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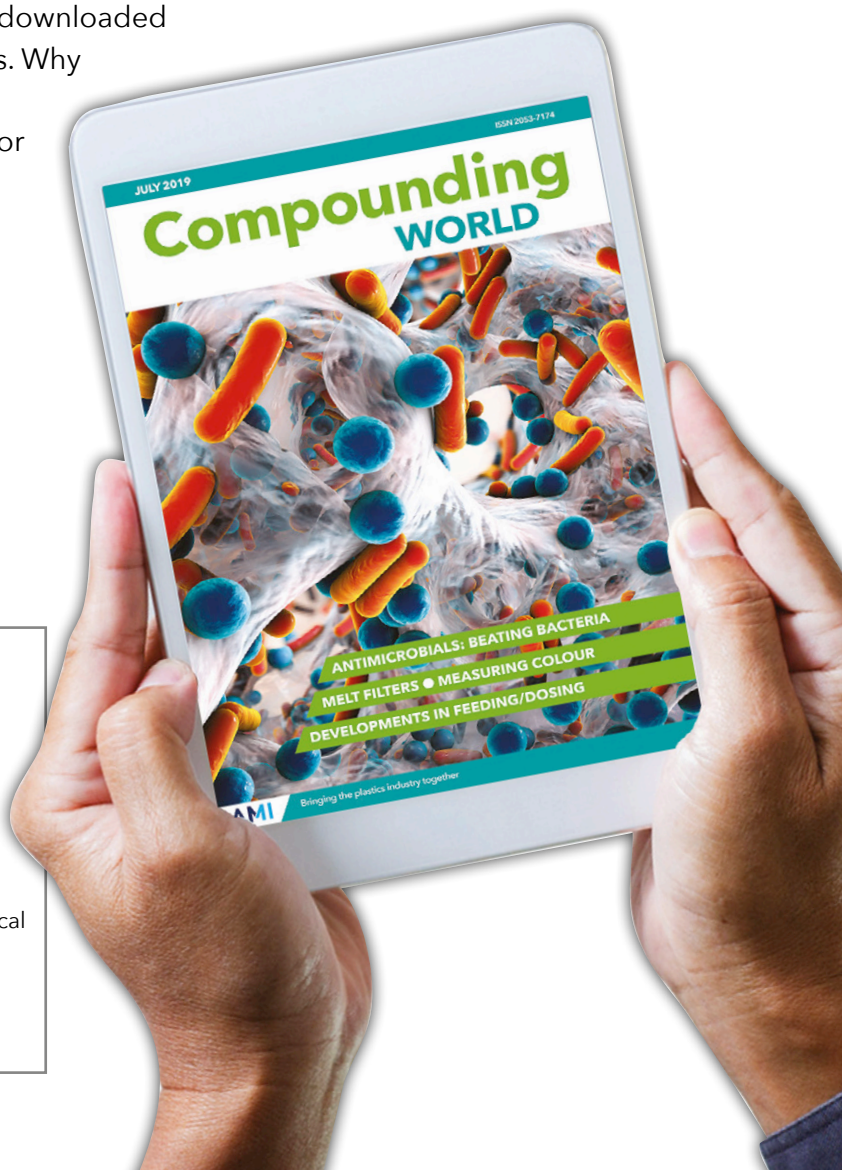

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extruders.leistritz.com

Compounding WORLD

COVER IMAGE: SHUTTERSTOCK

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Clariant exits pigments with Heubach-SK sale

Clariant has agreed to sell its pigments business to a consortium comprised of German pigment specialist Heubach Group and private equity group SK Capital Partners. The deal values the business at €735-780m, depending on potential earn-out payments, and is expected to close in the first half of next year subject to regulatory approvals.

The Clariant pigments business supplies organic pigments, pigment preparations and dyes to the plastics, automotive and industrial and architectural coatings markets, among others. It generated sales of around €775m in 2020.

The combination with Heubach creates a new entity with 3,000 people and annual sales of more than €900m. Heubach CEO Johann Heubach said the fit between the two companies was "perfect".

Clariant will retain a 20% stake in the holding company but said the move essentially completes its exit from non-core businesses announced in 2018.

› **www.heubachcolor.com**
› **www.clariant.com**

IMAGE: SHUTTERSTOCK

Clariant sale creates a new €900m global pigments business

UniteChem invests in R&D

Chinese light stabilisers manufacturer UniteChem Group has opened a second R&D and innovation centre in Shanghai. Employing 30 people, the centre will provide testing, analysis and process evaluation support to customers.

The facility is equipped with injection moulding, film blowing and casting machines, as well as a high-performance, twin-screw compounding extruder, accelerated weathering and ageing equipment.

The company said that the centre is part of its commitment to invest 5% of total revenues in R&D and is driven by a wish to "further expand the availability of its technical support capabilities for customers in Europe and worldwide."

› **www.unitechem.cn**

Repsol takes on impurities

Spanish petrochemicals firm Repsol, together with French technology provider Axens and energy specialist IFPEN, has developed a new process for chemical recycling of plastic waste that is claimed to remove challenging impurities.

Developed at the Repsol Technology Lab and IFPEN facilities using Axens' industrial technologies and catalysts, the Rewind Mix process is said to remove impurities such as silicon, chlorine, diolefins and metals from the mixed plastic waste to produce pyrolysis oils that can be fed direct and undiluted into petrochemical units.

Pilot testing of representative pyrolysis oils has already been successfully completed. The partners now intend to trial the process, which will be licensed by Axens, on an industrial scale in a Repsol facility.

› **www.repsol.com**
› **www.axens.net**

Gabriel-Chemie adds capacity in Russia

Austrian masterbatch manufacturer Gabriel-Chemie has completed construction of its expanded masterbatch production plant at Vorsino in Russia.

The company has invested around €6m in the facility, which is built on a 27,500m² site. Two new lines lift annual capacity to 2,000 tonnes while operational and environmental efficiency has been enhanced with a UV-cleaning closed water system and expanded on-site warehousing. A new underwater pelletising system will be installed later this year.

According to Gabriel-Chemie, the site provides space to increase capacity to around 20,000 tonnes annually.

■ The company has also invested in near-infrared detection technology at its headquarters location in Austria. This will allow it to provide customers with certification that its colour masterbatches can be sorted using industry-standard NIR recycling detectors.

"Due to the current demand from various markets, this test is more and more desired for all colours," said a company spokesperson.

› **www.gabriel-chemie.com**

Covid hits EU plastics demand

Estimates by trade association PlasticsEurope indicate that production and demand for plastics were stable globally in 2020 but fell in Europe as a direct result of the Covid-19 pandemic.

It said worldwide plastics production in 2020 reached 367m tonnes, 0.3% down on the 2019 total. China's share increased from 31% to 32%, while North America's remained stable at around 19%. European production, however, fell by more than 5% to 55m tonnes, taking its share from 16% to 15%.

European converter demand was also about 5% down and, at 48m tonnes, was its weakest result since 2014. This decrease was largely driven by packaging and automotive.

› **www.plasticseurope.org**

Entek ramps up torque

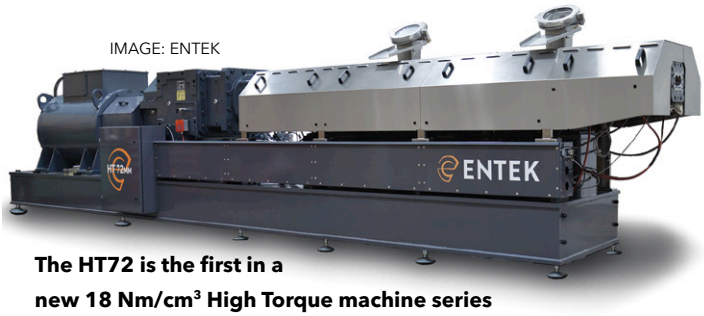
US compounding machinery maker Entek has introduced the first in a new line of high output twin screw extruders – the HT (High Torque) series – that offer a torque density of 18Nm/cm^3 with a Do/Di ratio of 1.61, which it claims results in the highest free volume in its class.

The new design is aimed at the commodity compounding and masterbatch industry, where customers typically require medium-to-large batch production sizes and high production rates are especially important.

The HT design is available initially in a 72mm diameter version. Entek Technical Processing Manager Dean Elliott said typical production throughputs for this first variant are expected to range from 1,800 to 3,200 kg/h, with 3,900 kg/h possible in some specific applications.

The launch marks Entek's entry into a new market sector, said VP of Sales Linda Campbell. "We now have an ideal solution for those needing high throughput for continuous production of large batches of materials," she said. "We did extensive market research and realised this size [72mm] is pretty popular in this market."

IMAGE: ENTEK



The HT72 is the first in a new 18 Nm/cm^3 High Torque machine series

The HT72 machine has been extensively lab-tested. Campbell said she hoped to have the first operating in a production location soon.

Also new from the company is its recently-patented Vacuum Feed Technology (VFT). "VFT is the solution if a compounder is challenged by a process that is volumetrically limited when processing low bulk density powdered materials," said Elliott.

VFT is a licenced technology that is available on any of Entek's twin screw extruders. Developed for use when compounding fluffy materials, it does not require open atmospheric vents so overcomes the problem of powder spewing when running at high production rates.

"Processors can achieve much higher throughput, as much as twice the output rate without VFT," according to Elliott.

› **www.entek.com**

Coperion supplies ZSK for chemical recycling

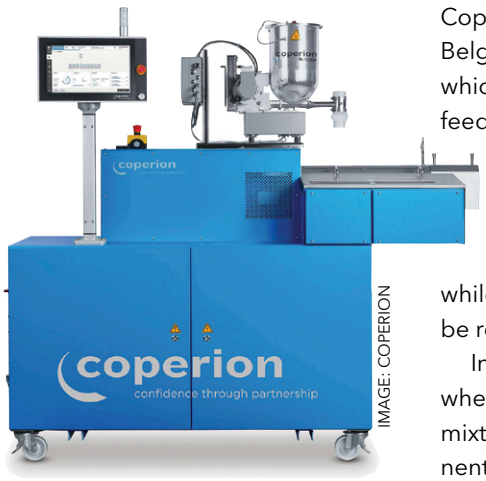


IMAGE: COPERION

Coperion says twin screw technology is well suited to chemical recycling

Coperion has supplied a ZSK 18 Megalab twin-screw extruder to Ghent University, in Belgium, for research into chemical recycling of mixed plastic waste. The machine, which offers a throughput of up to 10 kg/h, is equipped with a Coperion K-Tron feeder and vacuum unit.

According to Coperion, its twin screw extruder technology is particularly well suited for chemical recycling of plastics and can typically produce a homogenous and devolatilised melt with a temperature of up to 350°C within 30s. The ZSK also allows additives such as catalysts to be incorporated easily while residual water or by products from PVC contaminants in the waste material can be reliably extracted via vacuum devolatilisation.

In the Ghent R&D programme, the prepared polymer is delivered to a reactor, where it is further heated to 500°C. This results in pyrolysis leading to a broad mixture of liquid and gaseous phase hydrocarbons. Most of the inorganic components remain in the reactor sump while the organic hydrocarbons evaporate and are recovered for transformation into monomers, syngas or other marketable products.

› **www.coperion.com**

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Leistritz
EXTRUSION TECHNOLOGY

Celanese acquires Santoprene; adds to global POM activities

Celanese is to buy the Santoprene thermoplastics vulcanisate (TPV) business from ExxonMobil for $1.15bn. It said it hopes to complete the deal in Q4 of this year.

The acquisition includes the Santoprene production units at Pensacola in Florida in the US and Newport in the UK, which together have an annual capacity of 190,000 tonnes. It also includes the Santoprene, Dytron and Geolast trademarks and product portfolios, as well as related IP, customer and supplier contracts, and around 350 staff.

"This transaction substantially strengthens our existing elastomers portfolio, allowing us to bring a wider range of functionalised solutions into targeted growth areas including future mobility, medical, and sustainability," said Tom Kelly, senior vice president Engineered Materials.

IMAGE: EXXONMOBIL

Santoprene TPV production at Newport in the UK

In an unrelated move, Celanese has also acquired certain manufacturing technologies and will take over all of Grupa Azoty's Tarnoform polyacetal (POM) resin contracts. This follows the Polish company's decision to discontinue POM activities.

Celanese said the deal presented its Engineered Materials business unit with "an incremental volume opportunity … as well as access to a POM customer base and a proven POM technology." No employees, tangible assets, manufacturing facilities or sales offices will be moving.

Grupa Azoty announced its decision to discontinue POM manufacturing in June. It said it had concluded the business "would not be economically viable in the foreseeable future." The company said POM accounted for around 0.5% of its total business in 2020.

› **www.celanese.com**

› **www.grupaazoty.com**

Leistritz delivers ZSE for LFTs

Leistritz has installed a ZSE Maxx twin-screw extruder at the Eppingen, Germany, site of Dieffenbacher, which is currently building a manufacturing system for volume production of long-fibre thermoplastic direct (LFT-D) components using up to 100% recycled plastic.

According to Leistritz Regional Sales Manager Frederik Huck, the ZSE Maxx compounder is a key part of this production line as its combination of high torque and large free volume ensures energy-efficient melt processing and gentle incorporation of the reinforcing fibres.

IMAGE: DIEFFENBACHER

The LFT-D plant in build at Eppingen

Typical LFT-D processes run at a 30-50% fibre content and require two twin-screw extruders. However, this project, for a US customer, calls for a fibre content of 10-20% so compounding can be carried out with one.

Leistritz said it worked together with Dieffenbacher to optimise the extruder's performance data, the screw geometry and the melt discharge in order to meet these requirements.

› **www.leistritz.com**

Orion and Evonik settle

Carbon black manufacturer Orion Engineered Carbons has settled arbitration proceedings it began against Evonik in June 2019 relating to the sale of Evonik's global carbon black business. Evonik has agreed to make a one-off cash payment of €66.55m to resolve all the claims.

The action stems from a partial indemnity Evonik made against various exposures, including some arising in connection with the US Clean Air Act.

› **www.orioncarbons.com**

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coperion K-TRON

Polykemi invests more in China

IMAGE: POLYKEMI

Polykemi is to build a new compounding plant at Chongqing in China

Sweden's Polykemi Group is opening another production unit in China. Production at the 9,300 m^2 site at Chongqing in Sichuan province, where the firm already has a sales office, is due to start up in Q1 2022.

The decision to build the new Chongqing plant follows the addition in 2019 of a third production unit at its site in Kunshan and comes just weeks after its decision to build a first manufacturing plant in North Carolina, US. The Chongqing plant will make compounds from both virgin and recycled raw materials.

Magnus Lindahl, CEO of Polykemi Compounds Kunshan, described the move as part of its strategy of being geographically close to its customers. "We can guarantee that customers who have production on multiple continents get the exact same high-quality total concept regardless of whether they have production in Asia, the USA or Europe," he said.

› **www.polykemi.com**

IN BRIEF...

German inspection technology company **Sikora** said it has supplied a second in-line Purity Scanner Advanced X-ray/optical system for 100% inspection of XLPE compounds to an undisclosed Chinese manufacturer of submarine and EHV cables. The system checks the surface and interior of each pellet for contaminants and automatically isolates any defective production.
www.sikora.net

Plastics recycling rates in North America rose by about 8% from 2017 to 2019, according to the 2019 US Post-Consumer Recycling Data Report, which is compiled by Stina and Napcor for the **Association of Plastic Recyclers** (APR). Recycling levels in 2019, however, fell by 0.5% to 12,250 tonnes driven in part by a drop in the recycling of PET.
www.plasticsrecycling.org

Techmer PM additive deals extend technology options

North American technical compounder Techmer PM has announced new additive technology partnership agreements with Canada's NanoExplore and US-based Cupron.

The multi-year partnership with graphene specialist NanoXplore will enable Techmer PM to formulate the company's GrapheneBlack materials into compounds for a variety of applications, including strengthening recycled resins, electrical conductivity enhancement, lightweighting, and barrier improvement.

