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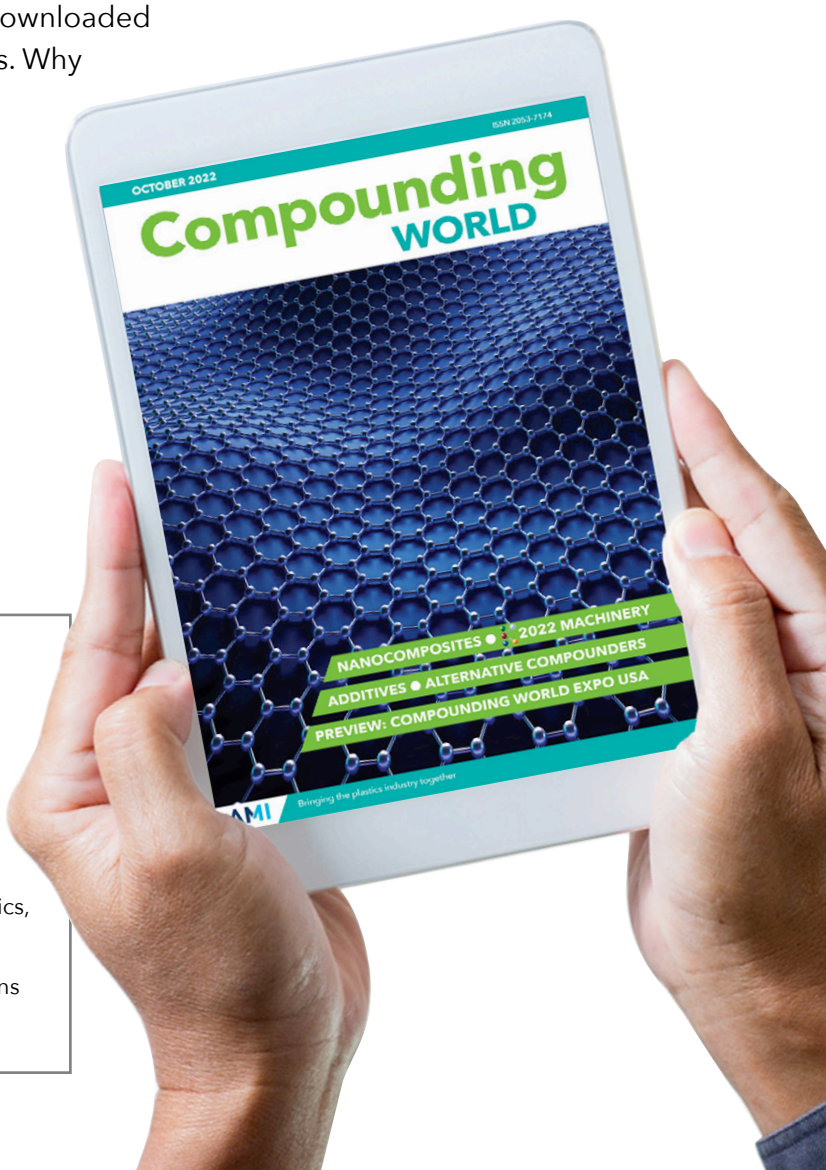


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# Cabopol builds in Mexico

Portuguese speciality thermoplastic compound producer Cabopol is building a production unit at Monterey in Mexico, its first in the Americas.

The new 10,000 m² plant will have an initial configuration of two compounding lines with potential for further expansion. It will offer a production capacity of 25,000 tonnes/yr on completion in December 2023.

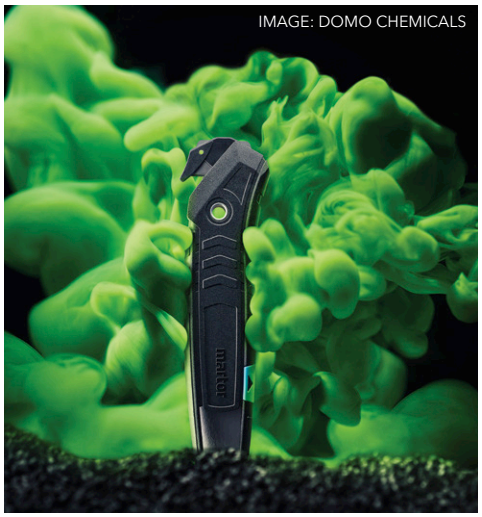
Cabopol, which has a strong position in the automotive, wire and cable and footwear sectors, already operates production facilities in Portugal, Serbia and Morocco. It said the new Mexican plant will be equipped with the latest technology and will significantly increase production capacity, improve supply chain efficiency, and reduce lead times for customers in the Americas.


**Cabopol's new compounding plant in Mexico will be the company's first in the Americas**

"We are dedicated to delivering the highest-quality polymer compounds, and this expansion allows us to further our commitment to excellence," said Sales Director Anselmo Mendes.

› **https://cabopol.com**

# Safety solutions from Domo




Domo Chemicals' PA6-based Technyl 4earth compounds are being used to mould Martor's new Eco line of safety knives. The Secumax 148 and Secumax 350SE knives are produced in 100% recycled content grades with different glass fibre percentages to match the application's mechanical requirements.

"Today, we are supplying Martor with post-industrial black materials, but as a next step we are developing sustainable alternatives in natural shades, allowing them to match their corporate blue," said Arndt Lechner, Global Key Account Manager C&E Market at Domo Engineered Materials.

› **www.domochemicals.com**

## IN BRIEF...

**Solvay** said that its polyphenylene sulphide (PPS) production unit at Borger in Texas in the US and its Ryton PPS Echo compounding unit at Kallo-Beveren in Belgium have obtained independent mass balance certification under the ISCC Plus scheme.
**www.solvay.com**

**Kafrit** announced that three of its staff were among those killed during the 7 October attack by Hamas on Kfar Aza in Israel - Nadav Goldstein, Aviv Kotz and Dorit Bar Ilan - and that some employees' family members are still unaccounted for. Kafrit was founded in Kfar Aza in 1973 and still has a factory there.
**www.kafrit.com**

Germany's **Knauf Industries** is to acquire **BASF**'s Neopolen expanded PP business, including all related IP, customer and supplier contacts, and the Neopolen production plant, which is located at BASF's Schwarzheide manufacturing site in Germany. The two companies said they hope to complete the deal by March 2024.
**www.knauf-industries.com**

# LyondellBasell buys into mechanical recycling

LyondellBasell has acquired a 50% stake in Rodepa Vastgoed, the holding company of Netherlands-based plastics waste recycling specialist De Paauw Sustainable Resources (DPSR).

Founded in 1956, DPSR is a major recycler of LDPE and PP in the Benelux region, operating production facilities at Hengelo and Enschede in the Netherlands.

"Through this collaboration, we can further expand our CirculenRecover portfolio of mechanically recycled polymers," said Yvonne van der Laan, LyondellBasell Executive Vice President, Circular and Low Carbon Solutions.

