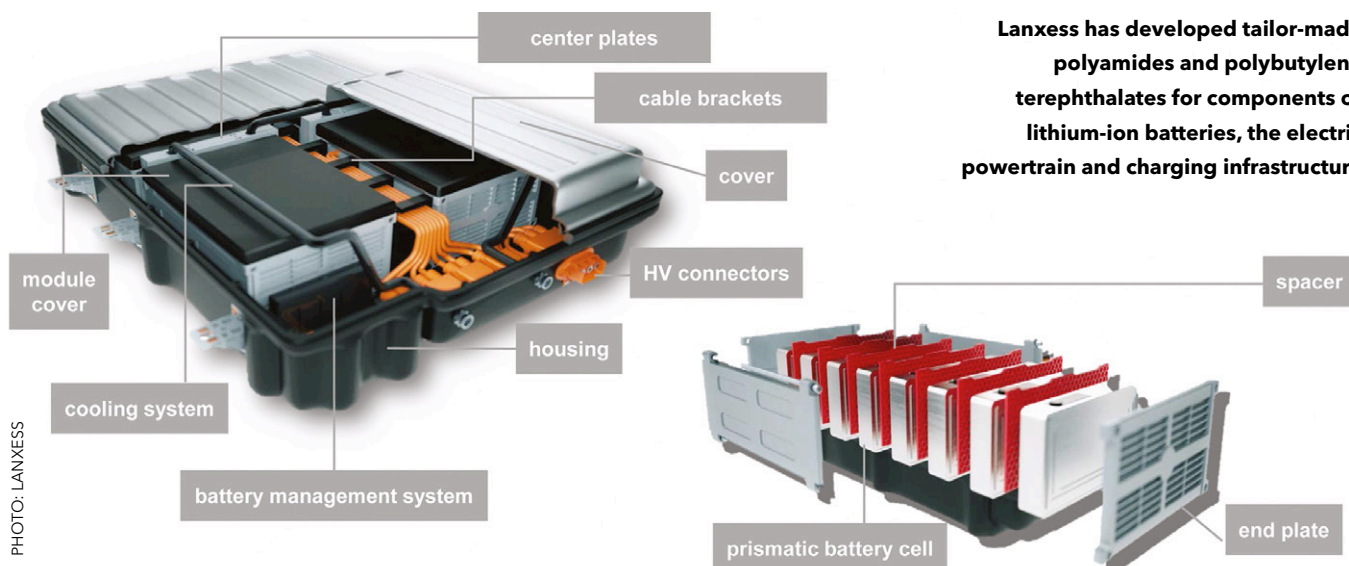
to be able to handle high loads of electricity and the heat generated by moving that much power that quickly. These parts need to perform reliably and we think there is a place for PA 66 in these applications. With autonomous vehicles, safety and reliability will be essential to proving that technology viable. Autonomous vehicles with their abundance of sensors will offer new challenges in these areas. We already provide a number of solutions in the EV space that ensure safety and reliability in and around electrical systems, we are thinking ahead on what solutions are needed for autonomous driving."

BASF, in cooperation with Joma-Polytec and Mercedes-Benz Fuel Cell, a subsidiary of Daimler, has used the engineering plastic Ultramid to manufacture a number of fuel cell system components. These have been used in the new Mercedes GLC F-Cell, which combines a fuel cell with a rechargeable lithium-ion battery. BASF says that key Ultramid properties for the Mercedes GLC F-Cell include good thermal and chemical resistance, dynamic stiffness, impact strength and good long-term performance. Two glass fibre-reinforced Ultramid grades are now being used as standard to manufacture the anode- and cathode-end plate in the fuel cells.

The company says that Ultramid A3EG7 EQ is an ideal material, given the purity requirements associated with sensitive applications in the electronics industry. In the case of the media distribution plate and the water separator unit, which is exposed to a wide variety of media through the cooling water, air and hydrogen channel, this Ultramid grade offers good resistance, while at the same time meeting all requirements regarding the purity of the material.