The deal with Cupron, which makes powder form antimicrobials based on oxidised copper, extends an existing arrangement. Techmer PM will now become Cupron's primary plastics technology partner handling manufacturing, sales and marketing in a range of application sectors.

› **www.techmerpm.com**
› **www.nanoxplore.ca**
› **www.cupron.com**

New plant for Apply Carbon

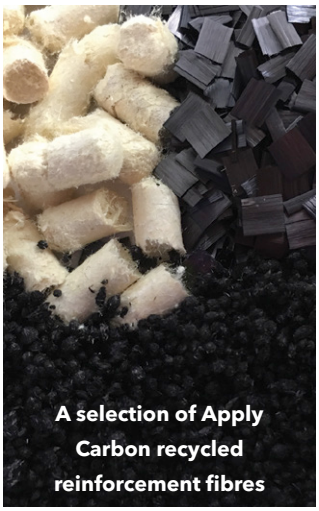
Procotex subsidiary Apply Carbon is to build a new production facility at Plouay in France to house its growing recycled carbon and aramid fibre business and the recently acquired carbon fire recycling activities of UK-based ELG.

The company will transfer its production activities from its existing site at Lauguidic and relocate the acquired ELG production machinery and carbon fibre stocks into the new facility. The aim is to offer a full range of sized, cut, milled and granulated recycled fibres.

"The acquisition of the new facility in Plouay and the integration of the machines, stocks and business of ELG UK will complete the next strategic step in the growth journey of staying the leading sustainable carbon fibre supplier," said Hervé Cayuela, CEO of Apply Carbon.

› **www.procotex.com**

IMAGE: PROCOTEX



A selection of Apply Carbon recycled reinforcement fibres

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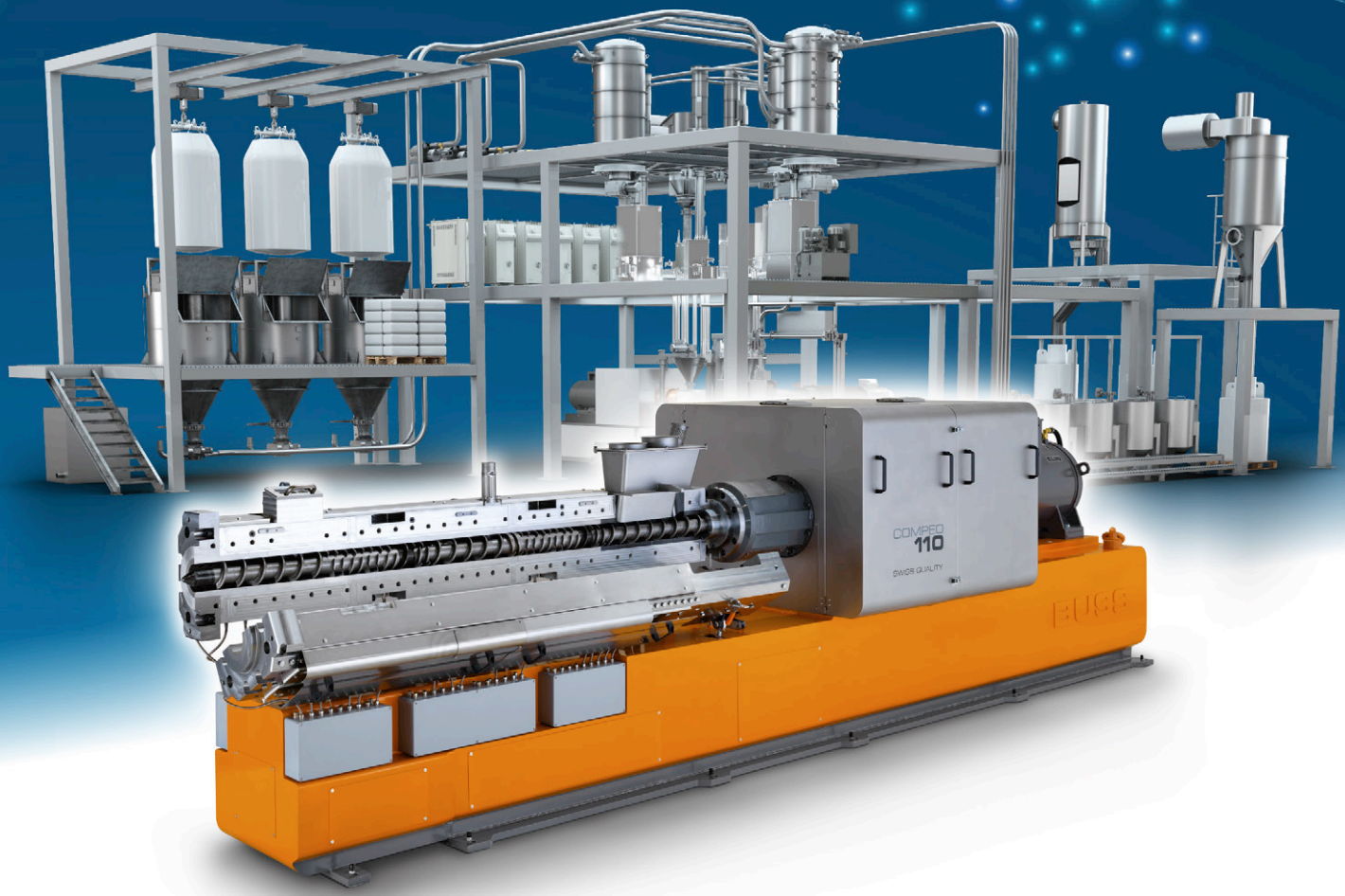

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www.busscorp.com

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Q1 machine data shows demand strengthening

The latest quarterly business updates from European and US plastics machinery manufacturers suggest the plastics processing sector is recovering strongly from the impact of the pandemic.

German plastics machinery makers have seen a 92% year-on-year increase in order intake over the first four months of this year, according to the sector trade group at the country's engineering association VDMA. It is predicting a final result for 2021 at least 10% ahead of the 2020 figure of just under €7bn but warns that supply chain issues may prove to be a limiting factor.

"Economically, the industry is currently doing very well again," according to Thorsten Kühmann, Managing Director of the VDMA's plastics machinery division. "However, this also has its downsides in the strained supply chains, with regard to availability of necessary raw materials and components."

Kühmann said his concern is not only for direct supply of materials and parts to machine builders but also bottlenecks in the supply of plastics "which is impacting the willingness on the part of manufacturers to invest."

The Italian plastics machinery and mould manufacturing sector is also faring well. Sector trade association Amaplast said in Q1 2021 its members reported a 12% increase in sales over the equivalent period in 2020 and a 64% increase in orders.

"The first quarter of the current year confirms the early forecasts by the association, which called for a marked reversal of trend from the difficult period for companies because of the pandemic in 2020," said Amaplast director Mario Maggiani.

Meanwhile, the Committee on Equipment Statistics, part of the US Plastics Industry Association that compiles industry sales data, said plastics machinery shipments for Q1 2021 were, at $335m, up by 32% on the same period in 2020. Shipments of twin screw extruders saw a particular gain, up by 18% in value year-on-year.

"With the economy staying in a recovery cycle, plastics machinery shipments can be expected to increase this year. However, supply chain issues in plastics end-markets could slow growth in plastics equipment demand, so we'll be watching market dynamics very closely in the coming months," said Perc Pineda, Chief Economist at the Plastics Industry Association

› **www.vdma.org**
› **www.amaplast.org**
› **www.plasticsindustry.org**

Ingeo PLA plant wins approval

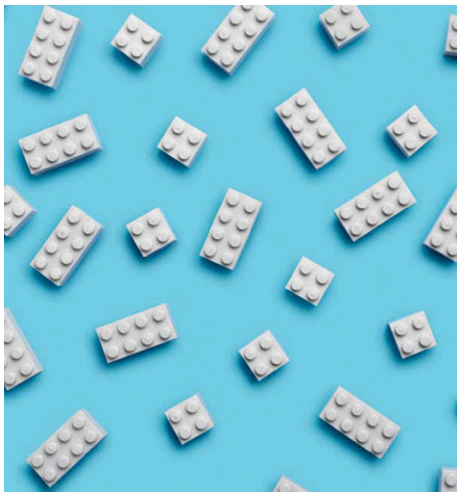
NatureWorks said it has passed two key milestones in its plan to build a second production facility for its Ingeo PLA bioplastic. Last month it received approval for the project from the Thailand Board of Investment and announced that front-end engineering design work has been completed.

When open in 2024, the plant on Thailand's Nakhon Sawan Biocomplex will provide 75,000 tonnes/yr capacity and will produce lactic acid and polymer.

NatureWorks, which is owned by Thailand-based PTT Global Chemical and US agriproducts giant Cargill, recently expanded its original facility at Blair in Nebraska, US. That has a capacity of more than 150,000 tonnes/yr and is claimed to be the largest PLA production facility in the world.

› **www.natureworksllc.com**

IMAGE: LEGO



Prototype Lego bricks produced from used PET bottles

Recycling ideas at Lego

Danish toymaker Lego has unveiled a prototype Lego brick made from recycled PET sourced from used bottles. Currently, the company's bricks are moulded in ABS. The company said this is the first recycled material that meets its quality and safety requirements, including the ability to for bricks to 'clutch' together while remaining easy to dismantle.

Lego said it has developed a patent-pending formulation that increases the durability of PET using a bespoke compounding technology and a number of strengthening additives. The company said a further year of testing and formulation development is expected before the bricks are launched to the market.

In 2018, Lego commenced production of some elements – smaller pieces such as trees, branches, leaves and accessories for mini-figures – using a sugarcane-derived bio-PE. Last year, it announced plans to remove single-use plastics from its boxes.

› **www.lego.com**

SK Global invests in PET recycler Loop

SK Global Chemical (SKGC), a subsidiary of South Korea's SK Group, has taken a 10% stake in Canadian PET depolymerisation technology company Loop Industries. The two companies have also signed an MoU to form a 51-49 joint venture to build four facilities throughout Asia.

SKGC's investment amounts to a total of $56.5m. The first tranche will be used to help fund construction of Loop's Infinite Loop manufacturing facility Bécancour in Québec. The second tranche will follow when the first Asian site is completed. At present, that is forecast for 2022 and will be in South Korea.

According to Loop, four Asian facilities will be built by 2030 as part of the JV. Total projected throughput of waste PET in these is expected to amount to 400,000 tonnes/year, with associated CO_2 savings of 632,100 tonnes/yr. Loop will receive royalty based on revenues from each plant.

Loop's technology, which is yet to be implemented on a commercial scale, is claimed to depolymerise PET to allow it to be upcycled to virgin-quality. According to the company, contaminants such as dyes and additives are eliminated during the process.

› **www.skglobalchemical.com**
› **www.loopindustries.com**

Avient sets sights on cork

Avient has launched a new special-effect masterbatch package under the Renol and Remafin brands for production of natural-looking TPE wine corks.

The new masterbatches have been developed at the Avient ColorWorks site at Merate in Italy using TPEs supplied by compounder Marfran. They have been trialled at a TPE cork manufacturer.

The new formulations comply with FDA and EU food contact standards. Avient said they can be produced using existing injection moulding technology and are price-competitive with natural cork counterparts.

› **www.avient.com**

DIC closes BASF colour deal

Japan's DIC Corporation finally closed its acquisition of BASF's global pigments business – BASF Colors & Effects – at the end of June. The deal, first agreed in August of 2019, had been held up by regulatory processes in the US and EU.

Colors & Effects is a leading global supplier of high-performance, special effect, and specialty inorganic pigments. It generates annual sales of around €1bn. DIC said the business fits very well with its existing Sun Chemical pigments subsidiary with little overlap in their technologies, products, manufacturing assets and supply chain.

The combined operations mean DIC now has 30 pigment production facilities worldwide.

› **www.dic-global.com**
› **www.colors-effects.com**

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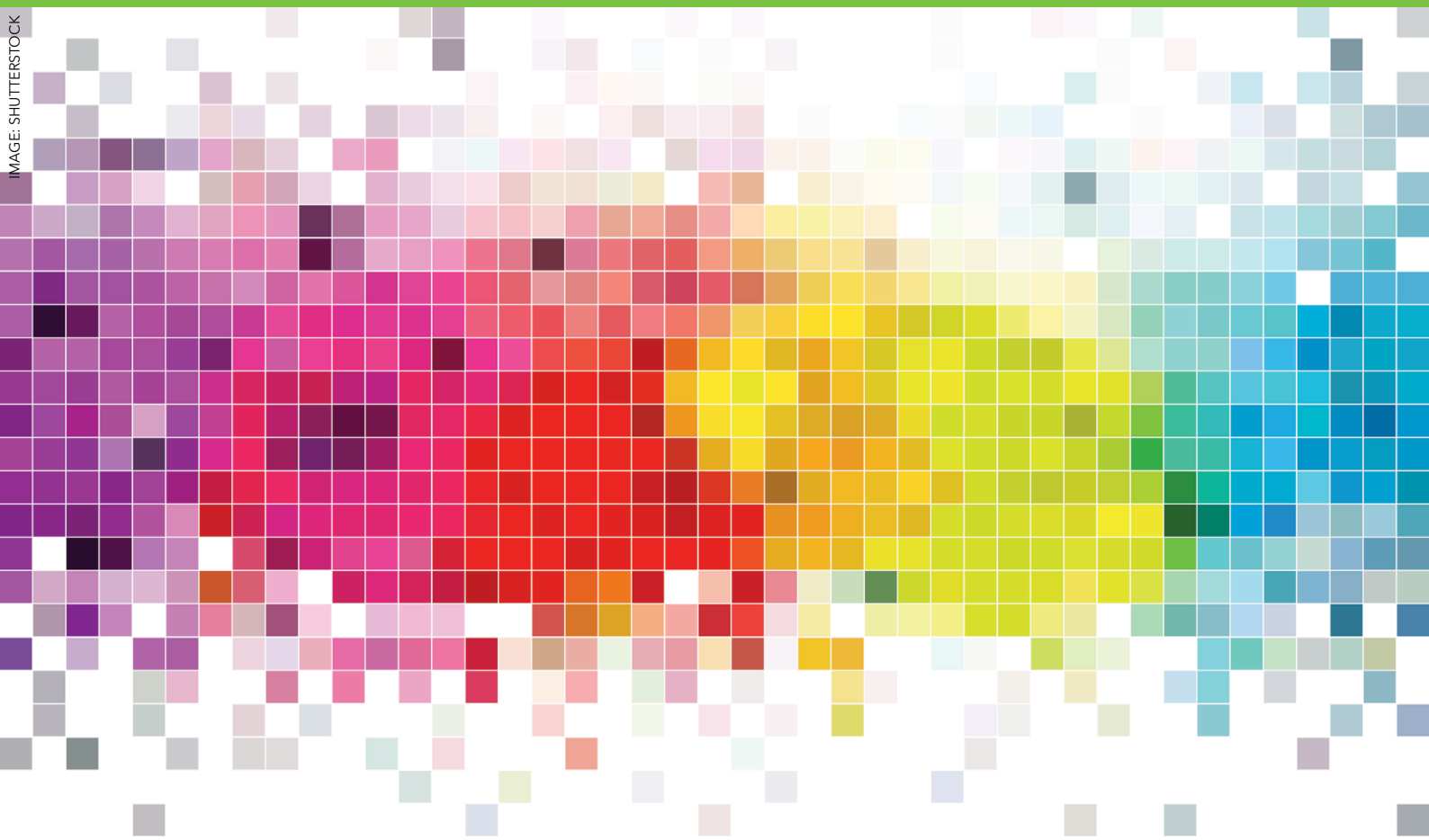

IMAGE: SHUTTERSTOCK

Digital precision in colour

*Measuring and matching colour in plastics is no easy task but the latest digital tools can help at all stages of the production process. **Peter Mapleston** learns more*

"Getting colour right in the plastics industry is essential to customer satisfaction because customers associate colour consistency with quality," according to Earl Balthazar, Colour Technologist and Senior Applications Engineer at colour measurement equipment producer **Datacolor**.