› **www.lyondellbasell.com**

# Vamp Tech partners with Encom

Italian flame retardant and technical compound maker Vamp Tech and US compounder Encom Polymers have agreed a partnership to support global growth of each other's product portfolios to OEMs.

"North America is the necessary next step to continue our commercial growth and expand our global footprint," said Piero Eigenmann, President, and CEO of Vamp Tech. "We are excited about the cooperation with Encom Polymers; their customer orientation, flexibility in manufacturing and synergic product portfolio will be key factors to sustain our market development activities in USA and Mexico."

Encom Polymers, headquartered in Evansville in Indiana, said the partnership will extend its FR compound options and help it to support its North America and Asian customers when they translate products into the European market.

› **www.vamptech.com**
› **https://encompolymers.com**

## Birla buys CNT firm Nanocyl

Carbon black producer Birla Carbon has acquired Nanocyl, a producer of multi-wall carbon nanotubes (MWCNTs) based in Sambreville, Belgium. The move is primarily intended to lift Birla's presence in the Li-ion battery sector but also expands its offering for conductive polymer applications.

Founded in 2002, Nanocyl is among the pioneers in the manufacture of industrial multiwall carbon nanotubes (MWCNT) and MWCNT-based formulated products, including masterbatches. It claims a production capacity for its NC7000 MWCNTs of around 460 tonnes/yr.

Birla said the addition of the Nanocyl products to its existing Conductex family of conductive carbon black additives and active anode materials will extend its range of solutions for conductive compound applications.

› **www.birlacarbon.com**
› **www.nanocyl.com**

# Avient adds DBDPE-free Syncure cable grades

Avient Corporation is expanding its Syncure portfolio of XLPE cross-linkable PE formulations with the launch of new flame-retardant grades without decabromodiphenyl ethane (DBDPE).

The Syncure XLPE 200 Series is the company's first DBDPE-free Syncure offer and is designed to provide an alternative flame-retardant choice for production of low-voltage wire and cable insulation. Like other Syncure materials, the DBDPE-free formulations combine a PE graft resin and flame-retardant catalyst to create a cross-linked solution.

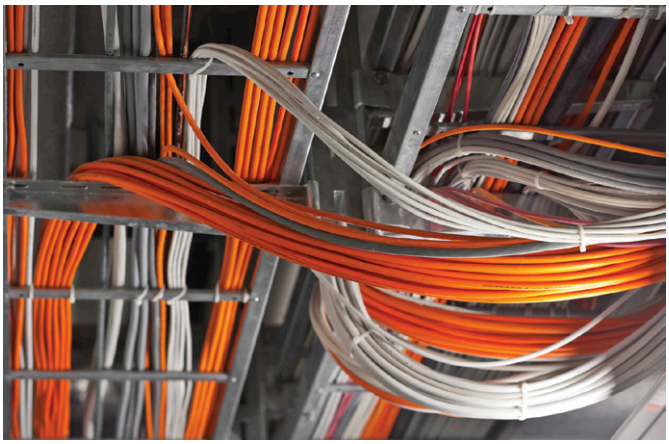


IMAGE: AVIENT/GETTY IMAGES

**Avient is extending its silane-crosslinked Syncure compounds to include DBDPE-free grades**

"These new grades are formulated without DBDPE, meet industry specifications, and enable our customers to quickly adapt to regulatory shift," said Matt Mitchell, Avient's Director, Global Marketing, Specialty Engineered Materials.

› **www.avient.com**

# Covestro recycling PC in China

Covestro has started production on its first dedicated mechanical recycled compounding line for polycarbonates (PC) at its integrated manufacturing site in Shanghai, China.

The new line has capacity to produce more than 25,000 tonnes/yr of PC and PC blends. The company said it will target growing demand for post-consumer-recycled compounds in the region for use in applications such as electrical and electronic products, automotive, and consumer goods sectors.

"With new or repurposed capacity now operational, we are better positioned to assist our downstream customers in their journey towards more sustainable products, expediting the transformation of industries towards a circular and climate-neutral future," said Lily Wang, Head of Covestro's Business Entity Engineering Plastics.

› **www.covestro.com**

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# Sirmax invests in India

Italian compounding group Sirmax has acquired land for construction of a third plant in India (and its 14th worldwide). The company has earmarked €6m for the plant, which will be located on a greenfield site in the Bangalore-Hosur region and will lift its capacity in India to 82,000 tonnes/yr when it starts up in 2026.

The announcement was made as the company initiates a major upgrade at its Autotech-Sirmax JV operation at Palwal in India, which will include four new high speed compounding lines, additional warehousing, and automated materials handling. The plant (a JV with India's Tipco Group) will be expanded by around 7,000m$^2$ and capacity doubled to 30,000 tonnes/yr.

"I am very proud of the expansion projects in India. These actions will consolidate the partnership between Sirmax and the Tipco Group and lay the foundation for even greater future growth than we have experienced thus far," said Sirmax Group President and CEO Massimo Pavin.

"Upgrading of the Palwal site and building the new plant, which will be ready by 2026, will enable us to further strengthen our position in the Indian and Southeast Asian markets," he said.

› **www.sirmax.com**

# Evonik PEEK for 3D medical

IMAGE: EVONIK

Evonik has introduced two new carbon-fibre reinforced PEEK filaments for use for production of 3D printed medical implants using extrusion-based manufacturing technologies such as fused filament fabrication (FFF).

The Vestakeep iC4612 3DF and Vestakeep iC4620 3D filaments contain 12% and 20% carbon fibre content respectively and are said to be suitable for production of critical long-term medical implanted parts such as bone plates and other reconstructive prostheses.

"By introducing the world's first carbon-fibre reinforced PEEK filament for long-term medical implants, we continue to design biomaterials that open up new possibilities in today's medical technology for patient-specific treatment," said Marc Knebel, Head of Medical Systems at Evonik.

› **www.infinam.com**

# Celanese targets EV market

Celanese introduced new polyamide compounds for manufacturers of electric vehicle (EV) battery and powertrain systems at last month's Fakuma fair in Germany.

The Frianyl PA W-Series offers UL94 V-0 flame retardance at 1.5mm combined with good flow characteristics required for the manufacture of large, thick-walled components such as battery module housings, e-box housings, and covers. The compounds retain a high Comparative Tracking Index (CTI) after aging at 125°C for 1,000 hours.

Celanyl PA B3 GF30 E is a new polyamide-based compound for semi and structural EV powertrain applications. It offers an HB flame classification and CTI of 600V after 3,000 hours aging at 150°C. The company is targeting connectors, switches, relays, busbars, and sensors.

› **www.celanese.com**

# Europe plans pellet release regulation

IMAGE: SHUTTERSTOCK

The European Commission last month published proposals for a Regulation to tackle unintentional release of plastic pellets in to the environment, which it says is one of the major sources of unintentional microplastic pollution amounting to between 52,000 and 184,000 tonnes/yr.