Evonik has developed high performance

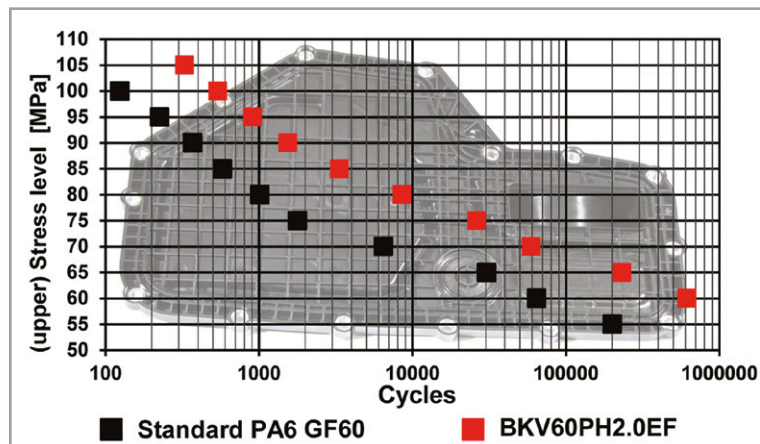
Lanxess has developed tailor-made polyamides and polybutylene terephthalates for components of lithium-ion batteries, the electric powertrain and charging infrastructure



polymers based on polyamide 12, PEEK and polyimides for applications in EVs. The company says that hybrid and fully electric vehicles require optimum cooling and heating. Highly efficient thermal management is needed not only for the high-voltage battery, but also for the other essential high-voltage components, such as the electric motor and converter or inverter. Automotive electrification also opens up new fields of application for high performance polymers in engines and drive systems. Specialised products like Vestakeep PEEK, P84 NT polyimide, and Vestamid polyamide 12 moulding compounds allow manufacturers to produce durable, precision components such as bearings or gears that are capable of transmitting or absorbing power. Their use reduces friction for efficient, long term use. They also eliminate noise and vibrations for a quiet ride, says the company.

Lanxess has expanded its polyamide 6 Durethan P product range with the addition of two highly reinforced material variants that can be used as an economical alternative to polyamide 66 materials. The company says that Durethan BKV50PH2.0 and Durethan BKV60PH2.0EF have short glass fibre content levels of 50% and 60% by weight respectively. The 'P' in the product name stands for performance and indicates the high fatigue resistance of these materials against pulsating loads. This means that these grades are many times more resistant to cyclical mechanical loads than standard products with the same glass fibre content, it says. Potential applications include supporting structures for electrical and electronics modules in batteries for EVs, engine oil pans, oil filter modules and end caps, engine and chassis mounts and damper pistons. In mechanical engineering, the new materials are suitable for dynamically highly stressed components such as gear wheels.

Lanxess has also developed tailor-made polyamides and polybutylene terephthalates under the Durethan and Pocan brands for components of the lithium-ion battery, the electric powertrain and the charging infrastructure. Potential battery applications include module covers and separators, high-voltage connectors, housing parts for control units, cell holders, spacers, module cover plates and supply lines. One example for batteries is easy-flowing Durethan BKV45FN04, featuring 45wt.% glass fibre reinforcement. The halogen-free, flame-retardant



Lanxess has expanded its polyamide 6 Durethan P product range, which are an economical alternative to polyamide 66 materials in many automotive applications

Source: Lanxess

ant polyamide 6 passes the UL 94 flame-retardant test from US testing institute Underwriters Laboratories with the best classification of V-0 (0.4 mm) and is also tracking resistant at high electrical voltages. Due to its stiffness and strength, it is ideal for the production of structural components of the battery – such as cell frames and end plates. It is also suitable for high-voltage connectors.

EMS-Grivory has developed Grivory HT (High Hydrolysis Resistance) polyphthalamide (PPA) to provide good hydrolysis resistance at elevated temperatures. In automotive cooling systems, plastics are required that have long term resistance to hot water, steam and cooling agents. Grivory HT is suitable for applications involving permanent contact with water. For example, Grivory HT1VA has 30% higher

retained strength values after 12,000 hours in water at 95°C than a traditional PPA. The company says that in automotive construction, this product line is particularly suited for components in engine cooling systems which must withstand the most extreme conditions.

For example, Mann+Hummel manufactures a cool-water valve for Hyundai-KIA-U Motors made of Grivory HT1VA-35 HYS. For use in these applications, along with the good hydrolysis resistance at elevated temperatures, good resistance against cooling agents and high dimensional stability is also required. It also has optimised demoulding capabilities. This means that the material enables