"It can be challenging to achieve consistent, reproducible colour in any industry, but the physical characteristics of plastics require closer attention when it comes to colour matching. This is why a comprehensive digital colour management workflow and the latest advancements in colour management technologies are key in ensuring reliable and accurate colour," he says.

Balthazar says a typical digital colour management workflow includes full-spectrum instruments that generate colour data beyond observation by the human eye. "Use of advanced colour management solutions and colour quality control software allow producers and decision makers to measure, analyse and manage colour digitally from anywhere in the world and quickly share those analyses across the supply chain," he says.

"With higher-end spectrophotometers, professionals can skip the time-consuming process of creating plaques – a process that can take up to 25 minutes just to make a single pass/fail decision. Today's technology makes it possible to make the same pass/fail decision in just five minutes, increasing efficiencies, saving time and avoiding wasted off-spec material," Balthazar explains.

The latest spectrometers – such as Datacolor's Spectro 1000/700 series instruments – measure temperature as well as colour. Balthazar says temperature measurement is important because plastics samples coming off the production line are frequently considerably above ambient temperature. He says this can significantly impact colour appearance.

Last month, Datacolor introduced two new models to its Spectro range of benchtop spectrophotometers. It says the economical Spectro 700V

Main image: New digital technologies can help maintain colour consistency even in the most complex plastics supply chains

Above: Datacolor's latest Spectro 1000 model measures sample colour and temperature

vertical configuration instrument enables users to measure a greater variety of samples, while the Spectro 1000X model, with its upward-facing aperture, is said to be well suited for handling liquid, paste, powder and granular samples.

Colour and gloss

New models also feature in the **Konica Minolta** line-up. The benchtop-series CM-36dG and CM-36dGV (the second has a vertical alignment) are two-in-one high-precision spectrophotometers that measure colour and gloss simultaneously.

"Differences in measurement values between instruments are exceedingly small, so when these instruments are used consistently from suppliers through finished product maker, higher inspection process efficiency can be expected," says Jutta Albertin, European Product Manager CCM at Konica Minolta Sensing Europe. She says stability and reliability of the devices is guaranteed using a patented monitoring function that the company calls "Wavelength Analysis & Adjustment" (WAA). This compensates for slight shifts in measurement values due to external factors such as ambient temperature changes.

Albertin says the two new units retain the strong points of the predecessor series CM-3600A but add several new features to improve user experience. These include status LEDs to provide a clear visual feedback, a camera preview system for sample positioning and reporting, and a more versatile port alignment that allows the device to be used horizontally or rotated 90° to measure materials such as powders in "top-port" style.

Albertin also highlights some features of the company's Colibri software platform for colour quality control and recipe prediction. "Any kind of polymer can easily be used for recipe prediction without a lot of pre-work," she says, adding that this includes post-consumer recycled material. "Depending on the desired colour shade, the software helps to decide about the best ratio of PCR to virgin polymer and thus enables the compounder or masterbatcher to react fast if the PCR varies. Colibri software also has the ability to match not only colour but also opacity 'in a perfect way,'" she says.

Pandemic effects

One observed effect of the Covid-19 pandemic has been an increase in the number of compound and masterbatch produces – as well as their customers – that are using digital colour references and digital workflows to enable colour work and communication from remote locations, according to Felix Schmollgruber, EMEA Technical Applications Manager at **X-Rite**.

Digital standards quantify a colour's identity based on the type of plastic, gloss or surface reflection, special effect additives, opacity and more, Schmollgruber says. They can reduce waste and unnecessary time spent on iterations passed back and forth between design and production. "To create a digital colour standard, you need an accurate, repeatable master spectrophotometer," he says, highlighting the X-Rite Ci7860 benchtop as a suitable option.

When specified correctly, digital standards make

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IMAGE: HUNTERLAB

Right: The Aeros system from HunterLab provides reliable performance on granular samples

it simple to begin formulation immediately. Schmollgruber says X-Rite's Color iMatch software helps identify the best candidate formulas, offers recipes that use the colorants on hand, and gives the option to include leftover materials to work off wasted material from past jobs. "Once formulation is complete, the masterbatcher can create a sample plaque, measure it with a spectrophotometer to ensure it is within colour tolerance, and send the digital colour data to the customer for approval, eliminating the expense and time delay of travel and shipping samples back and forth," he says.

"When it comes to digital workflows, we are also seeing a need to capture not only colour but the full material appearance consisting of colour, gloss, transparency, opacity, surface structure, sub-surface effects, etc. This is important for special effects finishes. Colour measurement devices such as X-Rite MA-T multi-angle spectrophotometers help to quantify colour and appearance such as sparkle and coarseness," he adds.

Schmollgruber says the company is now working to make it easier for players all along the manufacturing and supply chain to transform digital colour standards into digital material files. For example, the latest release of its Pantora appearance software allows users to capture colour and appearance data using Ci7000 Series or MA-T12 spectrophotometers to render a digital material file for 3D design, production, and quality control teams. This minimises the need to ship samples between various members of a development project.

"The past year has accelerated the move to digital workflows and impacted operational budgets for many suppliers. X-Rite now offers subscription-based pricing for Color iMatch formulation software that makes budget planning easier. We also offer a range of online colour education and virtual training," he says.

"Colour trends are always evolving. There is also a shift towards more recycled, sustainable plastics. This creates new challenges in delivering fast, accurate and consistent colour from batch to batch. Digital standards and processes allow plastic suppliers to connect measurement devices/data with formulation, QC and analytic software," Schmollgruber says. "The result is a more streamlined and sustainable process that helps producers get colour right every time."

Below: X-Rite's Color iMatch system uses digital standards to speed up formulation development

IMAGE: X-RITE

Granular approach

The Aeros unit from **HunterLab** can be used to determine the colour of granulated samples. The company says the unit is easy to handle and that measurement results can be reproduced with high repeatability. Product is simply poured into a sample tray and the system's "smart" sensor enables the surface of the granules to be considered as a whole, automatically taking into account variation in granule height and orientation.

"The simple filling of pellets into a tray without stripping or shaking leads to the most accurate results with the highest accuracy in repetition," according to the company. "Given a sufficient layer thickness of the sample in the tray, even when measuring translucent plastics, the colour of the bottom of the tray does not affect the measurement results."

Within five seconds, Aeros calculates the average of 35 readings as the sample tray rotates beneath the sensor. A total surface area of up to 177.25 cm^2 is covered. A comparison with intermediate readings without use of a reading flash is said to guarantee that the measurement is insensitive to the existing ambient light of the environment.

"Among experts, there has always been a disagreement about how to prepare samples so that measurements appear to be most stable and repeatable," says HunterLab. Some would say simply pour the material into a sample tray, some to scoop it with the tray. Others prefer to fill the tray to the brim and level it with an edge of a ruler or to fill and place on a tumbling station for a few seconds. Having carried out its own tests, the company has concluded that, contrary to the intuitive assumption

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that stripping or shaking leads to better results, simple filling provides the most stable result.

"The easy filling of a sample tray with pellets, which can be handled quickly and safely during the production process leads – by averaging over a large surface – to highly repeatable and precise results for measuring colour and in particular for the Yellowness Index YI E313 for translucent samples," Hunterlab claims. It adds that, because height positioning of the sensor and the averaging are carried out automatically, the operator does not need to be highly trained so the Aeros is well suited to quality control of plastic pellets during manufacturing.

Managing black

Black has traditionally presented acute measurement challenges. Surfaces appear black when less than 1% of incident light is reflected, which means that most of the "blacks" we see around us are actually just very dark colours. This means there are all sorts of blacks, each carrying their own undertones of red, blue, and green. **Byk-Gardner** recently introduced the spectro2guide Pro spectrophotometer to measure the darkest blacks.

"To measure the deepest blacks with a reflectivity of 0.1% or less, a new approach is required in combination with careful sample preparation to ensure reliable and reproducible quality assurance measurements with a hand-held spectrophotometer, as well as a good correlation with our visual assessment," the company says.

Three indices are used to determine how black a black really is: Blackness (My) is directly related to reflectance without considering undertone; Jetness (Mc) is the colour-dependent blackness value; and Undertone (dM) describes the amount of blue shade (positive value) or brown shades (negative value) – Figure 1.

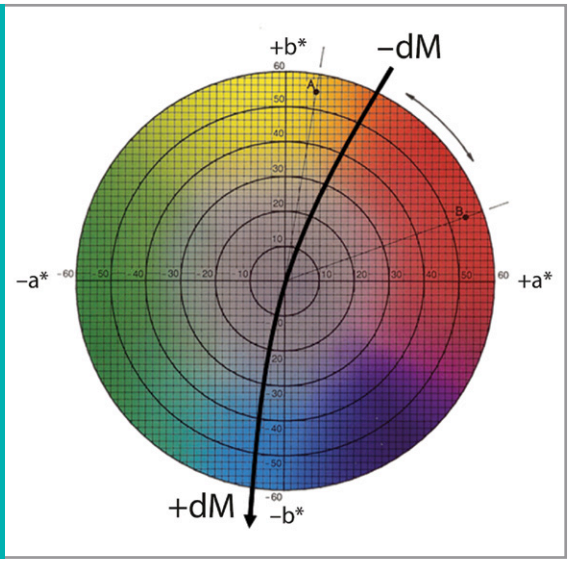

Figure 1: All blacks carry their own specific colour undertones. A positive dM (undertone) value indicates a bluish undertone, while a negative value indicates a brownish undertone

Source: Byk-Gardner

The app-based Colorix Nano measurement system can provide colour data from a single granule

IMAGE: COLORIX

"Measurement of the deepest black colours places high demands on a measurement instrument and pushes the technical performance of a handheld spectrophotometer to the utmost limit," according to Byk-Gardner. It says the high performance of its spectro2guide Pro is based on the use of a high-power LED light source, which provides very good short-term and long-term stability and ensures homogeneous illumination of the measuring spot.

"The technical performance of the spectro2guide Pro is outstanding even on deep black samples with a blackness value My value close to 400," the company claims. It also claims that the new unit, as well as others in the spectro2guide family, are the only spectrophotometers on the market that can measure colour and gloss as well as predicting the long-term colour stability of a sample. Lightfastness is analysed by the combination of a spectrophotometer with a fluorimeter.

Fake detection

Introduced back in 2019, a growing number of industrial customers across diverse markets are now using the **Colorix** Nano device with its Color Quality Control iOS App, according to company founder David Maurer. "What they like is that they can make colour quality control on a small area of 0.3 by 0.3 mm," he says. "Being able to measure such a small area allows masterbatch producers to directly control the quality of the masterbatch. It is no longer necessary to melt the masterbatch to have a larger surface to be able to carry out quality control." ❯

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IMAGE: COLORLITE

Right: ColorLite has developed a continuous colour monitoring system to reduce reject rates and downtime

The company has recently added a special version to its range of Nano devices that detects an invisible ink that can be mixed into plastics to provide counterfeit protection. The system was developed in collaboration with Israel-headquartered company Dotz, which has developed proprietary technology for tagging polymer products. Its ValiDotz taggants, supplied in masterbatch form or in finished compounds, show up in UV light.

Continuous control

Meanwhile, **ColorLite** has developed a continuous monitoring process to reduce production costs, reject rates and downtime. It says its compact high-performance "sph ipm" spectrophotometer provides 100% colour control. "Due to the high precision and repeatability, time-consuming laboratory analyses can be reduced," it claims.

As soon as the system detects a colour deviation outside a specified tolerance it forwards the information to the process control system so production can be stopped. A "traffic light" system then shows the error. The sph ipm, which has an IP65 rating for protection against dust and water, can be connected to the process control system via various interfaces. Fitted with a 7" colour touch screen, it can display CIE L*a*b* colour values and other colour scales, including customised units.

For colour measurement of granules, ColorLite offers the MA80 probe head. This has a measuring surface 80mm across and can be mounted directly on a material feed or a separate measuring chamber. "To measure granules or other inhomogeneous samples it is necessary to measure over a relatively large area," the company says. The probe head adapter is fitted with an array of high-powered LEDs to illuminate the samples, with a white barium sulphate coating used to diffuse the light.

Like other equipment suppliers, ColorLite emphasises the importance of the effect of temperature on the colour of plastics. "Neglecting this fact leads to false measurements," it warns. To counter this risk, its system can be equipped with an optional integrated infrared thermometer. This allows colour deviations caused by thermochromatic effects to be measured and compensated for in the measurement software.

ColorLite offers inline solutions for various plastics compounding and processing operations. Its portfolio also includes portable spectrophotometers and benchtop instruments.

Measuring in the die

In line colour measurement systems are also available from US-based **Equitech**, which offers the EquiSpec fibre-optic spectrophotometer for measurement of chemical concentration and colour in the UV-Vis region of the light spectrum (200 to 800 nm) directly in manufacturing processes under a variety of environmental conditions.

The company's systems use fibre optic probes to transfer the signal from the sample to the spectrophotometer so absorption, transmission or L*, a* and b* values can be obtained. The company says it developed its Reflection and Transmission Polymer Melt Probes (RPMP and TPMP) for plastics compounding, making it possible to directly measure chemical concentration and colour in the polymer melt at up to 400°C and almost 35 MPa.

The RPMP consists of six illumination fibres angled at 28° from the surface normal and evenly spaced around the probe circumference. Reflected light is picked up by a single fibre at 0° from the normal. "The EquiSpec and probes system helps maintain colour matching in polymer masterbatch production while minimising time, sampling and scrap required to achieve colour tolerance or make colour changes online," says Equitech President and CEO, Jaime Gómez. The system allows alarms to be set when colour and/or additives go off-specification, providing continuous real-time quality assurance. ›

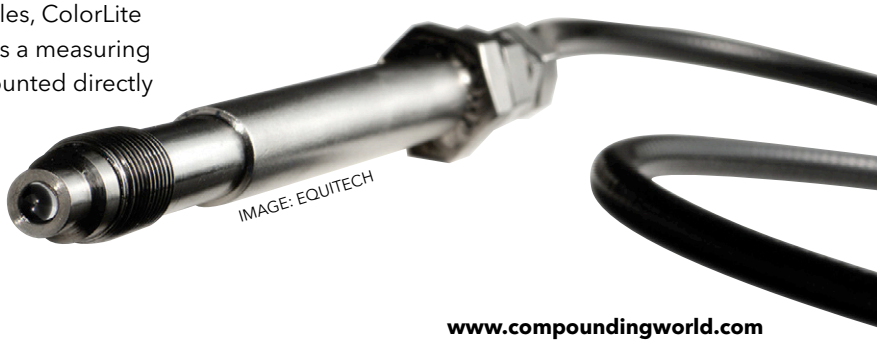

IMAGE: EQUITECH

Right: Equitech's EquiSpec system uses fibre optic probes to measure colour in the extrusion die

The hardware is complemented by Equitech's EquiColor software, which is designed with security features that allow production managers or process engineers to set standards and tolerances while letting operators use, access, and recall previous operational files without affecting their settings, according to Gómez. He also highlights the system's ability to use two probes simultaneously, for example both for colour or one for colour and the other for gloss.

Probes are also available from German company **ColVisTec**, which has cooperated with Equitech in the past as well as working on its own spectrophotometer and probe developments. The two companies now work independently but have an agreement to market technologies in separate territories.

ColVisTec Sales, Marketing and Customisation Director Fuat Eker says 90% of the systems it has installed so far are in extrusion applications for plastics and also other materials. "The integration into existing extruders is as easy as into new extruder lines, there are no differences," he says. The company's InSpectro X and fibre optic probes are designed for production environments as well as laboratories.