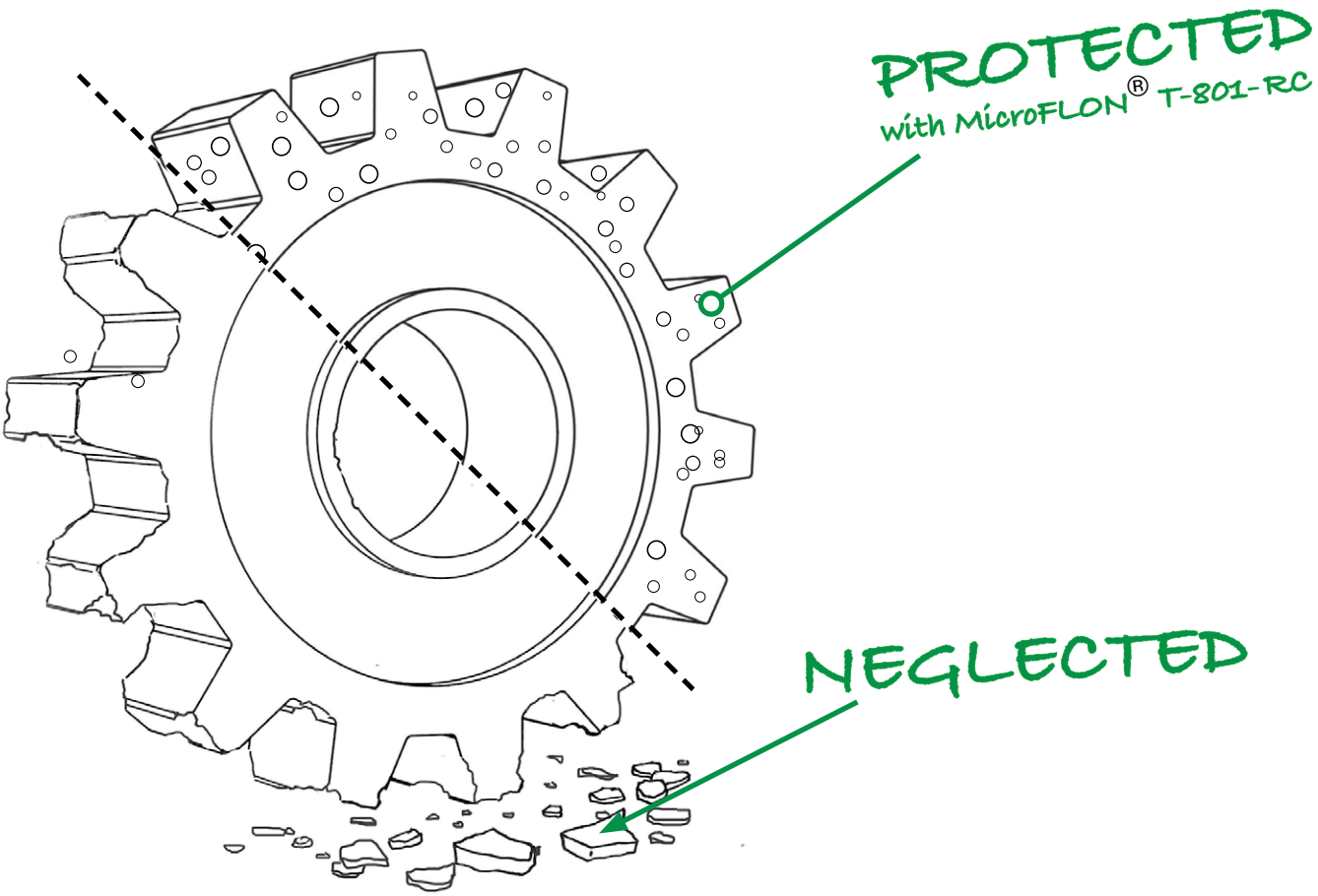
The proposals, which aim to reduce losses to the environment by up to 74%, will focus on spill prevention, containment and clean-up. They cover best handling practice, systems for verifying compliance, and methodologies for loss estimation.

The Commission said it recognised that many companies using plastics are SMEs and that this will be accounted for with lighter compliance requirements for smaller operators.

The proposals will go to the European Parliament and the Council for discussion. If adopted, business will have 18 months to ready themselves for compliance.

› **https://commission.europa.eu/**

SHAMROCK

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## HexpolTPE sticks with Almaak

HexpolTPE and Almaak International have formed a partnership that aims to optimise 2K material combinations for automotive applications.

"TPE materials for multi-component processes need to be adhesion synchronised with substrates, especially polar technical thermoplastics," said Thomas Köppl, Group Product Manager at HexpolTPE. "The collaboration between Almaak and HexpolTPE delivers tested material combinations that ensure chemical compatibility and adhesion performance."

According to Hexpol TPE, the company's chemically-modified TPEs have been adhesion tested with Almaak's compound portfolio, which includes PC/ABS, ABS, PC, ASA, PBT, PA6, PA6.6 and blends and includes grades with up to 100% recycled content.

› **https://www.hexpol.com/tpe/**
› **https://almaak.de**

# A groovy kind of PET

SK Chemicals is aiming to tap into the vinyl record revival. The South Korean company has worked with German LP maker Sonopress to develop its EcoRecord, which uses SK's SkyPET chemically recycled PET resin in place of traditional PVC.

Sonopress says the EcoRecord, which is being launched in partnership with Warner Music and was trialled last year, matches the sound quality of vinyl with an 85% production energy saving.

"The tests were so encouraging that we gave the green light for extensive investment in the construction of a pilot line in the twelve-inch LP format," said Sven Deutschmann, Sonopress Managing Director. The company said the EcoRecord is produced on a 300 tonne injection moulding machine using processing technology similar to CD and DVD production systems.

SK, through its European distributor Albis, also aims to supply SkyPET to Greenyl, an Italian startup planning to offer a more sustainable LP production service.

SkyPET resin is produced by depolymerisation chemical recycling of PET waste at a 50,000 tonnes/yr plant in China that SK acquired from Shuye Environmental Technologies earlier this year.

› **https://eng.sk.com**


IMAGE: SONOPRESS

**The Sonopress EcoRecord replaces vinyl with chemically recycled PET from SK Chemical**

## Invista cuts ADN production

Invista is to discontinue production at its PA66 intermediates plant at Orange, Texas, US. Adiponitrile (ADN) production unit will cease immediately and production of hexamethylene diamine (HMD) by mid-2024, the company said.

"Given long-term projections, we're confident we'll be able to supply our customers and have the capacity to support additional growth in the nylon 6,6 value chain moving forward," said Francis Murphy, Invista President and CEO.

› **www.invista.com**

# Radici opens compounding plant in India

IMAGE: RADICI GROUP

Radici Group has inaugurated its first compounding site in India. Located in the municipality of Halol in Gujarat, the 11,000m² facility employs around 100 people and will produce engineering polymers for automotive, E&E, and consumer and industrial goods markets.