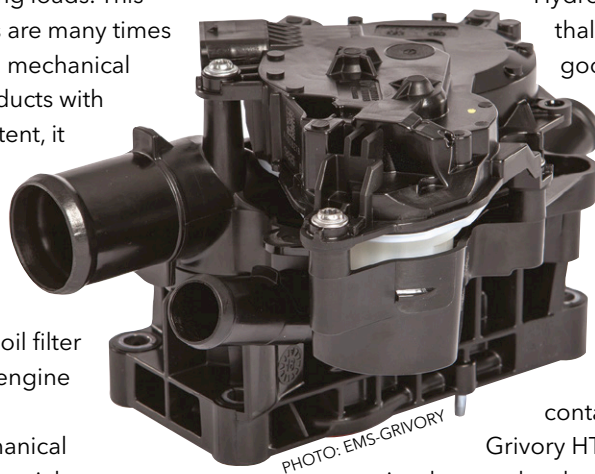


PHOTO: EMS-GRIVORY

Left: Cooling water valve from Mann+Hummel, made of Grivory HT1VA-35 HYS

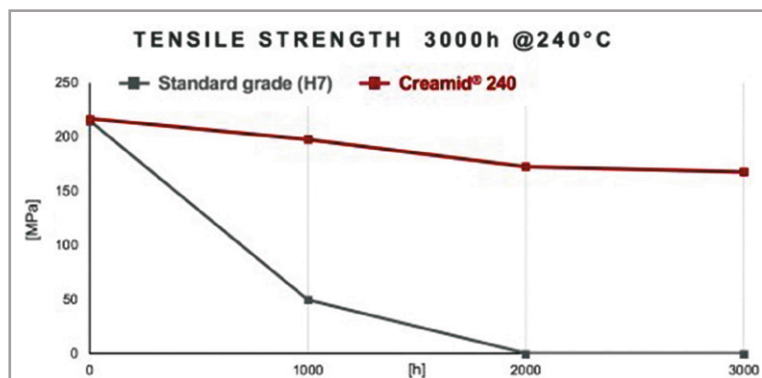


Figure 1. Teknor Apex: Property retention after heat ageing of two glass fibre reinforced polyamides

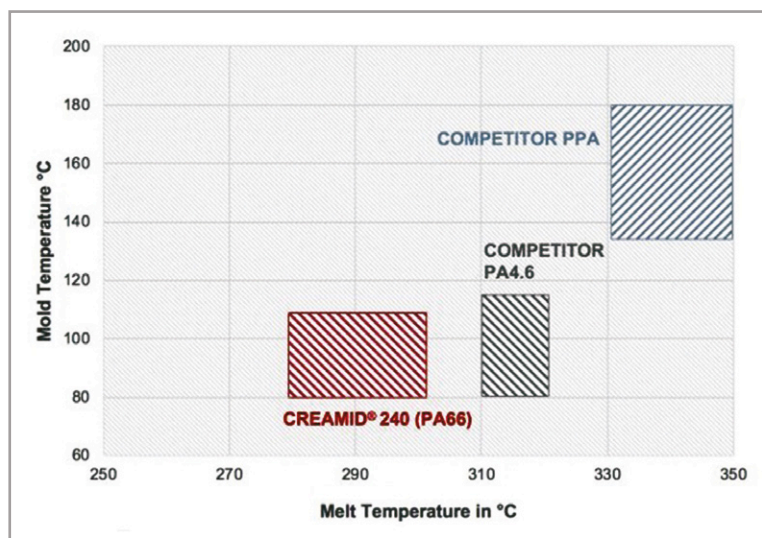


Figure 2. Teknor Apex: Processing temperatures of high heat polymers

use of complex mould geometries and improves the efficiency of the injection moulding process. Grivory HT is suitable for vehicles with classic internal combustion engines as well as those with electro motors, where thermal management is particularly important and liquid cooling systems using water are also employed. Combination with electrical conductor tracks and electrical components is possible because it is stabilised to prevent problems with salt efflorescence and corrosion caused under warm and moist conditions.

Teknor Apex has introduced a series of high-heat glass-reinforced polyamide 66 compounds that it says bridges the cost-performance gap between standard heat-resistant polyamides and costly speciality polymers, providing injection moulders with a more economical alternative for automotive and other metal-replacement parts. Creamid 240 H7.5 Series compounds are claimed to provide the strength and stiffness of highly glass filled engineering polymers while maintaining high levels of critical mechanical properties even after continuous service at temperatures of 240°C.

Currently available grades, with glass fibre content of 35, 50, or 60%, exhibit improved property retention in comparison with similarly glass-filled standard PA 66 compounds (see Figure 1). They also cost around 30% less per kg than high performance polymers such as PPA or PA 4.6, while providing comparable performance.

"Additional cost savings with Creamid 240 H7.5 compounds are achievable in processing," says Hartmut Elsässer, Global Director of Technology for engineering thermoplastics. "These new materials exhibit lower melt and mould temperatures than competing PA 66 compounds and high-performance products like PPA, providing economies in terms of energy consumption, cycle times, and tooling requirements."