Eker says InSpectro X allows fast measurements for residence time detection and RTM (Residence Time Measurement) and ReTA (Residence Time Analysis) software tools also provide fast analysis of the measurements. Results are calculated and displayed in numbers as well as in graphs. "This function allows to define process windows very quickly and to find the optimal screw configuration. It opens up new insights in extrusion," he says.

"The trend is more and more towards control loops to precisely control the dosing of raw materials for the right colour or composition of the final product," Eker says. "We remain focused and continue to expand our product portfolio with innovative and new developments for the analysis and monitoring of continuous processes in the polymer industry."

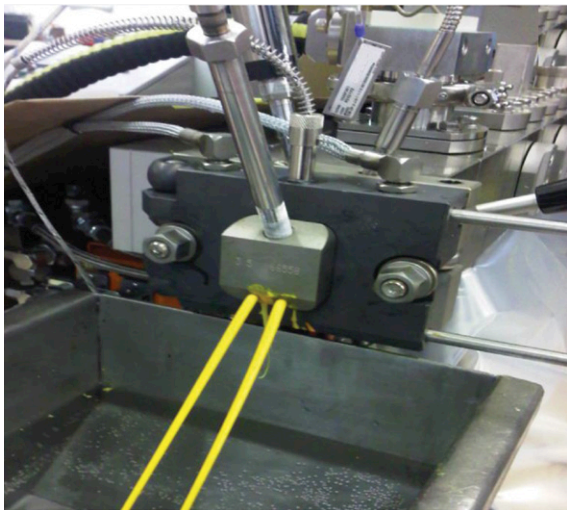

IMAGE: COLVISTEC

Above: ColVisTec's latest development is the GiANT system, which combines a three-function spectrometer platform with a combination probe (shown here) for UV-Vis and NIR spectra

Colour values are not only an indicator of product quality but are also useful in providing insight for process monitoring in the extrusion stage. "All parameters in the production process – temperature, pressure, production speed, feeders, pumps etc – have an impact directly on the colour values," says Eker. "Immediate adjustments of the process parameters are therefore possible through immediate 'off-specification' detection."

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Keeping surfaces clean

Biocidal and antimicrobial additives for plastics stand ready to address microorganism growth in a wide range of applications, limiting material degradation and extending product lifetimes. Jennifer Markarian reports

IMAGE: SHUTTERSTOCK

Main image: The Covid-19 pandemic has intensified concerns over infection but demand for microbial-resistant surfaces extends beyond healthcare

The onset in 2020 of the Covid-19 pandemic put growth of microbes on 'high-touch' surfaces centre-stage around the world, with individuals and organisations everywhere becoming especially concerned about sanitizing surfaces. Many other plastics industry megatrends, even concerns about single-use packaging and its contribution to plastic waste disposal and the need to improve recyclability, were put on hold temporarily. While those issues have regained prominence in mid-2021, the desire for 'clean' surfaces is certain to continue. To that end, plastics formulators can call on a range of inorganic (silver or zinc-based) and organic active ingredients additives that can 'embed' antimicrobial protection into polymers and suppress microbial growth on plastic surfaces.

"The pandemic has brought into sharp focus how microbes, if left unchecked, can have a big impact on our lives," says Dr Ivan Ong, Vice President of Research & Development at **Microban International**, a leading player in antimicrobial additives.

Ong predicts continuing growth in antimicrobial additive use in plastics applications. "Antimicrobials built into products can aid in lengthening the useful life of products. Post-pandemic, we see this benefit as contributive to emerging corporate and industrial sustainability efforts. By making the useful life of plastic products longer, antimicrobials can play a beneficial role by preventing wasteful premature disposal. By their design, antimicrobials are used in repeated-use, durable articles, and the benefit they bring will aid in encouraging industry and consumers in migrating from single-use packaging and

Right: Swedish fashion-tech brand Happy Plugs is using Addmaster's Biomaster antimicrobial in its latest line of wireless headphones to prevent odour, staining and discolouration

products to durable, multi-use products."

Earlier this year, for example, global telecoms equipment maker Poly (created in 2019 from the merger of Plantronics and Polycom) announced it was using Microban technology in its latest Rove DECT IP phones to control growth of potentially product-damaging surface bacteria. According to John Lamarque, VP and General Manager of Poly's Voice Collaboration and Professional Headset business unit, the move means its customers can "feel confident while using our devices as they get back to work in warehouses, retail centres and hospitals around the world."

Paul Morris, founder of **Addmaster** (UK), which offers its Biomaster antimicrobial masterbatches and since January of this year has been a subsidiary of Sweden's Polygiene, also says that the pandemic has taught the public the importance of hygienic surfaces and that this will have a big impact on the growth of antimicrobial use. "The educational programme on how we stop pathogens entering our bodies…has had an impact that no advertising budget [for antimicrobial plastics] could ever achieve," he pointed out in a recent blog. As people return to 'nearly normal' lives, he said we will see "a massive surge in companies wanting antimicrobial products and surfaces to reassure and attract consumers to their commercial offering."

Unsurprisingly, perhaps, a common question asked over the past year has been whether an additive is available to protect a plastic product against the SARS-CoV-2 virus (which causes Covid-19). Industry experts – including those at Addmaster – caution that companies should be careful with antiviral claims and that any claims should be backed up with data. With a number of specialised laboratories now able to handle the SARS-CoV-2 virus, some plastic products have been tested to measure the efficacy of additives in protecting the plastic surface against it. A rigid PVC wall cladding produced by BePlas in the UK

IMAGE: POLYGIENE/HAPPY PLUGS

containing Biomaster antimicrobial technology was recently tested (ISO 21702:2019) and a reduction of the virus of more than 96% after 6 hours when compared to a control was obtained, according to Addmaster. The hygienic wall covering is designed for environments such as hospitals, food catering, and manufacturing facilities.

Also based in the UK, **BioCote** supplies a range of antimicrobial additives, including silver, zinc and organic compounds, as well as combinations such as silver/zinc and silver/copper blends. It also sees growth in use of antimicrobial additives for plastic product protection and has increased its production capacity for some of its products. The company emphasises that its technology does not protect users against disease-causing bacteria, viruses or other harmful organisms, and it is not a substitute for good hygiene and cleanliness. It does, however, reduce the presence of odour and stain causing microbes on a product surface by up to 99.99% and extends the functional lifetime of a product by protecting against material degradation.

Claims about what an antimicrobial product can do are highly regulated, explains BioCote, although those regulations vary for different countries. In the US, for example, antimicrobial active substances are categorised as pesticides and registered with

Kraton gains EPA approval for BiaXam

Kraton announced in April 2021 that it had received an emergency exemption from the US EPA to use its BiaXam antimicrobial polymer for use in specific applications. It differs from most antimicrobial product offerings in that its antimicrobial properties are not due to an additive but are inherent to the polymer.

The company says that, in laboratory conditions, the BiaXam technology can kill up to 99.999% of the SARS-CoV-2 virus and provide continued protection for up to 200 days, depending on use, exposure, and cleaning methods.

Kraton says the BiaXam sulphonated block copolymer can be applied as a coating and is also available as a peel-and-stick film.

The EPA exemption has allowed Delta Air Lines to use the polymer in kiosks and counters in three US states to protect surfaces from the SARS-CoV-2 virus. The company says it is seeking regulatory approvals for the technology that would allow broader use beyond the emergency exemption.

› **www.kraton.com**

IMAGE: BIOCOTE

Above: BioCote is part of the Amicable project to develop lightweight composite grab poles with antimicrobial properties for mass transit application

the EPA as such. Products containing antimicrobials can also be registered, or they can be categorised as a 'treated article' that is exempt from registration as long as it meets certain requirements, including strict rules limiting marketing claims.

"A treated article is a product that contains a pesticide for the purpose of protecting the product itself. Treated articles must not make any claims that could be interpreted as having a benefit to user or environment as a result of containing an antimicrobial technology," says BioCote's Managing Director, David Hall. "We invest a lot of time working with our customers to formulate messages that help communicate the benefits of antimicrobial products and why their customers should care, but everything is based on fact, based on data, and very much rooted in the reality of how that product will actually perform."

Hall says the company is working with a range of new partners on novel applications for antimicrobial plastics, with public transportation one growing area. In 2020, BioCote launched a partnership with US brand Aereos Interior Solutions (AIS) to integrate antimicrobial technology into interior aircraft parts such as tray tables, toilet shrouds, toilet seats and window shades to protect their products from odour, stain and material degradation-causing microbes.

BioCote is also involved in the UK's Amicable project. Funded by an Innovate UK research grant, the project includes manufacturers and researchers from the Warwick Manufacturing Group (WMG) at the University of Warwick and aims to produce innovative lightweight composite grab poles with embedded antimicrobial properties.

"The grab poles will be used in a wide range of public transport applications, such as bus, rail, underground and tram, including in the new prototype vehicles of the Coventry Light Rail system. The poles themselves will be suitable for retrofit, which means they can be installed into new vehicles, and they can also replace existing steel poles in buses and the Underground [London's public mass transit system]. Whilst the project initially focuses on public transport applications for improved cleanliness and additional product protection, there is the potential for the materials to be used on cruise ships, medical furniture or wherever there is a chance of odour, staining or material degrading microbes causing issues for products," explains Hall.

BioCote is also working with a number of automotive OEMs and their supply chain partners to develop antimicrobial-containing interior trim and HVAC components.

Antimicrobial protection of plastic parts helps products stay cleaner for longer and reduces microbial-induced material degradation, making products more durable. "BioCote has data to show the continued antimicrobial efficacy over an average product lifespan of 25 years," says Hall. He notes an upturn in enquiries from the re-useable product market over the past few years, as companies seek to reduce the demand for single-use plastics, for example, with reusable drink bottles and coffee cups protected with antimicrobial technology.

"Consumers are increasingly sensitised to hygiene," says Cédric Münger, Head of Application Laboratories at Switzerland-based **Sanitized**. Previously, he says people were most concerned about hygiene in areas such as kitchens and bathrooms, but today "a door handle is no longer what it was before the pandemic."

Growing application areas include moulded products for high-touch surfaces such as light switches and shopping cart handles, and self-adhe-

IMAGE: SANITIZED

Right: Consumers today are increasingly sensitive to hygiene issues, says antimicrobial additive maker Sanitized

Fraunhofer project to embed enzymes aims to make plastics self-cleaning

Scientists at Germany's Fraunhofer Institute for Applied Polymer Research (IAP) are mid-way through a project to embed enzymes in plastics to provide characteristics such as self-cleaning or degradation.

The Biopol Biofunctionalisation/Biologisation of Polymer Materials project was commenced in 2018 in cooperation with Brandenburg University of Technology Cottbus-Senftenberg and aims to demonstrate the possibility of commercial production of enzyme-embedded plastics.

Key to the embedding process is the use of porous inorganic particles carrier particles that protect the enzyme from exposure to the high temperatures encountered during plastics processing. Both the carrier and the technology used to embed the enzyme in the carrier's pores have to be developed to the specific type of enzyme and application, the researchers say.

› **www.iap.fraunhofer.de**

IMAGE: FRAUNHOFER IAP

Enzyme-embedded polymer films in production

sive films for covering surfaces. Sanitized introduced a new portfolio of antimicrobial products in February this year. These BroadTect products – which are based on different active ingredients, active ingredient combinations, and delivery forms – have a broad protection spectrum and are effective against bacteria, mould, mildew, yeasts, and algae.

"Every substrate has its own characteristics. From our product portfolio we can choose the best one for the desired substrate," says Münger. One of the new BroadTect products is the Sanitized MB E 19-71 masterbatch, which contains a combination of active ingredients. "It is a highly compatible masterbatch that can also be used at high temperatures and is extremely water and UV stable," he says.

Sanitized has tested its BroadTect products against the SARS-CoV-2 virus but is cautious about making blanket statements about effectiveness because there is a high dependence on the substrate when evaluating a system. "With our experience, we can make recommendations as to which active ingredient performs well in which substrate," Münger says. The company also points out that the regulatory landscape is complex, and recommends users be particularly careful about claims, depending on the country in which the antimicrobial or plastic articles will be sold.

IMAGE: SANITIZED

Below: Development of application-specific antimicrobial masterbatches is carried out at Sanitized's technical centre in Switzerland

As antimicrobial properties vary depending on both the active ingredient and polymer, testing is critical, according to UK-based polymer additive supplier **Radical Materials**, which has a range of antimicrobials for plastics under its SteriTouch brand. "The pandemic has undeniably created a surge in demand for biocides, both in sectors in which they are commonly used and those in which there has previously been no real uptake," says Nick Corlett, Director at Radical Materials.

He says there is a particular interest in antimicrobials and additives that combine antimicrobial and odour absorbing properties. Antiviral properties are another area of acute interest, but the company says there are challenges in achieving antiviral effects in moulded plastics. It is typically more feasible (from a cost perspective) to achieve antiviral properties in a thin coating than in a moulded product, Corlett advises.

In April this year, Radical Materials introduced a new additive under its SteriTouch brand that the company claims has demonstrated an efficacy of

IMAGE: SHUTTERSTOCK

Above: Parx Materials has completed long term performance trials on domestic cutting boards containing its Saniconcentrate additive

99.9999% within 3 hours against bacteriophage Phi6 and 93% in 2 hours against SARS-CoV-2. The liquid additive is suitable for solvent-based coating applications, although the company continues to explore antiviral additives for water-based systems and for polymers.

"The range of BPR [the EU regulatory system] and EPA registered biocides that are suitable for polymers and capable of providing good antiviral efficacy is limited," says Corlett. "It is more difficult to achieve long-term, robust efficacy against viruses than it is against bacteria, particularly as the host material itself can play a significant part. A biocide that provides great antibacterial performance may show no antiviral efficacy in one material, but good efficacy in another."

Other challenges to be considered are that antiviral additives can cause discoloration, incompatibility with pigments, and loss of physical strength or flame retardancy. "Having tested most active substances, including those based on silver, copper, zinc, silane quats and several organics, we now have a much clearer picture of how each performs in different materials and under different conditions," says Corlett.

Netherlands-based **Parx Materials** produces its Saniconcentrate additive technology using elemental zinc, which functions by preventing bacteria and viruses from adhering to surfaces. The company claims that its approach to creating an antimicrobial surface does not present any risk of creating resistance, is biocompatible, and is non-migrating.

Parx says that its additive technology has proven efficacy against growth of mould, fungi, bacteria, and viruses such as Corona 229E, H1N1 and H3N2, according to ISO 21702 and ISO 18184 tests. In solid surfaces, the technology reaches an efficacy against SARS-CoV-2 of 99% in 24 hours, according to CEO Michaël van der Jagt. It is also said to be effective against another microbe of concern: Candida auris – a drug-resistant fungus that can persist on surfaces. The company reported in June that its Saniconcentrate has shown an 87% efficacy against Candida auris after 24 hours.

Earlier this year, Parx also announced the results of a four-year, real-life durability test in which cutting boards containing 3% Saniconcentrate were used in households and washed in dishwashers over an estimated 1000 dishwasher cycles. Tests showed that the boards maintained their antibacterial activity and demonstrated 'as new' antimicrobial performance at the end of the experiment, which van der Jagt says confirms that the additive is non-migrating even under harsh conditions.

Parx Materials continues to launch new products and develop applications, with the most recent introductions for the compounding sector being a range of additives for polyamide and injection moulded ABS.