"With this site, we'll be able to respond much faster to our customers' needs," said Federico Percassi, India Country Manager for RadiciGroup High Performance Polymers. "It will enable us to shorten material development and supply times [while] continuing to rely on the support of our global organisation."

› **www.radicigroup.com**

# Ruiya marks 30 years

US compounding machinery maker CPM marked the 30th anniversary of the founding of its Ruiya Extrusion division at Nanjing in China last month.

Established in 1993 and acquired by CPM in 2007, Ruiya initially manufactured around 50 machines a year primarily for the Asian market. Last year it shipped more than 260 extruders and it builds up to 10 compounding lines annually.

"Ruiya has grown into a leading brand in the industry," said CPM Vice President of Engineered Materials Sean Doran "We have Ruiya equipment onsite at our lab facility in Lauffen, Germany. This allows us to find the optimal cost-benefit solution at an early stage for our customers."

CPM said it has sold around 6,000 Ruiya brand extruders to date. The company moved into a $10m new plant in 2020 where it can now build machines up to 240mm diameter.

› **https://onecpm.com/**

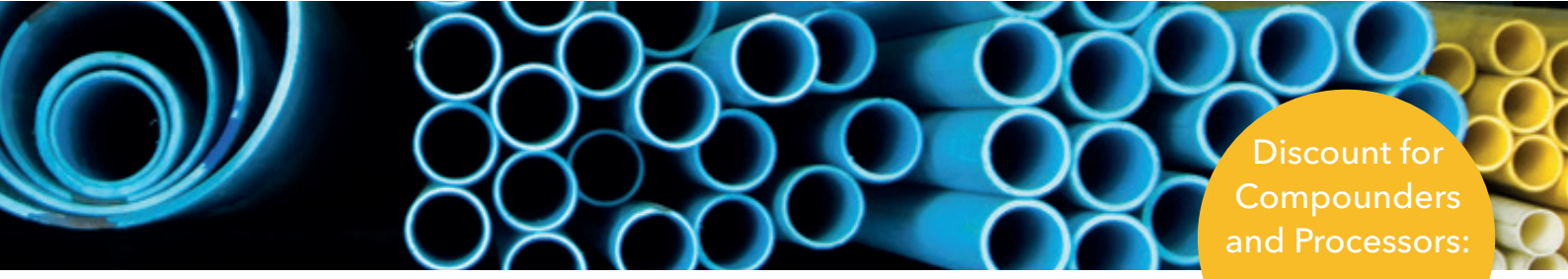

**CPM VP Engineered Materials Sean Doran, left, and Sustainable Products Director Anton Fuerst celebrate Ruiya Extrusion's 30th anniversary**

# SABIC adds recycled grades

SABIC has launched a new portfolio of LNP Elcrin PC-based copolymer compounds containing up to 75% certified post consumer recycled (PCR) content.

The new LNP copolymer resins are said to deliver high performance. Depending on grade, they can provide low-temperature ductility, chemical and weathering resistance, good flow, transparency and UV stability. Some grades can provide UL94 V-0 fire resistance at 0.6mm.

› **www.sabic.com**



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**EXPLORE THE AGENDA AND BOOK YOUR PLACE**

# Mocom and Wipag merge; sights set on sustainability

**Mocom CEO Jens Kaatze says merger will see plant closures in Europe as company integrates its mechanical recycling and compounding expertise to create a unified sustainable materials business**

IMAGES: OTTO KRAHN GROUP

**Above: A key element in Mocom's business will be sourcing reliable end-of-life material suitable for engineered compounds**

**Right: Mocom CEO Jens Kaatze says merged business will have fewer but more efficient production sites**

Germany-headquartered technical plastics compounder Mocom announced just before the Fakuma fair last month it is to merge with Wipag, also based in Germany and a sister company within the Otto Krahn Group focused on production of recycled compounds.

The move is part of a strategic plan to intensify development of products containing recycled content or that offer other broader sustainability benefits such as lightweighting, according to Jens Kaatze, who was appointed CEO of Mocom in May (taking over the role from Ian Mills) and has been CEO of Wipag since 2021.

"The thinking behind this is quite simple," he said. "We have two businesses that are producing and selling engineering plastics compounds. With a lot of our processes being similar and the markets being addressed the same, it is a logical step for us to merge these businesses and go to the market with one brand, which will be Mocom."

The aim of the merger is to bring together the best of both companies within a single organisation. "Mocom is focused on high quality compounds. It is very strong in the lighting area and has a strong background in polyamides and polycarbonate," he said. "Wipag is 100% mechanical recycling and is covering a broader value chain basically starting from scrap, even from end-of-life parts, and then bringing that into compounds. That is different to many other recyclers that you see because often they will stop after pelletising."

At an organisational level, the company aims to merge the two businesses by the end of the year. However, the process of consolidating specific expertise and streamlining production will take longer and will be implemented step-by-step. It will eventually see the combined group's production capacity in Europe reduced from five sites across Germany to three – the two Mocom plants at Hamburg and Zülpich and the Wipag plant at Gardelegen, where it is currently expanding capacity for recycled carbon fibre reinforced compounds. The Mocom plant at Obernburg and Wipag site at Neuburg an der Donau will be closed at some point in the future.

"In Europe we've got two things that we're looking at. Number one is increasing efficiency," said Kaatze. "We're aiming at having three sites at the end of this process and having them focused on certain product groups and types of production, with Hamburg being more specialised and having the smaller lot portfolio backed by the technical development, product development as well as the technology group that we have there. Zülpich is going to be for the larger lot sizes and Gardelegen will be the recycling spot."

Kaatze said that the need for rationalisation in Mocom's home European market can largely be attributed to the compounder's history of growth via acquisition. He says this has left it with multiple smaller sites that do not necessarily provide the levels of utilisation and efficiency it requires today. This is not the case for its compounding operations at Changshu, in Jiangsu province in China, and at Duncan in South Carolina, US, which

IMAGE: OTTO KRAHN GROUP

**Internal view of Mocom's plant at Hamburg in Germany, which will be its technical and product development hub**

have both been developed to serve current market needs.

Mocom's growth in China cooled a little over the past two years, according to Kaatze. However, the US market is performing strongly. The company has just commissioned a new $3m compounding line at its Duncan site and is expecting to see considerable further growth resulting from the US government's introduction last year of the Inflation Reduction Act (IRA). This makes $500bn of funding and tax breaks available to US businesses to invest in areas such as clean energy and sustainable technologies such as EVs.

Sustainability is the second driver behind Mocom's merger plans and Kaatze sees considerable value in integrating each company's expertise in areas such as sourcing, recycling and compounding. "It is a trend that's pretty clear, definitely in Europe, but we also see it in other regions," he said.