While the new compounds have processing temperatures in the range of 280-300°C and mould temperatures of 80-110°C, the corresponding ranges for PPA or PA 4.6 are 330-350°C and 130-150°C (see Figure 2). Teknor Apex recommends Creamid 240 H7.5 compounds for automotive under-the-hood components such as charge air cooler end caps, air intake manifolds, quick-fit connectors, radiator end tanks, turbo air ducts and resonators, oil pump wheels, EGR valves and thermostatic casings.

"While metal replacement continues to drive demand for polyamides in the automotive market, performance-boosting technologies such as turbocharged engines and advanced transmission systems place stricter requirements for heat resistance, chemical resistance and reduced water absorption," says Markus Krippner, Director of Sales and Marketing. "These forces, along with the overriding industry effort to reduce vehicle weight, are driving Teknor Apex investment into new polyamide technologies. Lightweighting requires materials that provide high strength, low levels of creep and excellent processability. Creamid 240 H7.5 compounds exhibit flow properties that readily accommodate the complex or thin wall parts or the long flow paths that are often required for metal replacement."

Solvay has developed Ryton PPS grades for flexible, lightweight coolant lines, brackets and connectors in automotive thermal management assembly systems. Injection moulding grades include Ryton XE5430BL (30% glass filled) and Ryton R-4-270BL (40% glass filled). These materials are used in many existing connector and bracketry fittings to enable automotive OEMs to design fully harmonised and integrated coolant line assemblies for engines and transmissions.

"Under-the-hood temperatures are pushing

existing cooling line design and material solutions to their limits, narrowing the safety margin," says Andreas Lutz, European Area Development Manager for Solvay's Specialty Polymers global business unit. "Engine downsizing along with the generalisation of high-temperature components such as turbochargers, superchargers, automatic transmissions, air conditioning and exhaust gas recirculation systems all crowded into a shrinking engine bay are leading to a 'space crunch' with hot spots that can exceed the thermal performance of conventional metal/rubber and polyamide designs."

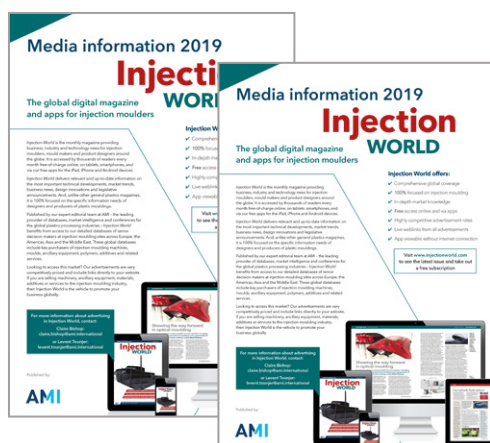
The company adds that because coolant lines are among the last components to be designed to fit the engine bay, materials must not only offer the design freedom to enable more complex routing, but also provide enhanced thermal and chemical resistance to ensure operational safety without adding weight, such as the need for additional heat shields.

PolyOne has rebranded ElectriPlast material technology as Surround EMI/RFI Shielding Formulations. This portfolio of conductive thermoplastic materials shields sensitive electronics from both electromagnetic interference (EMI) and radio frequency interference (RFI). Surround weighs up to 60% less than aluminium or copper, and brings increased design freedom compared with metal. The company says that Surround long fibre material is well suited to housings for advanced driver assistance systems (ADAS) because of its capability to replace metal in shielding applications. As automakers continue to add ADAS functionality to automobiles, more electronic control units (ECUs), cameras, and sensors are needed to make the systems function properly. In addition to minimising cross talk between electronic components, Surround material is lighter weight and easier to process than traditional materials such as aluminium or copper. Injection moulding also permits more complex shapes and fewer design constraints than aluminium or copper, all

without compromising on dimensional stability of the component during use.

Vehicle lightweighting continues to be a primary trend and a catalyst for developing new materials for under-the-hood applications for injection moulders, according to carbon black producer **Cabot Corporation**. "Automotive OEMs are still targeting a higher share of plastics per car, and this applies for power train systems in both internal combustion engines and EVs," says Dominique Strassler, Global Marketing Segment Manager. "However, for EVs the additional weight of the battery of around 200 kg is an additional consideration. Reduced weight helps to comply with CO₂ regulations, but also enables weight to be allocated for gadgets and new technology systems. For EVs, thermal management is also a key topic, because the battery runs optimally at a certain temperature - not too hot and not too cold. Materials that can provide thermal conductivity, either combined with electrical conductivity or specifically without it, will be in higher demand. The trend toward plastics recycling is also highly relevant. Automotive OEMs look at this from two perspectives. Firstly, whether materials and plastics that are used in cars can be recycled later, and secondly whether automotive parts can be made out of these recycled materials."