Alternate technologies

US-based **Gelest**, acquired by Mitsubishi Chemical Company in 2020, uses an antimicrobial technology based on silane quaternary ammonium salts. This non-migrating additive features a strong positive charge that disrupts the cell membrane of microorganisms and is said to be effective against bacteria, fungi, and algae. "Silane quat antimicrobials don't promote antimicrobial resistance, they provide durable antimicrobial protection, and they have a

IMAGE: BENVIC GROUP

Right: Toothbrushes are a potential application for Benvic's Plastisafe antimicrobial masterbatches

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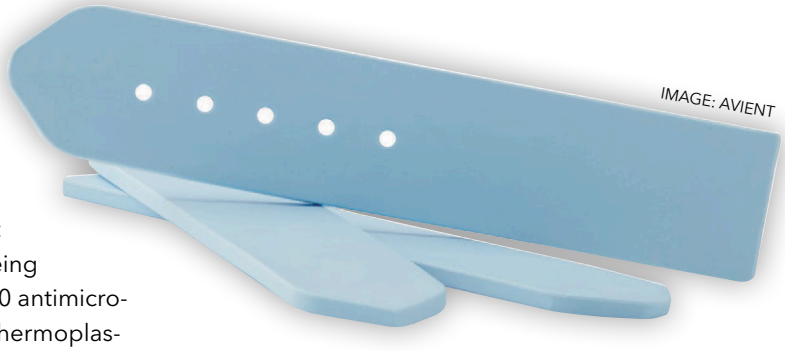
IMAGE: AVIENT

Right: High-touch TPE surfaces such as grips for wearable electronic products can benefit from antimicrobial protection, says Avient

compelling safety profile," says Shiming Wo, Gelest Vice President and General Manager Life Sciences.

The additives are marketed under the BioSafe name and are registered with the US EPA and have US FDA and NSF certification for direct food contact applications. The company says it is seeing increased interest in its BioSafe HM4100 antimicrobials, which can be compounded into thermoplastics, for applications in personal care, home care, medical devices, personal protection equipment, food packaging, and new markets.

European compounder **Benvic Group**, which is headquartered in France, uses a variety of antimicrobial technologies. Silver ion antimicrobial technology is applied in some of its PVC compounds for production of gaskets and cable conduits for hospitals or other environments where disinfection is critical, says Eric Grange, Marketing Manager at the company. It has also developed an antibacterial technology called Plastisafe that it supplies in its PVC and PLA compounds and also as a masterbatch for compounding in to a range of thermoplastics (such as PP, PE, PA, ABS) to provide bacteriostatic properties.

"Plastisafe modifies the surface and creates an electrostatic repulsion of the bacteria. The advantage of this solution is that it is fully food-contact compatible, harmless, and a lower cost than metal-based technology," according to Grange. Plastisafe is used in hospitals, the food industry, and for touch-surfaces such as computer keyboards and toothbrushes. According to the company, it is also suitable for medical packaging and drug delivery systems.

Flexible options

Last year, **Avient** introduced three GLS thermoplastic elastomers containing antimicrobial additives based on zinc pyrithione from Lonza. Available in the US and Asia, potential applications are said to include consumer electronic products, personal care item grips, and automotive applications such as cup holder mats and HVAC seals. The company says that high-touch TPE surfaces are vulnerable to detrimental aesthetic and mechanical property changes caused by microorganism growth, but that parts containing an antimicrobial can inhibit microbial growth and so extend useful lifetimes.

Avient has tested moulded plaques of the material according to JIS Z2801 and ASTM G21-15 standards and has determined that the additives protect moulded plastic parts by inhibiting bacterial growth (99.9% or more) and resisting fungal and mould growth, according to Russ Danielson, Senior Marketing Manager, Specialty Engineered Materials at the company.

Interest in antimicrobials is also developing for engineering plastics applications, according to Bill Galla, Vice President of National Sales at US-based **Polymer Resources Ltd**. He says that when the company had experimented with antimicrobial engineering thermoplastic compounds prior to 2020, most customers considered antimicrobials as cost-prohibitive and unnecessary. But that is no longer the case. "Customers are now viewing antimicrobial product development as a value-added need, not just a 'nice to have'," he says.

Polymer Resources recently commercialised an antimicrobial polycarbonate compound that is UL listed for all colours and fully tested for antimicrobial activity. The material is intended for electrical applications such as switches, enclosures, and wall-mounted coverings in both healthcare and home settings, according to Galla. He says such 'high-touch' applications are increasingly being made with antimicrobials.

"Adding any level of antimicrobial additives to a resin that is UL listed would require testing and recertification by UL in order to achieve a UL listing," says Galla. He says the company was able to achieve similar performance for their antimicrobial PC on the UL card as the non-antimicrobial version. Additional engineering resin grades using similar antimicrobial technology are now in development.

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IMAGE: ECKART

Making marks in plastics

*Laser marking and welding provide new opportunities for processors, enabled by collaboration between additive, compound and equipment providers. **Mark Holmes** reports*

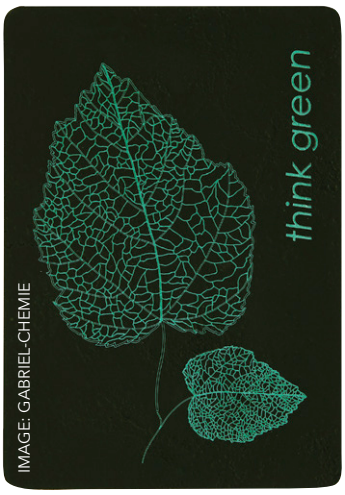
With laser-based processing – such as marking or welding – playing an increasingly important role in plastics production, manufacturers of the additives, masterbatches and compounds that make these technologies possible are working hard to develop new and improved products.

Laser marking provides a high-speed labelling and decoration option for plastic parts that can eliminate further processing while laser welding can be used to quickly and reliably join intricate plastics components. One of the key driving forces behind the adoption of both is sustainability, according to Austrian masterbatch producer **Gabriel-Chemie**. "Laser marking and decoration can achieve high quality, permanent marking of plastics without the use of any additional consumables such as printing inks. The final object consists only of a single, homogenous material, which is beneficial for the recycling process. That is what brands and converters are most interested in at the moment. Laser welding benefits from the same advantages, as no glue is necessary to join the two parts together," says Mark Hannah, Head of Corporate Marketing at the company.

In the area of laser marking, new developments are being driven by the need to increase the contrast between the marking and the base plastic, as well the dream of achieving coloured laser marking that would substitute printing inks on plastics completely. "As in all new developments, these things take time and creative minds are needed to drive them forwards. There is still a lot of work to do," he says.

Hannah explains that the physical performance of the plastic and the make-up of the polymer chains has an effect on laser marking. "Gaining an understanding of the properties of the virgin polymer and its influence on the laser marking is a challenge that we have been working on for many years. As polymers develop and more 'undefined' recycled polymer is added to the mix, this aspect will become increasingly important," he says. ›

Main image: Laser marking provides the opportunity to apply customisable markings that provide both pleasing aesthetics and effective product security and traceability



Right: The sustainability benefits of laser marking are emphasised in Gabriel-Chemie's Think Green line

Digitally-driven

The two key drivers behind interest in laser marking – aesthetics and traceability – both exploit, to some extent, its flexibility. Laser marking is digitally driven so every part marking can be unique. Personalisation of consumer products such as cosmetics is becoming increasingly popular – smaller customised batches are more "exclusive" so drive higher margins. Hannah says Gabriel Chemie and its laser marketing partners are working to develop solutions that incorporate multiple lasers to make complex decorative marking possible within an economically acceptable cycle time.

The traceability trend is driven by the need to permanently mark objects so they can be identified throughout the product life cycle. "The Unique Device Identification (UDI) system in place in the medical industry is a good example," Hannah says. "One of the main areas for laser marking remains the automotive industry, where both of these trends can be observed. Firstly, more individual interior designs are required, where laser marking has a lot of value. Secondly, more product traceability under-the-hood is leading to laser marking of individual components."

Germany-based additive maker **Chemische Fabrik Budenheim** highlights several issues currently impacting the market for laser marking and welding materials. "For laser marking, these include regulatory issues and the requirement for traceability. There is also a need for clean and contactless marking, as well as further moves towards high speed and cost saving in-line production. Laser marking must also be permanent, indelible, and resistant to solvents, humidity and abrasion. In addition, the marking process must be highly flexible," says Dr Heiko Rochholz, Head of Marketing, Business Unit Material Ingredients. "In laser welding, there is a need for extra tight and strong welding seams, without the use of glue, as well as gapless laser contour welding."

Eco developments

Rocholz identifies a number of current areas of development in laser marking and welding. These include the need for marking additives to be eco-friendly, antimony-free and safe for food and medical applications, and for welding the need for transparent additives that do not compromise colour.

Budenheim's latest product introduction – Budit L21 – is targeted at injection moulded applications. "Budit L21 is used in applications where light active features are introduced," says Rochholz. "The additive has high selective absorption in the spectral range of near infra-red (NIR). In typical applications of laser marking, welding and cutting, a matrix polymer will absorb the NIR-laser light much more efficiently when doped with even small concentrations. The let-down rate depends on the final application but is typically 2-5%."

The company says Budit L21, which is antimony-free, is convenient to handle in further masterbatching and compounding processes where further additives are added. The universal carrier is said to be designed to function well in engineering plastics such as polyamides but it will also function with polyolefins. An additional grade – Budit L23 –has been developed for compounding masterbatches with a higher pigment concentration.

Budenheim says the Budit L Series additives offer good laser marking with selective absorption in the NIR range and high transparency in the visible range. They are designed for use with Nd:YAG lasers at a wavelength of 1064nm and, depending on the energy level, can produce visual marks ranging from bright to dark on the polymer surface. The company says that, due to the low dosages required, they can be used to mark transparent polymers.

The Budit additives create a mark around 10 microns beneath the surface of the plastic. Depending on the laser parameters selected, the absorbed NIR energy causes one of two processes to occur: either the additive is degraded to create a dark marking colour or the energy is converted to heat, which releases gas and creates microbubbles. In this way, the visual appearance can be tuned from black to very light black. The company says metallised markings are also possible.

Budenheim says major application areas for laser marking at present include best-before dates and codes on food packaging or bottle caps, numbers on technical parts or electronical components, resistant bar codes, and ear tags for cattle.

Marking polyolefins

Plastics applications are a target for **Eckart**'s Lasersafe laser marking additives. The company says that the heavy metal-free Lasersafe additive provides strong contrast, high writing speeds and

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good marking quality. The additives are designed for marking of plastics that are inherently poor for laser marking – such as polyolefins – as well as PA, PET, PS, ABS, PC and PVC.

Lasersafe additives are said to be suitable for most common marking lasers, with the company claiming that colour and transparency of the resins is not affected. The range of applications is broad – the additives can be used in coded and individualised plastic packaging as well as for tracking and tracing of shipments, and for anti-counterfeiting purposes.

The Laser Mark Flex portfolio of masterbatches from **Ampacet** are designed for high definition laser marking on to flexible films using Nd:YAG technology. The antimony-free product range consists of LaserMarkFlex 1081, which is formulated for black/dark grey marking, and LaserMarkFlex 1135, intended for lighter grey marking and carrying broad food approval status (EC and FDA).

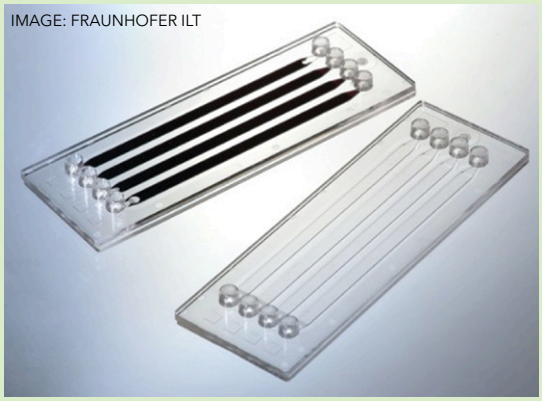
LaserMarkFlex masterbatches enable monochrome permanent and anti-counterfeit markings to be applied to film surfaces. The markings are waterproof, light-fast and chemical and abrasion-resistant and, because it is an ink-free technology, no pre-treatment of the film surface is required, which reduces complication and saves energy. The masterbatches are suitable for use in monolayer as well as coextruded film structures and can be used to apply logos, barcodes, expiry or best-before dates, and serial numbers on labels or packaging.

Ampacet has also recently introduced the LaserMark 1001074-E and LaserMark 1001088-E additive otptions, which it describes as cost-effective solutions that enable high definition, high contrast marking to be applied to clear and dark part surfaces using Nd:YAG laser systems. LaserMark 1001074-E produces sharp, dark markings on transparent or light-coloured plastic parts without affecting colour or transparency. It is antimony-free and suitable for food contact applications. Ampacet LaserMark

IMAGE: ECKART

Below: Eckart's Lasersafe additives are designed for effective use for traditionally difficult polymers such as polyolefins as well as PA, PET, PS and PC

IMAGE: FRAUNHOFER ILT



Precision microfluidics can be laser welded without additives using Fraunhofer's quasi-simultaneous irradiation technique

Fraunhofer aims to weld without using additives

Researchers at the **Fraunhofer Institute for Laser Technology ILT** worked with three industrial partners as part of the SeQuLas project to develop an additive-free technique for laser welding thin welds in transparent plastic components used in sectors such as medical technology and microfluidics.

The process uses a 1940nm thulium fibre laser, which offers a particular advantage in that many plastics absorb at that wavelength so additives such as carbon are not required. This means the transparency of the chip is not affected.

However, conventional absorber-free laser transmission welding creates a heat-affected zone (HAZ) that extends vertically through the cross-section of the component. The associated thermal expansion during melting promotes the formation of blowholes and cracks, which can cause leaks in the seam structure. There is also a risk that the material will warp, especially in flat components.

Fraunhofer ILT, together with German companies Amtron, Ortmann Digitaltechnik and Bartels Mikrotechnik, developed a quasi-simultaneous irradiation technique that reduces the heat-affected zone. It involves guiding the laser at high speed several times along the weld contour to ensure simultaneous heating at all points. The developers say this reduces vertical expansion of the HAZ by up to 30% compared to contour welding.

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IMAGE: MERCK KGAA

Above: Laser marking appeals to performance cable makers for its ability to easily mark substrates such as silicone

1001088-E is designed for complex projects requiring different colour shades. It can produce dark or clear markings depending on the colour of the plastic item and the parameters of the laser.

Cable applications

Interest in using lasers as a marking technology for high-speed production applications such as cables, where it is in direct competition to marking technologies such as ink-jet technology and printing/embossing wheels, is growing, according to Germany-based **Merck KGaA** (which operates as **EMD Electronics** in the US and Canada). It offers a range of laser marking additives within its Iriotec laser pigment family. They are available in powder or granule form.

A Merck KGaA spokesperson says the biggest advantage that it hears back from users of its laser marking pigments is the permanence and visibility of the mark. This is the case for containers, electronic parts, seals, as well as for cables. Users appreciate the durability, chemical resistance, weatherability, and high contrast that is achieved even on flexible surfaces such as elastomers or silicone, as well as the lack of adhesion problems. This is particularly relevant with silicone, which is used in high temperature resistant cables as well as high voltage and data cables. The company says the polymer itself becomes the mark.

For cable applications, which typically require fast marking speeds, the company says the optimium combination is to use a high-powered fibre laser and high speed Iriotec laser pigment. Without the use of high speed Iriotec laser pigments, marking may only be achievable in very specific cable formulations or at speeds generally too slow for in-line marking or at low contrast even when using a high power laser, it says.

A further benefit to users of laser marking is the reliability of the marking process. There are no external consumables used up during the marking process and no cleaning or downtime, which means less scrap and higher productivity. In addition, lasers have become more powerful and reliable and are now offer long life times with almost no maintenance.

According to Merck KGaA, it works together with many masterbatch and compounding companies to incorporate laser pigments into their products and it claims that many laser marking grades make use of its Iriotec laser pigments. The company also collaborates with laser producers to get the best results for the final application and to ensure reliable and reproducible results.

Laser marking is now very much a preferred option in many industries, according to **Domo Chemicals**. "This technology has been used for many years by major electrical and electronic OEMs and has proven to be efficient and of high quality. With an increasing need for traceability in almost all areas of current life, demand will continue to grow, and this technology will become standard," says Vincent de Givry, Marketing Manager at the company.