"The IRA is laying a good base for growth opportunities," Kaatze said. "The sustainability aspect is certainly at a different level in the US compared to Europe. However, being right in the discussion with our team we do hear quite a bit going on. We should not forget that taken by itself, California would represent the fifth largest economy in the world and California is pretty much amongst the leaders globally when it comes to sustainability regulations."

According to Kaatze, Mocom aims to offer its customers in the plastics industry a broad range of high performance mechanically recycled compounds that meet demands for circularity. "Mechanical recycling is usually very complex, because you're starting with small bits and pieces that you need to collect out of a product again, and that means you need to have a good understanding of the end use markets. In the end it's going into the supply chain and trying to get your hands on to it."

Wipag has already extended its recycling technology expertise into sourcing through its closed loop recycling schemes and its RaaS (Recycling as a Service) consultancy and logistics initiative. Kaatze sees significant potential to apply that expertise further within Mocom's technical compounds sector.

"When you look at technical polymers, mechanical recycling is still to a large degree dependant on production waste. Now that is, by definition, limited because every producer is trying to reduce their waste and you can't grow in that. If we want to follow our belief that we need to significantly grow the circularity of the business we need to tap into end-of-life material," he said.

Kaatze cites the example of the automotive industry, which is a key market for Mocom. Any one car can contain 150 or more different compound types and these need to be selectively extracted from the light shredder fraction at end-of-life.

"The sorting mechanisms that work for a lot of the packaging waste and polyolefins don't necessarily work for technical polymers. So, what we're working on is the supply chains and getting our hands on material before it goes into the shredder," he says. "The aim that we have is that for every product we offer, we also have not only a prime but also a recycled alternative."

Mocom already has an extensive portfolio of technical compound grades containing post-consumer and post-industrial recyclates within its Altech ECO and Alfater XL ECO product line and recently introduced some recyclate based grades for lighting applications (Alcom LB ECO for reflector applications and

IMAGE: OTTO KRAHN GROUP

**With more than 150 different compound types in a single car, sourcing material suitable for recycled engineering compounds means developing supply chains**

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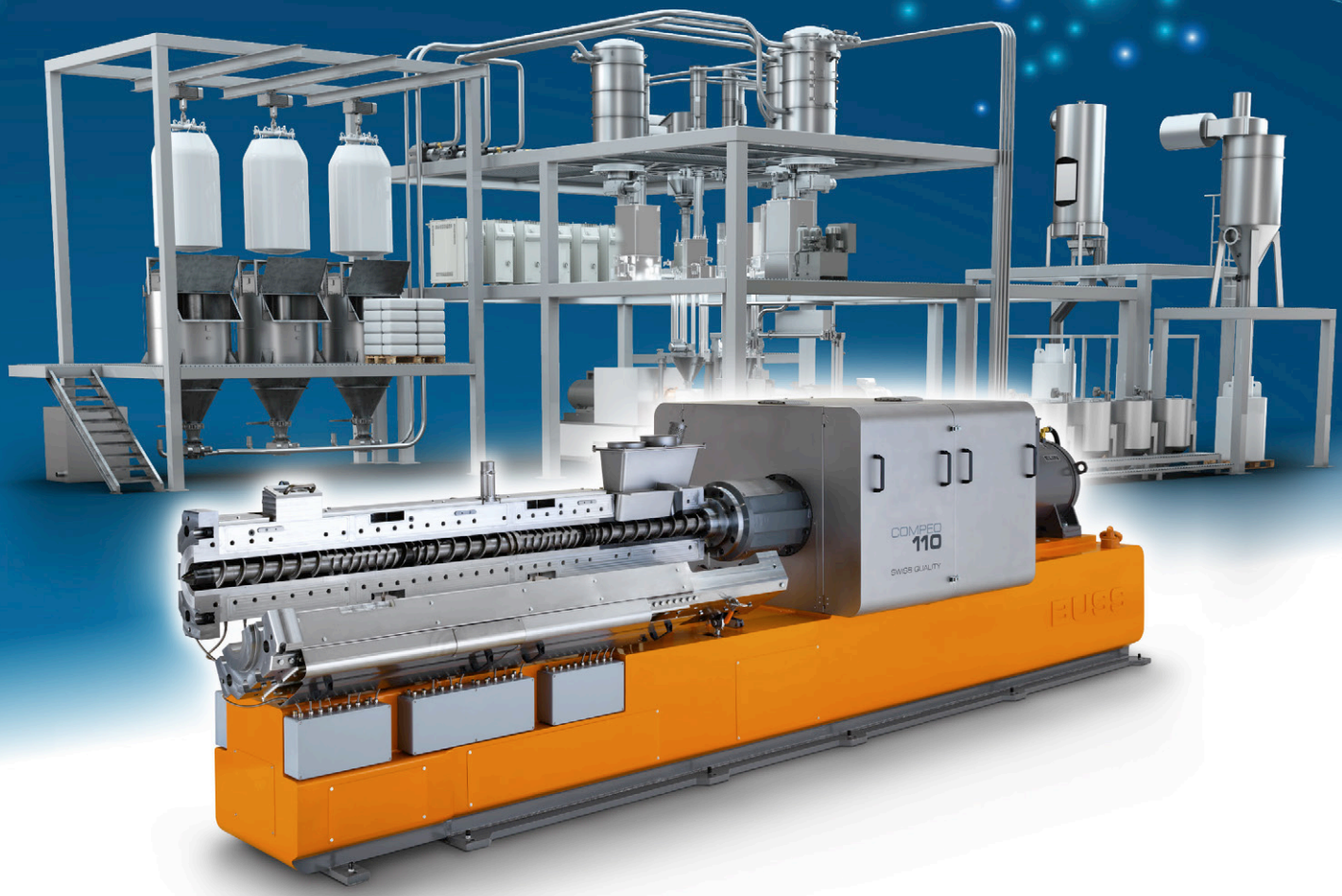


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From next year, the company will also be able to extend its offering in lightweight materials using the additional carbon fibre recycling and compounding capacity – more than 3,000 tonnes/yr – being installed at the Wipag plant at Gardelegen.

"The new production facility in Gardelegen is expected to be completed by the beginning of next year," Kaatze said. "We will start with one extrusion line and the equipment for processing the carbon fibres from post-industrial waste for compounding. The hall is dimensioned in such a way that additional extrusion lines can be accommodated."

IMAGE: OTTO KRAHN GROUP

**A 3,000 tonnes/yr recycled carbon fibre compounds line is being installed at the Wipag plant at Gardelegen in Germany**

The merger with Wipag is the latest step in Mocom's emergence as a standalone compounder (the company was created in 2020 when Otto Krahn Group decided to separate its compounding activities from its much larger Albis polymer distribution business).

The goal, Kaatze explained, was to change the compounding business from one that effectively plugged gaps in its parent company's distribution portfolio to a standalone enterprise that could make investment and product portfolio decisions on its own terms. And he deems that decision to have proved a success, with the sales of the combined compounding business now standing at more than €350m.