There are also some specific technical areas of interest at present requiring new solutions. "The industry has focused on lightweighting for a long time and, in general, lower density materials that are stronger and more durable are bringing incremental change," Strassler adds. "Thermal management is mainly addressed by thermally conductive solutions. In the plastics world, this is an area that still has lots of room for new developments. While metal has unique properties, it is prone to corrosion which is a disadvantage when compared to plastics. Regarding recycling, one topic is sortability, which puts some constraints on



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design, for example, minimising mixed use of materials. More important though is the need to find recycled materials that can be used in the car, with stable, reliable quality, global availability and at reasonable price."

According to Strassler, for lightweighting, the main technical solution remains metal replacement. However, design optimisations (lighter parts with same performance), optimised choice of material (lower density means lower weight, or stronger materials resulting in thinner walls) and density reduction by foaming are also typical approaches. As traditional solutions are expensive and have certain technical drawbacks, there is significant effort invested in developing the next generation of thermally conductive plastic compounds. There are two distinct needs. Materials need to be either thermally and electrically conductive, or thermally conductive but not electrically conductive (electrically insulative). For both needs, new additives, combinations of additives and improved formulations are being developed and tested.

The biggest challenges in recycling for the end user (OEM) is to receive reliable recycled raw materials with consistent quality both over time and across global locations. As the type and quality of recycled plastic pellets (recyclates) changes over time and different regions tend to produce different recyclates, suppliers need to develop ways that guarantee stable quality. Currently, recyclate suppliers are focusing on post-industrial recyclates and post-consumer recyclates, says Strassler.

In order to meet these requirements, Cabot says that it is improving its carbons to maximise colour efficiency, thereby minimising mechanical property degradation in engineering polymers. High jetness carbon blacks can help to provide a consistent black colour to any mix of raw materials with variable characteristics. The latest formulations are

new universal black masterbatches to improve the properties of recyclates. The company adds that it is working on next-generation carbon blacks for stronger polyamide parts under-the-hood. The target is for these carbons to disperse better in the resin and therefore bring better colour at lower loadings to help maximise the mechanical performance of the polyamide compound.

"We have incorporated recyclates to expand our existing Plasblak black masterbatch range and launched our new Techblak black masterbatch range, which is formulated with recycled material carriers and helps to improve the recycling content in a given formulation," adds Sebastian Heitkamp, Global Marketing Segment Manager at Cabot.

Plastic additives manufacturer **Songwon** is a major supplier of additives for automotive under-the-hood applications and is also observing some important trends in the industry. "Within an increasingly competitive global business environment, the automobile industry continues its course of rapid change and automotive manufacturers are facing even bigger challenges," says Thomas Schmutz, Leader Global Tech Service & Application Development. "Along with this, raw material suppliers have been pushed into playing a more sustainably conscious role to meet the ever-changing industry demands. Also, today's environmentally aware consumers expect to see higher eco-friendliness and better fuel economy in their vehicles together with technological advances, increased safety and more comfort. Thus, manufacturers are required to find ways to reduce costs and cut the time-to-market while optimising sustainability and finding a balance between the use of conventional materials and higher value alternatives, as well as solutions for recycling.

"The injection moulding industry as a whole has been working diligently to overcome these challenges with new solutions and greater efficiencies. In typical applications such as air intake manifolds, engine covers, rocker covers, front-end modules and other components, the trend of replacing polyamide with polypropylene wherever possible, has led to reductions in the amount of energy needed, lowered the required processing temperatures and contributed to overall more environmentally-friendly production processes."

Automotive manufacturers are seeking under-the-hood material solutions that can help them meet today's extremely tough performance criteria. "Not only must the materials' key properties enable manufacturers to fulfil the most up-to-date regulatory and environmental standards and include high deflection temperature (HDT) to withstand the high

Below: Plastic additives from Songwon are found in a wide range of under-the-hood automotive applications



PHOTO: SONGWON

temperatures, they must also be chemically resistant, lightweight and above all fuel efficient," Schmutz says. "Solutions to specific problems and applications vary depending on where parts are placed and what function they have. For example, parts near engines must be HDT, brake fluid tanks must be resistant to corrosive chemicals and application areas like under-body shielding demand stiffness and the highest levels of impact resistance.