Laser welding gains

De Givry sees a similar trend emerging with laser welding. "With the miniaturisation of objects and the growing importance of electronics, dust-free laser welding is becoming increasingly important. This is highly cost effective through fast and precise melting of the polymer. We are now seeing this technology expand from small-to medium-sized parts as customers optimise their machinery and manufacturing," he says.

Domo says laser welding is becoming one of the top cost-effective technologies to deep weld polymer materials together in many industries, but adds that it is particularly widely used in the development of small complex plastic parts for the automotive market, electronic circuits, Internet of Things applications and consumer goods. The benefits of the technology include its speed, flexibility, precision and superior appearance. The fact that it is a low dust technology is also appealing for electric and electronic applications. Typical uses for the company's laser weldable products include displays, sensor housings, light sensors in the electronics sector and automotive parts such as filter housings, air intake manifolds and tail lamps.

IMAGE: DOMO CHEMICALS

Right: Domo has introduced a laser transparent black Technyl PA66 suitable for welding applications

Domo Chemicals says one of its main

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IMAGE: DOMO CHEMICALS

Right: Air conditioning pipes produced using an unfilled Technyl PA grade burst before the laser weld failed in laboratory tests

areas of development at present regards colour, as well as improving the transparency of glass fibre grades. In addition, the company says it is looking to deliver compounds with a wider processing window to enable customers to better manage production across different manufacturing lines.

Among its latest product introductions is a new range of PA66-based black plastics suitable for laser welding – Technyl STAR AF 219 V30 black LT. " Our Technyl STAR AF 219 V30 black LT expanded product family will be important for the electric vehicle market, where there is a growing demand for sensor boxes, cases and control units," says de Givry.

Other Domo laser welding compound developments include an unfilled PA grade for production of air conditioning lines. Systems produced using this compound have passed the required burst tests before and after refrigerant ageing. Development of a new PA6 30% glass fibre filled compound is said to be in progress.

Eliminating risk

Elimination of the risk of contamination is a key attraction of laser welding and that is down to the process itself. The two mating parts, one produced in a compound that is transparent to the laser and the other in a compound that absorbs the energy so will heat up, are brought together then the laser beam directed through the laser-transparent component to reach the laser-absorbing mating surface. This results in a localised molten surface and effectively creates the welded joint from the inside out. The end result is near invisible and, unlike with friction-based welding technologies, there is said to be no displacement of material from the weld and no risk of contamination.

Domo Chemical says its Technyl STAR AF 219 V30 black LT grade has been examined using a light transmission test at a wavelength of 940nm and this proves the suitability of the compound at a thickness of up to 3mm. This has been further supported by in-house application part testing , which has shown good welding cohesion.

Among the latest additions to the Bergamid range from **Avient** are new laser weldable PA66 grades formulated for use in automotive parts, consumer goods and medical devices. Characterised by well-controlled laser transmission rates, multiple colour choices and customised performance options, the new additions are said to allow manufacturers to produce high-performance parts with durable welds and smooth surfaces.

According to Avient, compounds used for laser welding must allow a minimum 20% transmission rate for laser energy. Absorption can be controlled by adjusting the pigments used and it claims to offer a range of off-the-shelf and tailor-made solutions that meet the required laser transmission rates for applications in a variety of markets. The new laser weldable grades were introduced last year, initially for the Asian market. ›

Collaboration works for special effects

Laser marking technology can produce some increasingly exotic effects but this requires cooperation between material and equipment developers. Gabriel-Chemie collaborated with Germany-based **Belaser** to develop a solution to create improved contrast in metallic impressions. The technology can be used to create a camouflage effect or image in metallics, for example.

In its Colour Vision 21 collection, Gabriel-Chemie has created a coral effect using an additive that 'foams-up' to create a light-coloured marking that protrudes slightly above the plastic surface and gives an attractive haptic feel to the object. The company has also been working on various marble effects where the marbling is effectively hidden in a 'cloak' of laser reactive darker colours.

"Our focus for the future is not just on the laser marking masterbatch, but on a turnkey customer solution," says Mark Hannah, Gabriel-Chemie Head of Corporate Marketing . "We offer a first consultation and can make initial sample plastic objects and laser mark them in-house to help customers visualise the solution. We then work with our laser partners to offer a service to laser mark small and medium-size product batches. If customers then want to move into larger scale mass production, we have contacts to the major laser marker producers and can help them to find the right solution for their production needs."

› **www.gabriel-chemie.com** › **www.belaser.de**

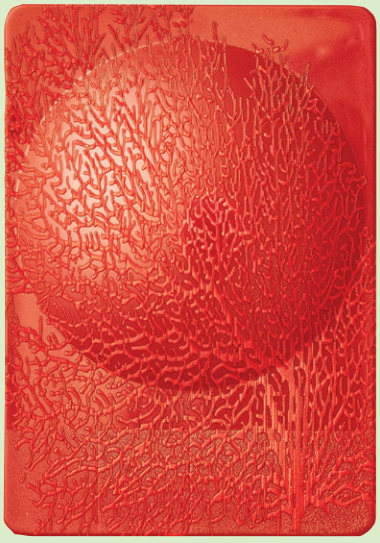

IMAGE: GABRIEL-CHEMIE

Gabriel-Chemie used a foaming laser marking additive to create this raised 'Magic-Touch' effect

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IMAGE: LPKF

Above: LPKF's TMG 3 allows laser transmission of plastics to be measured to speed process evaluation

"Laser welding is technically advanced, and its success depends on the weldability, transmission rates, softening point, absorption agents and colour compatibility of the materials used," says Flight Xu, General Manager of Specialty Engineered Materials Asia. "Our new Bergamid grades allow high welding strength and a smooth surface resulting in an unparalleled finished product."

Testing options

With transmission key to achieving a good weld, German laser systems specialist **LPKF** has developed a calibrated and certified transmission measuring device specifically for laser plastic welding. The LPKF TMG 3 can measure transmission properties of any type of plastic material prior to laser transmission welding. According to the company, it takes only a few seconds to find out whether the actual transmission values of the two joining partners match the target values from the process definition.

The company says the TMG 3 allows any material non-conformities from upstream processes – compounding or injection moulding – to be detected before unsuitable components can reach the production process. This is important because fluctuating transmittance values can result in sub-optimal weld seams.

The measuring device can easily be integrated into a production line for in-line transmission testing. In this configuration, it provides a reliable means to ensure that the weld seams meet the highest standards. The LPKF TMG 3 transmission measuring device is certified using calibration measurement filters tested and certified by Fraunhofer ISC.

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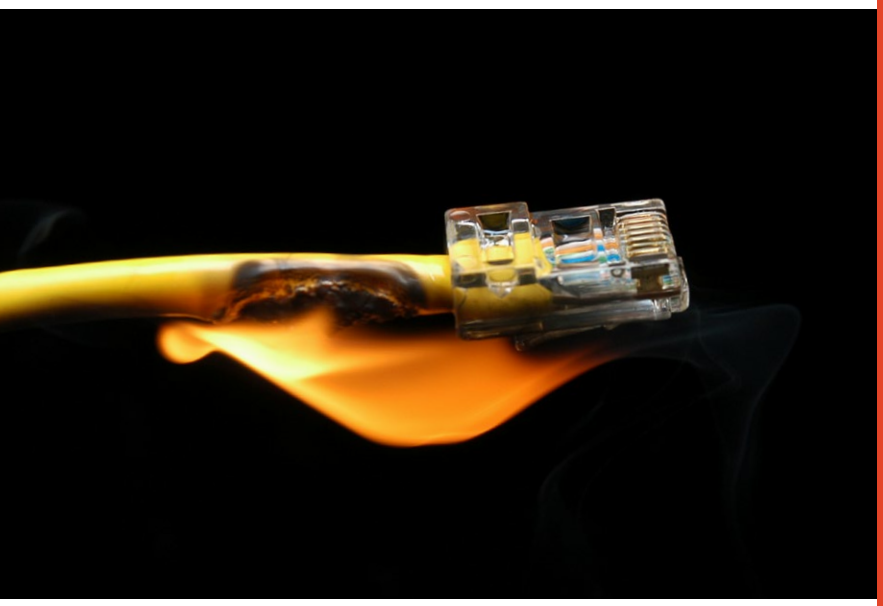

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Melt filter makers target high volume and quality

Rising quality demands and increasing use of recycled material means melt filters are on the consideration list for many compounders. Peter Mapleston reports

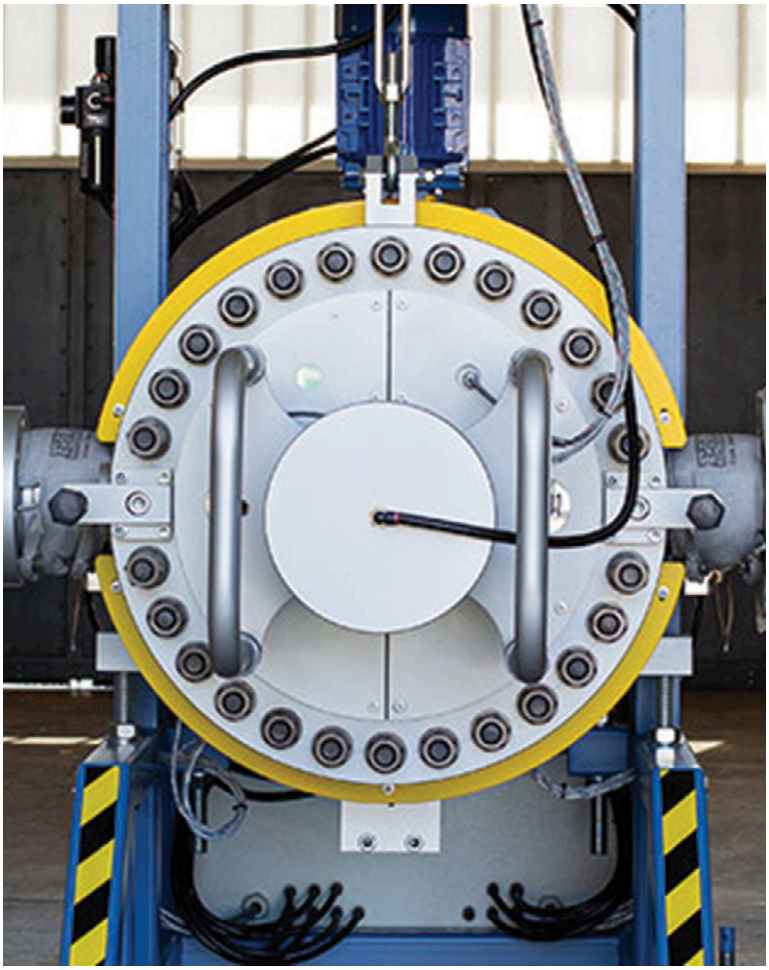

IMAGE: FIMIC

Whether for removal of gels from compounds intended for thin film production, or separation of non-melts from contaminated post-consumer waste, screenchangers and other melt filtration systems are increasingly frequent additions to plastics compounding lines. Melt filtration equipment ranges widely in its throughput capacity, filtration performance and level of process and operational automation, meaning there is likely to be a filtration unit available that meets most compounding requirements.

As the result of a redesign of its melt filters for removal of contaminants and gels and support for melt homogenisation in high-output compounding lines, **Maag Group** says it has been able to reduce maintenance requirements and improve operational reliability. The company's portfolio includes continuous melt filters, semi-continuous melt filters with high-speed hydraulics, and discontinuous melt filters for batch processes or where continuous processes are not required.

Maag's established DSC and CSC piston screenchangers are available with three different cavity options: the standard round cavity for very high filler contents; the enlarged 'PE' cavity designed to provide versatility for balancing throughput and filler loading; and the 'R' cavity with a curved screen that is claimed to provide four times larger filter area.

Maag cites numerous improvements across the product portfolio, including optimised flow channels through modified screen-bolt guiding, improved safety guarding, low viscous sealing possibilities, and a metal hybrid seal system for all flat-slide, HSC or FSC-D3 melt filters. This new metal-hybrid seal can be used over a wide range of viscosities and at temperatures up to 320°C. The company says it can be used in operations running with melt viscosities from 5 to 5,000 Pa.s (independent of temperature) and is easily exchangeable with a standard sealing ring.

Main image: There's a melt filter option for almost any plastics processing task. Fimic's GEM design aims for high throughput, heavily contaminated applications

Extending options

Also building on established product lines is **Gneuss Filtration Technology**, which has introduced an additional size across its line of Rotary Filtration Systems. The RSFgenius, SFXmagnus, SFneos and CSFprimus models are now available in a size 110, which the company says offers almost 20% more active screen area than the size 90 depending on the specific model. Screen area goes from around 300 to 400cm^2.

›

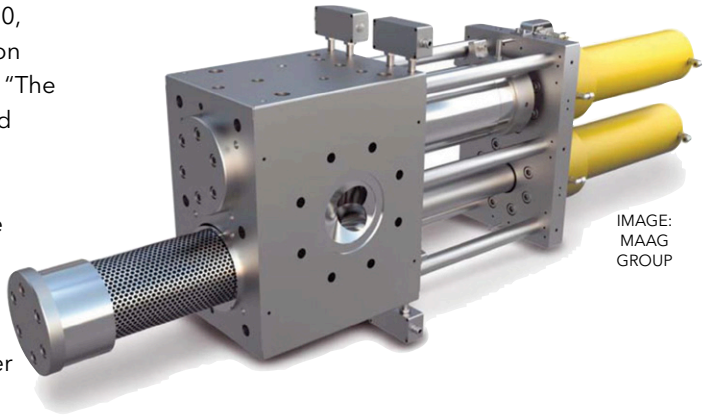

IMAGE: MAAG GROUP

Right: This CSC piston screen-changer from Maag is fitted with its high surface area 'R' type curved screen

"In the past the next size up was the size 150, with a jump of more than 50% in active filtration area," according to a company spokesperson. "The new intermediate size will ensure an optimised and cost-efficient filtration solution for every application."

Automatic Rotary Filtration Systems operate continuously, so are able to provide constant process pressure. Screen cavities are located in a ring pattern on a disc, which means that screens can be changed on the part of the filter disk that is not active in the melt channel. This avoids any interruption or disturbance to the production process. The various models differ mostly in terms of drive design, encapsulation and whether they offer integrated back-flushing.

Around three years ago, **Cofit International** introduced the Gorillabelt T, a sophisticated automatic and continuous screenchanger intended for heavy recycling and featuring a "zero polymer loss cleaning cycle." That project is on hold at the moment, with the company instead highlighting its AP manual, continuous, self-cleaning screenchanger, which is suitable for materials with low levels of contamination such as polymers for production of films and filaments.

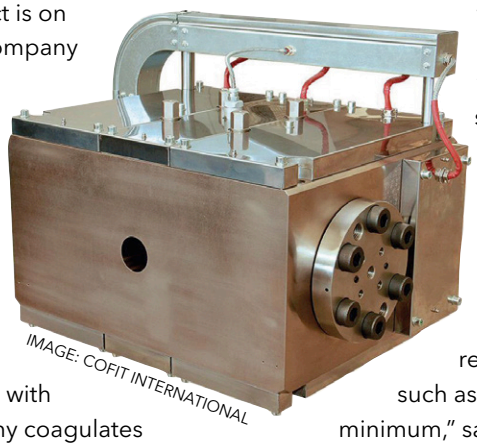

IMAGE: COFIT INTERNATIONAL

Right: Cofit says its low cost, self-cleaning AP screenchanger is proving a popular option

"The screenchanger removes the impurities that come with the raw material and disrupts any coagulates formed during extrusion. Besides this, its usage prevents damage to downstream equipment. Furthermore, an efficient extrusion process can be achieved by using a continuous screenchanger, since it does not require frequent change of filter which is time-consuming and costly," says Cofit General Manager Alessandro Fabbri.