Kaatze said the business environment has been challenging over the past two years with the global economy generally flat. He expects that to remain the case for the immediate future but is positive for the longer term. "I'd say next year will be challenging but it will improve after that. It will not be a big upswing but I believe we will see some rebound effects. Just look at the installed capacity at every step in the different industries. There's still room for growth."

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IMAGE: SHUTTERSTOCK

# Sustainable pigments in black and white

## *Whether for emission reduction, ease of processing, or to simplify recycling, pigment developers are seeking more sustainable products. **Jennifer Markarian** reports*

A great number of plastics applications depend upon black or white pigments as their primary colorant or as a component of their colour formulation, with critical characteristics including tint strength and regulatory clearances. Increasingly, however, users are also exploring sustainability characteristics, which can include the energy required to make the pigment or to use it in a compound as well as whether it can be sorted in expected recycling streams. One of the recent challenges for conventional carbon black pigments, for example, has been around concerns that they absorb near infrared (NIR) wavelengths, interfering with one of the key detection technologies used in some automated recycling sorting equipment.

"The overall issue of sustainability is a major concern up and down the supply chain," says Mark Ryan, Market and Product Manager at **Shepherd Color**. He says the company is addressing sustainability in pigment production, as well as how each pigment affects the sustainability of the material that it is incorporated into. "We are looking at how our products can improve sustainability through favourable life cycle analysis due to long service lives, inherent problem-solving properties like infrared (IR) reflectivity, and other properties," he says. ❯

**Main image: Sustainability is emerging as a top priority in the development of black and white pigments for plastics**

IMAGE: SUN CHEMICAL

**Above: Sun Chemical offers a variety of IR reflective black pigments suitable for automated sorting in recycling plants**

Shepherd Color's NIR-detectable black pigments for recyclable packaging are Shepherd Color Black 10F925, with a darker masstone colour, and Black 10F951, which is said to be optimised for tinting mid-tone colours or previously coloured PCR material. Both have FDA food contact notification.

Ryan sees IR-reflective technology as a good solution for making black plastics recyclable. "It is hard to beat the cost-to-colour for carbon black pigments, but the benefits of using IR technology to make black plastics more sustainable by improving recyclability is fractions of a cent per container. It often takes regulations to put new technology into common use to overcome that inertia to innovation," he says.

NIR sorting technology has been widely adopted for plastics waste recycling worldwide, according to **Sun Chemical**, which says that its NIR-reflective Sicopal Black K 0098 FK pigment has been used successfully in plastic sorting plant in Europe, Australia, and the US. "As the availability of equipment and infrastructure increases to match demand, we expect to see more countries embracing NIR sorting technologies and reflective pigments," it says.

The Sicopal Black pigment, which reflects NIR, can serve as the main or a shading component for black and coloured plastics. "The new pigment creates a clean product for packaging, lowers energy usage in manufacturing compared to carbon black, features multiple processing stability for more product life cycles, and enables dark and black formulations to be recyclable," the company claims. The pigment can be used in polyolefins and engineering plastics, including high heat polymers. It also meets food contact compliance regulations, including microwave and oven conditions, in regions Including the EU, Japan and the US.

Sun Chemical's Microlen Black 0089 MP and Eupolen PE Black 00-9805 pigment preparations are also NIR-reflective and have recently been made available in two new easier to handle granular and low dusting powder forms.

Another newly launched pigment preparation, Microlith Black K 0087 KP, is intended for use in PVC, where it is said to offer improved dispersion, higher jetness and higher NIR-transparency. According to the company, NIR-transparent pigments allow NIR light to pass through without reflection or absorption so can be considered detectable by NIR sorting systems. Applications for the new grade include PVC window profiles or automotive interiors, where it can provide improved heat management.

## Sorting selection

Plastics industry specialists are generally aware of the multiple alternatives to carbon black that are suitable for NIR sorting, says Marc Zwart, Technical Manager at **Heubach**. "However, given the large number of options, it becomes more difficult for the designer and the masterbatch producer to select the right one," he says.

"To choose between complex inorganic colour pigments or compounds of organic pigments or dyes, or a blend of all, is a difficult task. They must consider the suitability for the polymer, the black jetness/darkness, the shade, the various fastnesses (for example, light, temperature, migration), food contact compliance, and the coloration costs. Therefore, the technical support, industry and application knowledge of the pigment partner is of high importance," Zwart says.

Heubach Group Head of Marketing for Plastics, Philippe Lazerme adds: "Black as a colour will remain important in the packaging industry, especially for high-end articles, typically in the cosmetic and beauty industry. Black packaging provides a feeling of high value."

The latest black additions from Heubach are two grades based on organic pigments and dyes that are suited for NIR sorting: Graphtol Black CLN for

IMAGE: AVIENT/GETTYIMAGES

**Right: Avient's OnColor NIR sortable colorants have attained APR "Meets Preferred Guidance recognition for use in HDPE**

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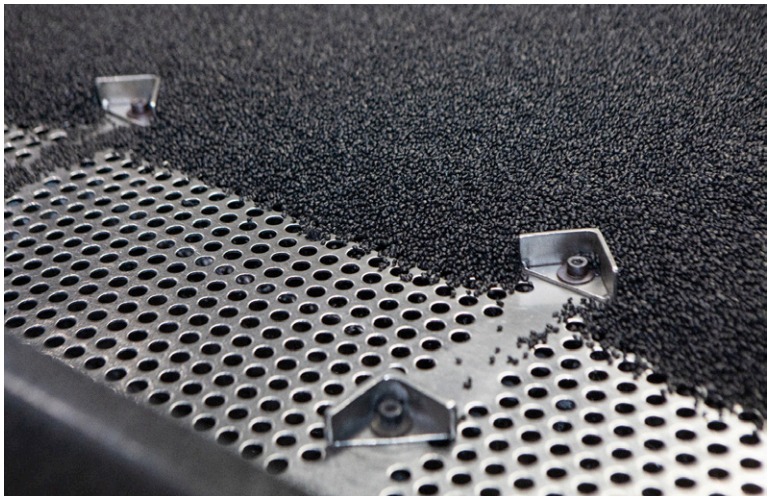
IMAGE: CABOT CORPORATION



**Above: Six of Cabot's global sites now carry ISCC Plus accreditation, including two compound and masterbatch production sites in Europe**

polyolefins and Solvaperm Black PCR for PET. "Demand for these products is steadily growing and Heubach is permanently investing in production processes," says Lazerme.

While NIR is used in packaging recycling plant to identify resin types, optical sensors are used in the PET recycling sector to separate black and coloured containers from clear ones. French recycling equipment company Pellenc says that this optical sorting equipment can not always distinguish between dark and transparent containers. It worked with masterbatch supplier **Ampacet** on sorting tests using black PET packaging containing Ampacet's REC-NIR Black 135 NIR-sortable masterbatch.