"Some of the upcoming trends emerging from the drive to achieve reduced environmental impact and energy efficiency that have had a direct impact on the dynamics of the automotive under-the-hood plastic industry include the development of carbon fibre-reinforced plastics and of cellulose enabled hybrid composites. The recent advances the industry has seen in both engineering and newer injection moulding equipment have already produced positive results, such as energy savings of between 20-50% compared to 10 years ago.

"Lightweight, extra strength and impact performance have been achieved in parts like front-end carriers and battery trays, for example, with glass fibre reinforced PP solutions that reduce processing temperatures and energy requirements while contributing to more eco-friendly production. The intricately complex and highly integrated housing for air conditioning systems must be constantly functional in an environment of continual shocks and vibrations at temperatures of up to 70°C. Furthermore, all parts must be fuel and lubricant resistant and maintain their dimensional sealing stability even at peak temperatures of 120°C. In order to prevent unpleasant odours streaming into the automobile's interior via the heated air, resins that guarantee low odour and minimal emission are needed."

Achieving cost, fuel and weight efficiencies is now an established imperative for automotive manufacturers and Songwon says that it has developed several solutions to address these needs. SongXtend 2124 stabiliser was specifically developed to meet the automotive industry's stringent demands for under-the-hood applications. The stabiliser improves the long-term thermal stability (LTTS) of the short- and long-glass fibre reinforced PP used in under-the-hood applications for moulded parts, and can match the LTTS performance of 1,000 hours and beyond at 150°C. It also contributes to making it possible for moulded parts to be thinner and lighter while maintaining similar mechanical properties as unfilled parts. The stabiliser can also achieve significantly better LTTS performance compared to classical systems based on SongNox 1010 and SongNox DSTDP stabilisers in glass fibre reinforced polypropylene.



PHOTO: SUMITOMO (SHI) DEMAG

Left: Henrik Langwald, Business Development Director Automotive, Sumitomo (SHI) Demag Europe

The company adds that using stabilisers interrupts the natural degradation process of plastics through oxidation and leads to the creation of highly durable materials which can be processed at high temperatures and can last for many years. Although the addition of stabilisers is essential for maintaining the value and properties of plastics after they are recycled, the type and quantity of stabilisers that are needed can vary according to the resin involved and the purpose for which it will be used.

One of the additives Songwon has developed for ensuring the quality of the recycled plastics, particularly in battery case recycling, is SongNox 3001-2. This stabiliser blend is certified for use in automotive interior applications and meets requirements in terms of improved LTTS, as well as making it possible for recycled-PP to be re-used in durable applications, for example, automotive applications that require more long-term thermal stability. SongNox 3001-2 increases quality and maintains the performance of recycled-PP. Depending on the quality of the recycling stream, it can extend the service life of recycled-PP by a possible factor of 3-4. The stabiliser's concentration can be adjusted on a batch-by-batch basis also depending on the quality of the recycling stream which provides manufacturers with greater flexibility, material economy and cost savings.

According to Henrik Langwald, Business Development Director Automotive, **Sumitomo (SHI) Demag Europe**, given the focus on energy and carbon emissions, plus all-electric vehicles, plastic materials and how they are used in under-the-hood applications will play an even stronger role in the automotive industry, particularly in relation to optimising performance and fuel economy. "For European Union and EEA member states, standards are currently in place for light-duty (cars, vans) and heavy-duty vehicles (lorries,

PHOTO: ENGEL



Above: Engel has recently supplied a V-Duo press to CCP Grandsden of Belfast in Northern Ireland

buses), and for non-road mobile machinery. At the end of 2018, the EU set the target to cut car CO₂ emissions by 37.5% by 2030.

"However, the limits are currently set according to the mass of vehicles, meaning heavier cars are allowed higher emissions than lighter cars. It has been suggested that this will switch to a footprint based approach, so the limits would be set on the size of the vehicle rather than weight, encouraging manufacturers to switch to lighter plastic components post-2020 in order to boost fuel efficiency and reduce weight. The result will be much higher volumes of lightweight components.

"There has also been a definite trend among OEMs and vehicle makers to switch their procurement of plastic components to domestic suppliers as it reduces supply chain risk and lead times. There is also a trend towards parts consolidation. In order to keep procurement, crash testing and approval costs lower, automotive parent companies, which tend to have multiple brands in their portfolio, frequently leverage product and technologies across vehicle models, for example a chassis. The downside to this is if there is a cross-model quality issue, the risks and recall volumes become higher."