Parallel filters

The AP screenchanger, which has been on the market for some time but the company says is proving very popular, features two parallel filtering cartridges that are cleaned one at a time without the need for removal from the extrusion equipment. As the flow of melt through the second filter continues while the first is being cleaned the extrusion process can continue uninterrupted. "The self-cleaning feature of AP screenchangers extends the service life of screens, thus reducing maintenance activities such as filter replacement to a minimum," says Fabbri.

He also highlights the unit's solidity and reliability. "It is also cheap and does not require expensive parts such as hydraulic units and control panels to operate. Apart from that, it is made of steel with nickel plating that serves as superior protection against wear and tear, thus ensuring its long-lasting service," he says.

Comparing the AP unit with hydraulic slide-plate screenchangers, which can also be operated without stopping the extrusion process, Fabbri says that with the latter design some off-spec melt may be produced during the change-out since contaminants may pass through because of temporary stops and air entrainment.

"Furthermore, manual work is still needed to clean or replace the soiled screens while production continues," he claims. "Contrarily, AP screenchangers maintain a high-quality melt because heavy build-up dirt on the screen that may affect filtering performance is prevented by the self-cleaning action. Moreover, occasional screen replacement does not negatively affect product quality." ❯

IMAGE: GENUSS

Above: Gneuss has introduced a 110 model to fill out its RSFgenius, SFXmagnus, SFneos and CSFprimus lines

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Also highlighting a well-established filtration product, **Berhalter** points to its Becoscreen continuous melt filtration system. It says the screenchanger is easy to use, features a solid construction and "works absolutely maintenance-free, leak-free." The Becoscreen can be provided with an optional conical insert: instead of the normal cassette, a full-hole cassette is inserted. The conical insert can be unscrewed to enable the extruder screw to be pulled through the screenchanger, which the manufacturer says makes screw changes faster and cleaning easier.

Nordson says its BKG filter candle packs offer more than 10 times the filtration area of standard filter elements

IMAGE: NORDSON

Seeking efficiencies

According to **Nordson**, plastics processors are looking for more efficient filtration solutions that allow for finer filtration, greater throughputs, and longer filter life. It offers a variety of filtration media for use with its BKG piston-type melt filters. Aside from solutions such as the BKG FlexDisc, the company also offers candle filters that can be retrofitted into existing systems. It says the candle filter concept combines the advantages of large filtration area with those of proven piston technology, including lower flux rates, gel filtration, low pressure differential, long filter lifetime, fast exchange of the breaker plate with filter elements, low residence time of the melt in the system, and easy handling.

"With our filter candle concept, the available filtration area can be enlarged by more than 10 times," says Oliver Brandt, Market Development Manager Recycling at the company. "For example, a BKG Poly melt filter that operates with conventional flat screens has a filtration area of 0.3125m² per piston. The same machine equipped with filter candles has a filtration area of 40m² per piston. Conventional screens need to be changed every three to seven days. Using filter candles extends the filter lifetime to two to four months."

Below: The Erema Laserfilter TWIN offers interruption-free screen changeovers and is well suited to recycling applications

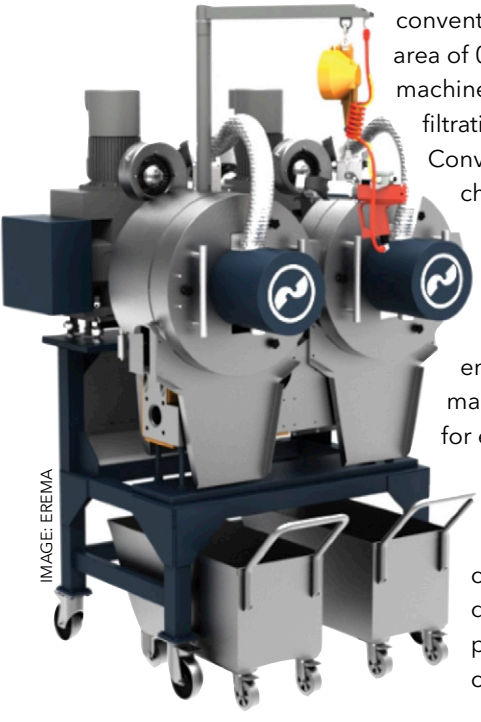

IMAGE: EREMA

A wide range of accessories enable the filter candles to be used many times over. A pre-heating oven, for example, contains clean breaker plates equipped with filter candles that are instantly available when the filter elements need to be changed. For the cleaning procedure itself, Nordson provides BKG pyrolysis cleaning ovens. BKG jet cleaners use heat and vacuum to remove material such as thermoplastic from the filter candles and other metal parts in what the company describes as an energy-efficient way.

In most cases, cleaning cycles take two to four hours. The cleaned parts then need to be put in an ultrasonic bath and afterwards undergo a "Bubble Point Test" to make sure the filter fabric is not damaged. "The cleaning procedure makes it possible to use the filter candles over several years, so that the overall investment cost is relatively low over the lifetime of the filter," Nordson claims.

Interruption-free

A shut-off slider option is available on **Erema** Laserfilter melt filters (starting with the TWIN model) so the machine can continue in production when one of the screens requires changing. Using a gate valve, an individual Laserfilter unit can be taken out of the production process and put back into operation again after the screen change. During that process, production continues to run via the remaining filter units without any interruption.

"This option is particularly important for production processes with high throughputs as well as for avoiding interruptions that would lead to a reduction in efficiency due to upstream or downstream processes (for example, the washing plant beforehand, or the downstream process)," the company says. Laserfilters are intended principally for recycling operations.

Recycling boom

Consumer sensitivity to environmental protection and the introduction of laws and regulations related to the circular economy means the plastics recycling market has been booming for some years, according to **Fimic**. "Many brand owners and the majority of recycling companies need to improve their technology to face the challenges of recycling post-consumer plastics," says María José Frazzoni, Marketing Manager at the company. "The major quantity of waste plastics is post-consumer, and so very contaminated. To reach high quality

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IMAGE: FIMIC

Above: Italian melt filtration specialist Fimic moved into a new 1,200m² production plant in Italy earlier this year

recycled plastics from contaminated waste it needs automatic technologies to filter out impurities and contaminations from the plastic flow."

Frazzoni says Fimic, which has just moved into a new and larger production plant at Carmignano di Brenta in Italy's Piedmont region, designed its GEM melt filter to deliver high throughput and good filtration of complex materials. First shown at K2019, it is said to use proprietary technologies. "Fimic has developed for the first time a filter equipped with two screens and two discharge valves to guarantee an unmatched filtering surface, the largest one on the market," she says.

The unit uses two 600mm diameter screens to provide 5,500cm² of filter surface and is intended for use in high volume and highly contaminated recycling applications. It can filter up to 3,000kg/h, and can be equipped with laser screens from 80-300 microns or mesh screens from 400 to 2,000 microns.

"This innovation will increase the extruder production [while] keeping the highest quality of the final product, while guaranteeing the simplicity that distinguishes Fimic equipment and the maximum reduction in the cost of operation," says Frazzoni. "This will not only allow shorter residence of the material, lower energy consumption and lower consumption of spare parts, but also less waste and a more efficient and faster replacement of the screen to processing of any level of melt contamination."

PET improvement

Meanwhile, **Ettlinger**, the manufacturer of continuously operating high performance melt filters acquired by Maag Group in 2018, has unveiled a new generation of Eco products for use in PET recycling. Designed to support higher throughput operation, the units are initially available in sizes suitable for medium-sized recycling lines. The new Eco 350, with a maximum throughput capability of 2,500kg/h, replaces the old Eco 250, while the new Eco 500, capable of achieving capacities of up to 4,000kg/h, replaces the Eco 250 Twin. The Eco 200 remains in the range.

The company's melt filter technology is based on the principle of self-cleaning with a continuous flow of melt from the outside to the inside of a rotating, perforated drum. A scraper removes the contaminants that are held back on the surface and feeds them to the discharge system. As with Ettlinger's ERF filters, which are designed for higher contamination, Eco filters are built on a modular basis that supports a wide range of options.

The new units are said to allow a higher concentration of contaminants in the discharge, which the company says "further decreases the already typically low loss of PET melt associated with Ettlinger's melt filters." Access to the scraper system has also been improved and the discharge now exits via the front side of the filters.

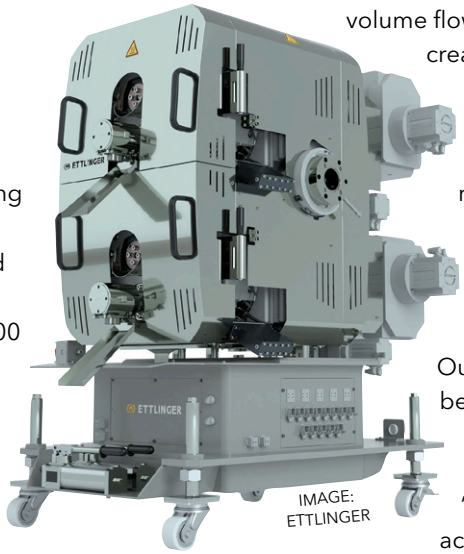

IMAGE: ETTLINGER

Right: Ettlinger has introduced a new generation of Eco screenchangers for use in PET recycling

"PET recyclers are reporting ever-increasing volume flows, resulting in a sharp increase in the capacity utilisation of many machines. At the same time, buyers have more stringent requirements regarding the purity of the recycled material. Consequently, many of the filter systems in operation today are reaching maximum capacity. Our further developments have been tailored to these changes in the market," says Uwe Kellner, Ettlinger Managing Director. "With these in mind, we have achieved enhanced performance without compromising on filtration efficiency. The new designs combine screen sizes up to 60 µm with a minimum loss of PET through the discharge."

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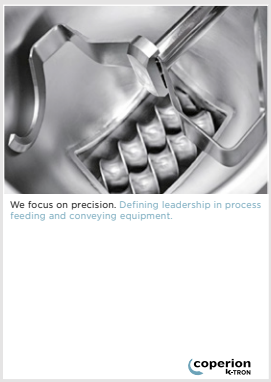

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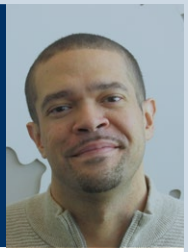

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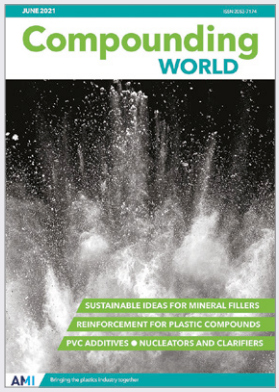

Compounding World June 2021
The June edition of Compounding World looks at the sustainability aspects of mineral filler products. Other features are on reinforcing options for compounds in addition to glass fibre, developments in PVC additives and the latest in nucleating and clarifying agents

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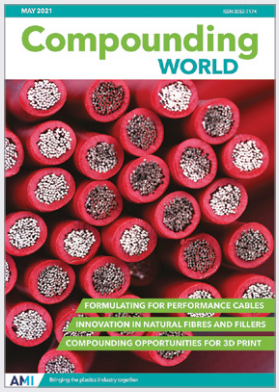

Compounding World May 2021
Features in the May issue of Compounding World look at the latest developments in halogen-free flame retardant compounds, how natural fibres and fillers are helping sustainability, and new compounds for 3D printing.

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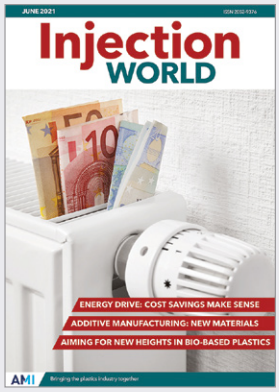

Injection World June 2021
The June 2021 edition of Injection World magazine looks at how to save energy in the moulding plant, including the often overlooked financial drain of scrap granulation. It also explores the latest innovations in bio-based plastics and additive manufacturing technology.

› CLICK HERE TO VIEW

Plastics Recycling World May/June 2021
The May/June edition of Plastics Recycling World looks at options for recycling in-house and post industrial waste plastics. It also explores developments in shredding technology and additives for improving polymer compatibility, as well as US recycling regulation.

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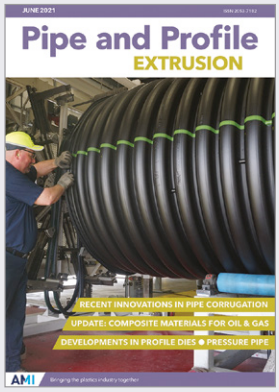


Pipe and Profile June 2021
Features in the June issue of Pipe and Profile Extrusion cover recent innovations in corrugated pipe technology, plastic pipes in the oil and gas sector, pressurised pipe applications and profile extrusion dies. Plus a review of the Chinaplas 2021 exhibition.

› CLICK HERE TO VIEW

Film and Sheet June 2021
The June 2021 edition of Film and Sheet Extrusion magazine looks at the latest innovations in film printing technology. It also explores developments in blown film cooling rings, additive and functional masterbatches, and downstream equipment.

› CLICK HERE TO VIEW

Take out your own FREE subscriptions to any of the magazines. Click on the logos below to simply register on-line.

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

GLOBAL EXHIBITION GUIDE

2021	**10-12 August**	Feiplar, Sao Paulo, Brazil **NEW DATE**	www.feiplar.com.br
	14-18 September	Equiplast, Barcelona, Spain **NEW DATE**	www.equiplast.com
	29-30 September	Compounding World Expo Europe, Essen, Germany **NEW DATE**	www.compoundingworldexpo.com/eu/
	12-16 October	Fakuma, Friedrichshafen, Germany	www.fakuma-messe.de
	3-4 November	Compounding World Expo USA, Cleveland, USA **NEW DATE**	www.compoundingworldexpo.com/na/
	8-12 November	Plastico Brasil, Sao Paulo, Brazil **NEW DATE**	www.plasticobrasil.com.br
	15-18 November	Arabplast, Dubai, UAE **NEW DATE**	www.arabplast.info
2022	**25-28 January**	Interplastica, Russia, Moscow	www.interplastica.de
	17-21 February	PlastIndia, New Delhi, India **NEW DATE**	www.plastindia.org
	8-10 March	JEC 2021, Paris France **NEW DATE**	www.jec-world.events
	8-11 March	Plastimagen, Mexico City	www.plastimagen.com.mx
	16-17 March	Injection Molding & Design, Detroit, MI, USA	www.injectionmoldingexpo.com
	5-8 April	FIP, Lyon, France **NEW DATE**	www.f-i-p.com
	19-26 October	K2022, Dusseldorf, Germany	www.k-online.com

AMI CONFERENCES

14-16 September	Cables Europe, Cologne, Germany
4-6 October	Polymer Sourcing & Distribution Europe, Hamburg, Germany
20-21 October	Plastics Recycling Technology Europe, Vienna, Austria
16-18 November	PVC Formulation Europe, Cologne, Germany
30 Nov-2 Dec	Fire Resistance in Plastics Europe, Dusseldorf, Germany
7-8 December	Performance Polyamides Europe, Munich, Germany

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

PLASTICS RECYCLING WORLD EXPO

POLYMER TESTING WORLD EXPO

29 - 30 September, 2021
ESSEN, GERMANY

PLASTICS EXTRUSION WORLD EXPO

COMPOUNDING WORLD EXPO

3 - 4 November, 2021
CLEVELAND, OHIO

www.ami.international/exhibitions

JULY 2021 EDITION

Extrusion Solutions

THE LATEST EXTRUDING NEWS FROM ENTEK

ENTEK Launches New Twin-Screw Extruder Products and Technologies

New HT72 Twin-Screw Extruder and Vacuum Feed Technology (VFT) Introduced at June 8th Virtual Press Event

Leading plastics industry reporters and editors joined ENTEK on June 8th for a live, virtual press event via Zoom

June 8th was a big day for ENTEK Manufacturing Inc., as the company officially launched its latest twin-screw extruder products and technologies. After almost three years of research and development, the company introduced its new High-Torque HT72 Twin-Screw Extruder and Vacuum Feed Technology (VFT) through a virtual Press Event.