The researchers found they were able to adjust the optical sorting computer algorithm to correctly distinguish between the black packages and transparent ones (Ampacet has also completed successful tests with recycling solutions company Tomra). The masterbatch maker has now obtained a technical notice from COTREP (the committee for recycling of plastic packaging in France) that says that its REC-NIR Black 135 meets COTREP's more stringent protocols for sorting PET containers.

The US Association of Plastic Recyclers (APR) publishes guidelines for how well packaging can be sorted at material recovery facilities. **Avient** says its NIR-sortable black and dark colorants for HDPE have been recognised under APR's "Meets Preferred Guidance" program. Testing is also underway for OnColor NIR Sortable Colorants in PP.

Plasblack PE8590NIR NIR detectable black masterbatch is one of the more recent additions to **Cabot**'s portfolio. The company is currently running a project to develop a range of sortable carbon black masterbatches for use in the consumer packaging industry, where NIR sorting equipment is used. "This includes close collaboration with NIR sorting machine companies and with our customers. We believe working in partnership with value chain members will facilitate the development of this product line. We welcome other interested partners to participate as well," says Bernadette Corujo, Cabot's Specialty Compounds Marketing Manager, Americas region.

NIR sorting issues aside, carbon black continues to be widely used in plastics for pigmenting. In addition to high tinting strength and relatively low cost, carbon black absorbs UV light and so provides weathering protection for plastics, according to Dominique Strassler, Global Segment Manager Plastics at Cabot. He sees growth potential in construction markets, such as geomembranes and pressure pipes, as well as agricultural films.

Strassler says Cabot's Black Pearls 1180HD carbon black, which was introduced several years ago primarily for use with higher-end polar engineering plastics, is now also finding use in compounds made with recycled resins. He reports that compounders are finding value in the combination of deep black colour and mechanical properties that the product provides. "Black Pearls 1180HD carbon black allows those compounders to cost-optimise their input materials and maximise the amount of post-industrial and post-consumer in their formulations while still meeting the performance targets of their products."

## Automotive options

Cabot's latest product selection for automotive and other segments includes three high jetness, high dispersion black masterbatches. Plasblak XP6399D black masterbatch is suitable for PC-based applications in automotive interior and exterior parts and consumer electronics, or in appliances requiring high gloss and superior mechanical strength, says Alexandra Megally, Specialty Compounds Marketing Manager, EMEA.

Plasblak SA6801 black masterbatch is intended for use in automotive and consumer product related applications. "It enables compounders to break the trade-off between colour and mechanical properties by allowing better impact properties without sacrificing colour strength," Megally says. "It also enables lower masterbatch and carbon black loadings in the final compounding, providing formulation flexibility to meet stricter customer performance requirements."

Plasblak XP6559A Polyamide 6 black masterbatch allows high jetness in PA compounds. The product enables users to reduce the masterbatch and carbon black dosage up to three times, without compromising UV resistance, which also improves mechanical properties, she says. ›

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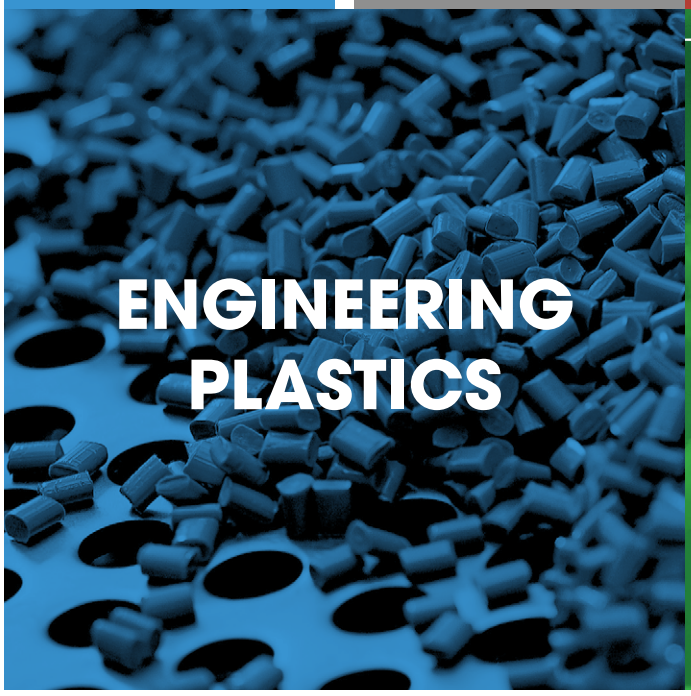



*Plastics Engineer*

*www.tisan.com.tr*

IMAGE: BOLDER INDUSTRIES

**Above: Carbon black recovered from end-of-life tyres using Bolder Industries' proprietary pyrolysis process**

## Reclaiming black

Sustainability is a key area of development for Cabot. The company's masterbatch portfolio includes several products that contain recycled polymer and reclaimed carbon, including Techblak PE8505 black masterbatch (containing reclaimed carbon and recycled polymer) and Techblak PT6468 black and PT5001 black masterbatch (containing recycled PET).

Cabot also recently announced that the ISCC Plus accreditiation that supports certification of its recently launched Evolve Sustainable Solutions platform has been extended to cover two European masterbatch and compounding plants. While the company currently only offers Evolve reinforcing grades for rubber applications, it says it is assessing the feasibility of potential portfolio expansion into specialty applications, including plastics.

Other companies targeting more sustainable carbon black products include US-based **Origin Materials**, which has a 100% bio-content carbon black produced by treament of hydrothermal carbon (HTC), which is itself made from the interaction of lignin and chloromethyl furfural during the conversion of biomass. The company says that its HTC-derived carbon black has a structure similar to fossil-based alternatives but adds that the surface chemistry and morphology can be manipulated. It is targeted for tyre and rubber applications but can also be used in plastics as a pigment or filler and Texas-based concentrate-maker ATC Plastic has partnered with Origin to create a black concentrate for a range of applications.

Finland's **UPM Biochemicals** has been producing UPM BioMotion Renewable Functional Fillers (RFF) made from lignin in UPM's biorefinery. In addition to use as a filler, the company says samples have been tested for use as an NIR-detectable black pigment.

US-based **Monolith** manufactures carbon black using renewable electricity to power a methane pyrolysis technology that converts natural gas to clean hydrogen and carbon black. The company says this results in a lower environmental impact with "virtually zero emissions from operations". The company announced in May 2023 that this carbon black material is being used in Goodyear tyres.

BolderBlack is a carbon black alternative produced by US-based **Bolder Industries** from end-of-life tyres using a proprietary pyrolysis

# Filler-free PE alternative to pearlised BOPP

US-based Void Technologies has developed its VO⁺ PE 1300 Series voiding agents for production of opaque mineral filler-free machine direction oriented (MDO) HDPE films that are claimed to offer a combination of low density and high opacity not achievable with mineral pigments such as $TiO_2$.