Traceability in vehicle manufacturing is increas-

ingly critical. "Product recalls are increasing in volume and this is where machinery equipped with smart manufacturing technologies can assist," says Langwald. "Heavily regulated products like airbag sensors, requires comprehensive audit trails. However, it is not purely about information tracking. Real-time traceability is about being able to call up data and verify the exact settings used on the injection moulding machine when that individual plastic part was made.

"At Sumitomo (SHI) Demag we liken it to issuing each component with a unique fingerprint. It means that any potential quality defect, which might not be picked up for several months, or even years, can be tracked back to the very day and cycle it was manufactured to achieve item-level traceability and conduct root cause analyses on parts and components. To facilitate this traceability we created a fully automated plastic injection moulding and laser marking station that connects and communicates the code back to Management Executive System (MES), where it reconciles up with the machine processing data. In addition to boosting traceability, this synchronised data gives production managers greater visibility on product cycle times and quality."

Langwald says that all-electric machines were once deemed the preserve of medical moulding. "However, automotive plants are predominantly automated," he says. "This means assembly robots are not tolerant to variables or even the smallest defects, and this is driving the automotive supply chain towards precision moulding. Furthermore, all-electric machines, like the IntElect, are more efficient if working with more complex materials or reducing the weight of components. They also deliver significant energy savings to moulders. As a result, Sumitomo (SHI) Demag is in the process of increasing the range of machine sizes, including a mid-sized unit for automotive moulders looking to switch from hydraulic machines to all-electric."

Engel agrees that in automotive, lightweight

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construction continues to be of major interest and that thermoplastic solutions are increasingly being specified over existing thermoset composites. Engel has recently supplied a V-Duo machine to CCP Gransden of Belfast in Northern Ireland – a company with many years' experience in the development and production of composite components for the automotive industry. CCP Gransden has an increasing focus on thermoplastic materials for lightweight construction in the context of high volumes. So far, mostly sample parts have been produced on the V-Duo: geometrically complex components with multiple reinforcement ribs and functional elements to demonstrate the wide range of applications as well as the moulding precision and platen parallelism control of the V-Duo machine. In the organomelt process or single stage overmoulding, long-fibre reinforced semi-finished products with a thermoplastic matrix are heated, placed into the mould, formed and directly overmoulded with thermoplastic.

Engel has also recently supplied an integrated manufacturing cell for overmoulding fibre-reinforced semi-finished products to the National Composites Centre (NCC) in Bristol, UK – a composite research and technology organisation. The NCC is looking at mass production in both automotive and aerospace industries using composite lightweight construction based on thermoplastics for more efficient manufacturing processes and recycling of obsolete components. Engel has supplied the first injection moulding machine for the NCC: a Duo 1700 large-scale machine including a Kuka articulated arm robot and an integrated infrared oven.

At its recent Technology Days 2019, **Arburg** identified lightweight construction, electric mobility and autonomous driving as key trends in the automotive industry and highlighted a number of initiatives. These include the ProLemo project for creating a servo motor drive that is 20% lighter. The concept for the series production of lightweight servo motors was developed as part of the German BMBF research project ProLemo (production technologies for efficient lightweight motors). At the Technology Days 2019, a hydraulic two-component Allrounder 570 S with a clamping force of 2,200 kN produced a rotor disc for electric single-axis drive trains in a cycle time of around 60 seconds. First, the internal contour for connection to the shaft is produced from glass fibre-reinforced PA6. A Soft Magnetic Composite consisting of the matrix material PA6 and highly filled with a permalloy is used as the base material for the moulded-on rotor segments. Compared to the original drive with a hollow steel shaft, the metal-filled plastic part reduc-

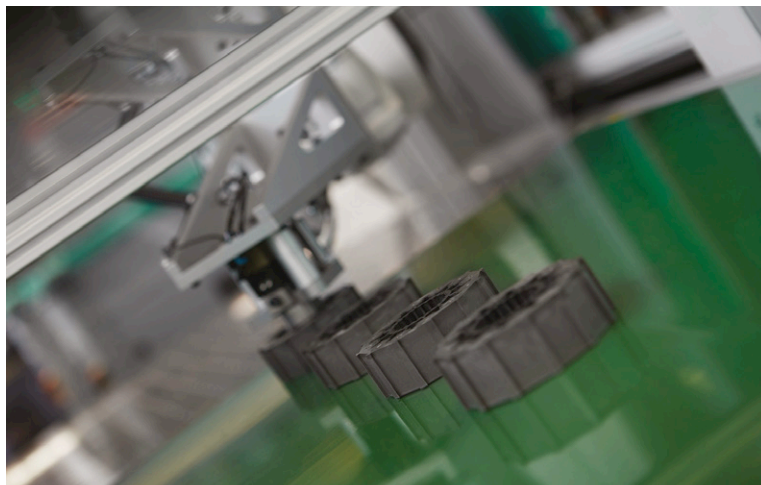


PHOTO: ARBURG

es weight by 20% and mass inertia by around 14%.