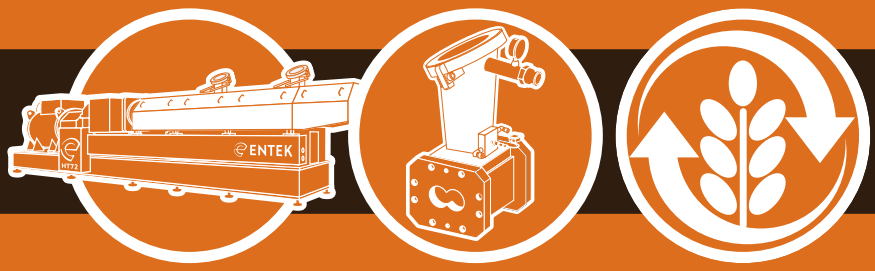
The plastics industry's leading reporters and editors attended the event, which was held on the Zoom platform. After a brief welcome from Linda Campbell, ENTEK's Vice President of Sales, ENTEK President Kim Medford provided updates on the state of ENTEK's business. Then Ryley Jones, ENTEK Mechanical Engineering Supervisor, and Dean Elliott, ENTEK Technical Processing Manager, presented the details on the company's newest products and technologies.

"The original plan was to introduce the HT72 and VFT at NPE2021 in Orlando," said Linda Campbell, "but as we all know the show was canceled. So we decided to hold this virtual press event as the best way to get our news out to the plastics industry."

Campbell noted the last major press conference that ENTEK held was in 2015, when members of the plastics industry press traveled to ENTEK's headquarters in Oregon to see the launch of the company's QC3 (Quick Change, Quick Clean, Quality Control) line of twin-screw extruders.

"Of course we would have preferred to host the press here in Oregon again, but there are still travel challenges due to the global pandemic," she said. "This virtual conference was our next best option and based on the coverage we're already seeing, we're very happy with how it turned out."

Detailed stories on the new HT72 twin-screw extruder and Vacuum Feed Technology (VFT) appear in this issue of *Extrusion Solutions*. Check them out and visit ENTEK's new website at www.entek.com for more information.



A Commitment to Innovation - and Continued Growth

Welcome to the latest issue of ***Extrusion Solutions***.

Kim Medford

"Our team, even during a time of great uncertainty, came together and committed to continued investment to bring to market new solutions for our customers."

Exciting Times

When I took on my current leadership role with ENTEK late last year, we were still in the middle of the unknown impacts of a pandemic, making investment decisions challenging.

However, our team, even during a time of great uncertainty, came together and committed to continued investment to bring to market new solutions for our customers.

We know that our greatest success comes from helping our customers to grow their businesses. Whether that means more throughput, more uptime, or new products being introduced to the marketplace, ENTEK extruders are the obvious solution. So, we took some risks, and the results are really exciting.

New Products, Technologies and Investment

You will see our announcements in this issue of Extrusion Solutions on the new HT72 twin-screw extruder, and our new Vacuum Feed Technology (VFT). In addition to sharing the news on our exciting new products with you, it is important for me to share that we are also committed to continue our overall growth as a company.

This year, we will be making significant capital investments in our machine shop to increase our wear parts throughput, and we have some exciting R&D projects in the works to expand our product offerings. Watch for more news from ENTEK in the near future.

Press Event

We really enjoyed meeting with the members of the plastics industry press on June 8th to introduce our new products and technologies. Even though we met virtually, the event was very successful and we got some great questions. Thanks to all who attended.

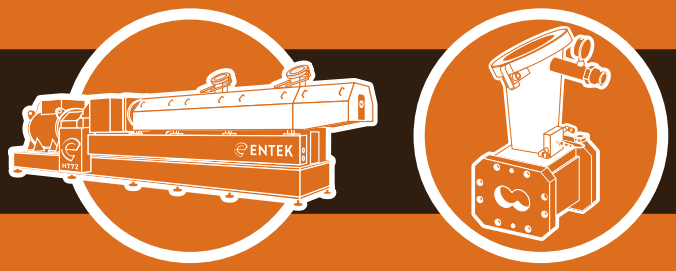
Prior to the June 8th event, our last press conference was in 2015, when members of the press came out to our headquarters in Oregon to learn about the new QC3 line of twin-screw extruders. As exciting things continue to happen at ENTEK and we accelerate our growth, it will not be another six years before we will invite the press to gather again for interesting happenings.

Thank you to all of our customers for your continued support.

I encourage you to contact me anytime at kmedford@entek.com.

Sincerely

Kim Medford
President



ENTEK Introduces the HT72 Twin-Screw Extruder

ENTEK is proud to introduce its newest co-rotating twin-screw extruder, the HT72. HT stands for 'High Torque' and this new machine provides just that – in fact, it delivers the highest free volume at 18 torque density in the industry!

In addition to its robust construction, the HT72 is coupled with a larger motor size to be a true workhorse for continuous 24/7/365 production. The HT72 is the first in what will be a new series of twin-screw extruders from ENTEK.

The HT72 is designed for the commodity compounding and masterbatch industry, where customers require medium-to-large batch production sizes and high production rates are especially important. When coupled with ENTEK's new patented Vacuum Feed Technology (VFT), the HT72 can drive throughputs even higher for processes which involve feeding low density fillers. This new machine will be welcomed by compounders looking for maximum uptime, high production rates, and readily available Overall Equipment Efficiency (OEE) data, both at the machine and via remote monitoring and access from mobile devices.

"We are excited to be launching this new twin-screw extruder to the compounding market," said Linda Campbell, ENTEK VP of Sales. "It represents almost three years of research and development, to produce a completely new machine that provides industry-best performance.

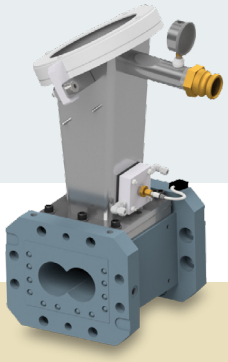
When you combine the industry-best performance and technology of this machine with the outstanding customer service and support that ENTEK is known for, we believe we are adding value for our customers."

Features of the new HT72 are numerous, but the following lists some of the machine's key specifications:

- 18 Nm/cm3 torque density
- 1.61 D_o/D_i
- Mistake-proof screw elements and shafts
- Dashboard for quick health stats (OEE)
- Low decibel water cooled motor
- Real time vibration monitoring
- Real time oil quality monitoring
- Easy access offboard cooling system
- Full stainless-steel shroud for easy cleaning
- Insulation blankets to retain heat
- Point of use tools
- Quarter turn, standardized retained fasteners
- Hinged guards for quick access

New Patent-Pending Vent Flow Sensor

An important new feature of the HT72 is a new, patent-pending Vent Flow Sensor. If the sensor detects a potential problem with vent flow, operators will have the time to correct any processing issues before they become problematic. This device will effectively reduce unplanned downtime and help reduce safety issues including the risk of fire. It will also make vent flow cleaning easier.

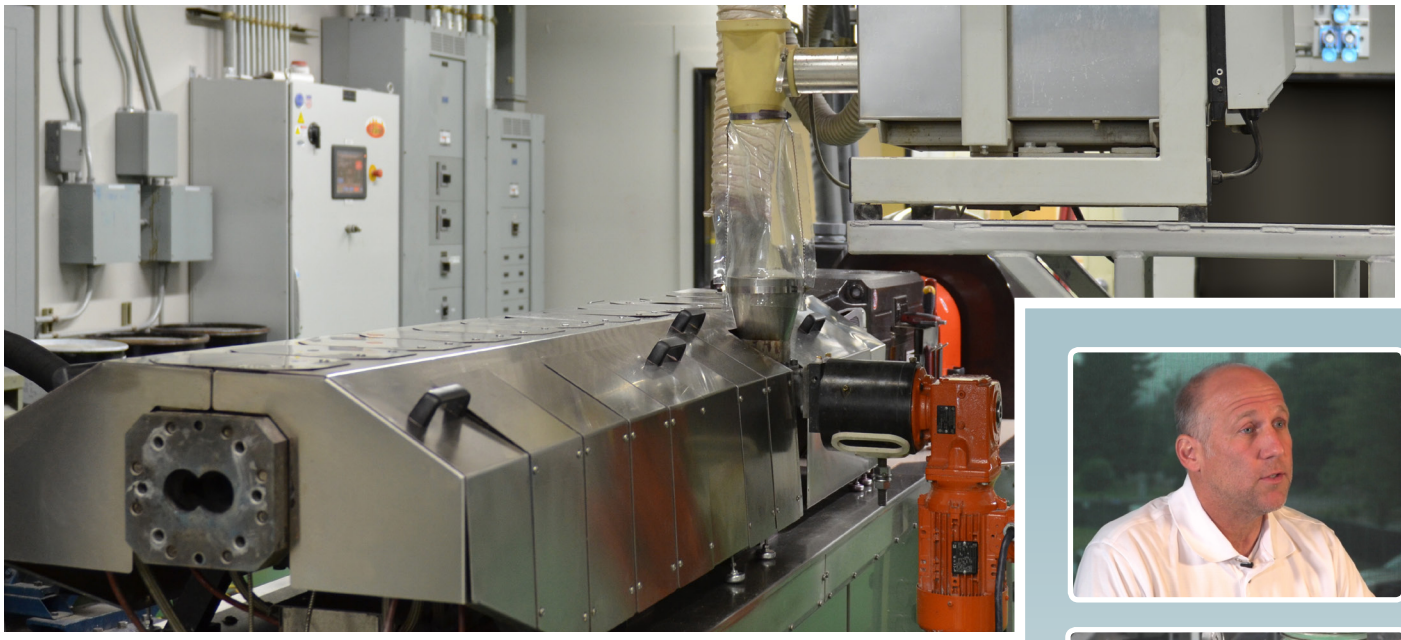


Watch our short video featuring Ryley Jones,

ENTEK's Mechanical Engineering Supervisor and HT72 Project Lead, discussing the features and benefits of our newest twin-screw extruder!

https://vimeo.com/channels/entek/559218752

New Patented Vacuum Feed Technology (VFT) from ENTEK Boosts Twin-Screw Extruder Throughput Rates



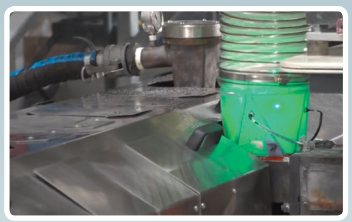
ENTEK has introduced a new, patented processing technology that improves twin-screw extruder throughput rates. Developed for use when compounding "fluffy" materials, ENTEK's Vacuum Feed Technology (VFT) also overcomes the discharge of fluffy powders out of atmospheric vents, traditionally used to vent out the air associated with fluffy powders.

"VFT is the solution if a compounder is challenged by a process that is volumetrically limited when processing low bulk density powdered materials," said Dean Elliott, ENTEK's Technical Processing Manager. "Processors can achieve much higher throughput, as much as twice the output rate as without VFT."

Since VFT does not require vents open to atmosphere, this technology solves the problem of powdered materials potentially spewing out the atmospheric vent of the extruder. "This prevents not only a messy situation but creates a safer work place environment," said Elliott.

Offered by license, ENTEK's VFT includes pilot plant trials at ENTEK to configure the extruder for customers' materials of formulation and to demonstrate the throughput rate improvement compared to traditional extruder atmospheric venting. Complete documentation of the screw and barrel configuration is provided, along with on-site process start-up support at the customer's location.

ENTEK VFT is available on all of the company's twin-screw extruders.



Watch our new video featuring Dean Elliott,

ENTEK Technical Processing Manager, discussing the benefits of Vacuum Feed Technology (VFT):

https://vimeo.com/channels/entek/560551235

Biopolymer Compounding Done Right

There has been a lot of 'buzz' lately surrounding biopolymers. This fast-growing segment of the plastics industry continues to make inroads into mainstream products, including packaging.

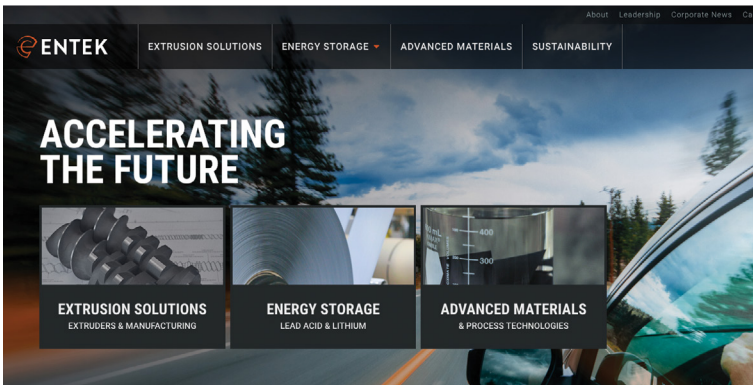
ENTEK has been at the forefront of biopolymer development since its earliest days, having worked with Plantic and others in the early 2000's on some of the first commercially successful biodegradable products. We have learned over the years what methods work best for processing these materials in twin-screw extruders.

Dean Elliott, ENTEK's Technical Processing Manager, recently presented a webinar sponsored by *Plastics Technology* magazine titled 'Biopolymer Compounding Done Right.' This webinar, which drew over 400 registrants, provides 'how-to' guidelines with numerous processing tips for compounders who are in, or want to be in, the biopolymer market. The agenda includes:

- Introduction to biopolymer compounding
- Biopolymer compounding challenges and solutions
- Biopolymers and specific mechanical energy
- Extruder metallurgy for biopolymers

The webinar is available on demand on Plastics Techology's website. Click here to watch: https://www.ptonline.com/events/details/919c6b20-f856-4bd3-b4c7-d3036edfb21c

ENTEK Launches New Website



In June, ENTEK launched its all-new website. The new site is the first major website refresh for ENTEK since 2014.

"We are excited to launch a fresh, new website that showcases our industry-leading products, technology and services," said Tammy Straw, ENTEK's Marketing and Business Development Manager. "We believe that our existing and future customers alike will find the new site easy to navigate and filled with useful content."

Besides its new look, the website features more technical information and includes numerous videos, specification sheets and white papers that are showcased in the 'Resources' section. In addition,the site is better organized to reflect ENTEK's three key business units: **Extrusion Solutions**, **Energy Storage** and **Advanced Materials**.

Check it out today at www.entek.com!

ENTEK is growing its East Coast Customer Support Team!

As our industry grows and changes, the ENTEK Customer Support Team is growing as well.

We are happy to welcome Craig Clayton to our team!

With his experience in the extrusion industry and extensive support of pelletizing systems, as well as his recognized high-quality service, our customers will benefit greatly from the dedication Craig brings to any role.

"Craig will be an excellent addition to our experienced team," said Darla Bulmer, Customer Support Manager. "We continue to grow this department to provide more services, faster response and increased coverage for our customers."

Customized Preventative Maintenance Plans

ENTEK is now offering **PREVENTATIVE MAINTENANCE PROGRAM (PMP) PLANS**, customized to each customer, including quarterly site visits and remote/site training of operators, maintenance staff and process engineering team members. Our goal is to help our customers receive the best results, while addressing the daily issues and challenges of this industry. Contact ENTEK for more information!

Upcoming Events

Extrusion 2021
Rosemont, IL,
Sept 21-23
Booth E-513

Extrusion 2021

Compounding World Expo
Cleveland,
Nov 3-4
Booth A515

COMPOUNDING WORLD EXPO NORTH AMERICA

Women Breaking the Mold
Nov 11-12
Sponsored by ENTEK

Plastics News WOMEN BREAKING THE MOLD NETWORKING FORUM NOVEMBER 11-12, 2021 AUSTIN, TX

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