A further demonstration formed magnetising rotors directly in the mould for E-mobility applications. A hydraulic Allrounder 370 S with a clamping force of 700 kN produced a magnetic sample part with 20 poles from an innovative plastic-bound magnetic compound based on PA12. For this purpose, the ferrite contained in the compound is aligned in the mould using a magnetic field. The cycle time is around 30 seconds, with the part weighing about 7 g. Handling is performed by a Multilift H robotic system.

For its Fibre Direct Compounding (FDC) technology widely used in automotive injection moulding, Arburg has further improved the side feeder as well as the supply of the glass-fibre rovings. The continuous fibres are trimmed and added directly into the liquid melt. This is a cost-effective alternative to processing fibre-filled compounds. With the FDC process, the fibre length, fibre content and material combination can also be adapted on an individual basis and flexibly to influence the part properties in a targeted manner. Further advantages include the high availability of the materials and a cost reduction of up to 40%.

Above:
Arburg's
hydraulic
two-component
Allrounder 570
S with a
clamping force
of 2,200 kN
produced a
rotor disc for
electric
single-axis
drive trains in a
cycle time of
around 60
seconds

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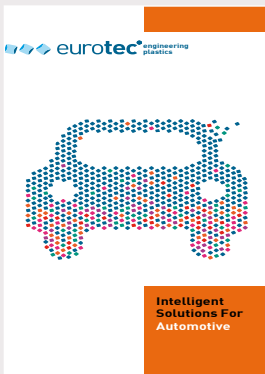
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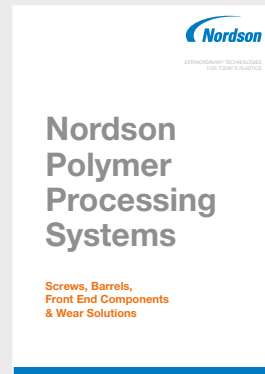
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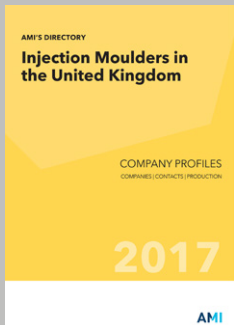
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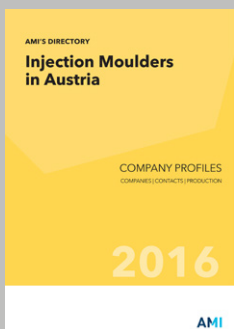
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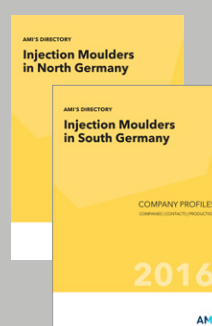
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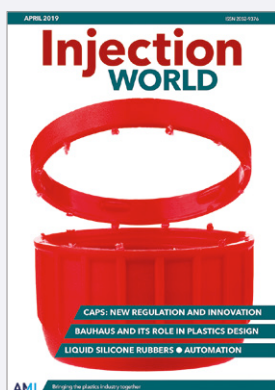
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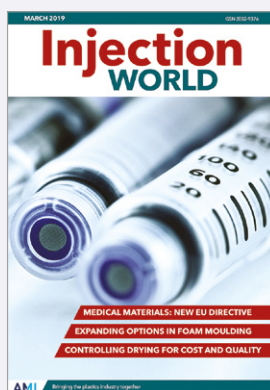
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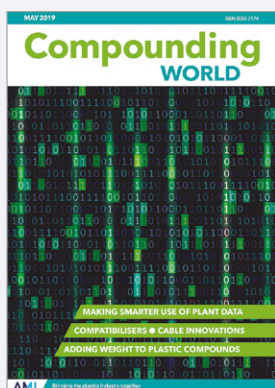
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	19-22 June	Interplas Thailand, Bangkok	www.interplasthailand.com
	5-7 September	Utech Asia, Guangzhou, China	www.puchina.eu
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	16-23 October	K 2019, Dusseldorf, Germany	www.k-online.com
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18-19 June 2019	Thin Wall Packaging, Chicago, IL, US
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