The company's patented VO⁺ technology is said to create nano- and micro-voided structures in MDO films that reduce density below 1g/cm$^3$ while creating opacity via light diffraction.

The company says the latest VO⁺ PE 1300 additive enables production of PE-based alternatives to the pearlised BOPP films used for white label and packaging films that are compatible with PE film recycling processes (it says BOPP is difficult to sort from PE and, due to the incompatibility of the two resins, acts as a contaminant).


IMAGE: VOID TECHNOLOGIES

**Left: Void Technologies' VO+ additive can produce opaque PE films without the use of mineral fillers**

The polymeric cavitation agents used in the VO+ PE 1300 additives are said to offer a broad processing window, good bubble stability and high throughput in MDO production. The company says they are also non-abrasive and comply with the requirements of US and European food contact regulations.

VOID Technologies' CEO James Gibson says the additive is available now in commercial quantities and that some customers are currently conducting end-to-end supply chain trials to support new packaging designs for launch in 2024.

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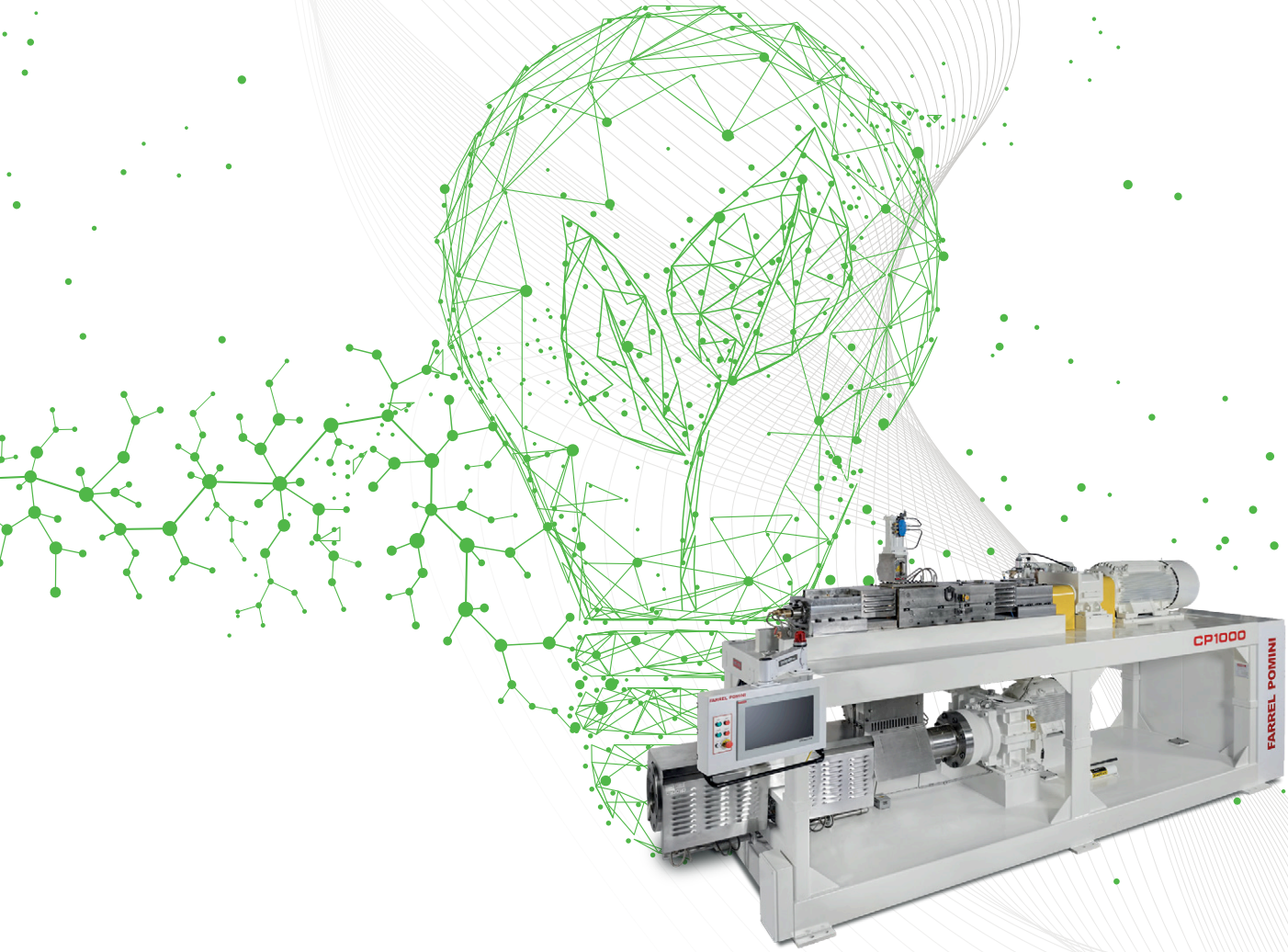


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IMAGE: BOLDER INDUSTRIES

**Above: Internal view of the Bolder Industries plant at Maryville in the US, which produces carbon black from end-of-life tyres**

process. As far back as 2016 the company co-developed a black masterbatch with vehicle-part maker Soucy Techno for use in agricultural and industrial vehicle parts. Recently, the two companies signed a long-term supply agreement that Bolder says signals a major achievement for recovered carbon black as a reliable and beneficial polymer additive.

Consistent performance of the black alternative has been key. "We don't have to worry about changes in carbon content, bulk density or particle size, which are key to our process and product performance," said François Bédard, Directeur General of Soucy Techno. The companies report that Soucy's use of BolderBlack has resulted in more than 1.5m end-of-life tyres being diverted from incineration or landfill, saving 39,000 tonnes of $CO_2$ emissions, more than 117.5m gallons (445m litres) of water, and 13m kWh of electricity.

Bolder says that its in-house lab, the Bledsoe Innovation Group, ensures that product specifications are set and held to according to customer needs. It says it also has compounding capacity and expertise that can be used to assist customers in development of products containing BolderBlack. Other plastics applications using the pigment include agricultural pipe, flowerpots and trays, and consumer goods.

BolderBlack grades are currently produced at Bolder's first site in Missouri in the US, which has the capacity to process almost 2m end-of-life tyres (ELTs) annually. The company this year began development of a second facility at Terre Haute in Indiana, which will process up to 6.6m tyres a year once fully operational. A first European facility is also being planned for Antwerp in Belgium.

End-of-life tyres are also the source material for **Birla Carbon**'s Continua Sustainable Carbonaceous Material (SCM). It signed a long-term SCM supply agreement with pyrolysis technology firm CircTec (formerly Pyrolyx) in 2021. Birla also recently secured ISCC Plus certification for its plant in Italy.

"This [certification] supports the principles of environmentally, economically, and socially sustainable production, beginning with our Continua Sustainable Carbonaceous Material. It is our intention to adopt this important certification at all our manufacturing locations in the near future," says Birla CEO John Loudermilk.

## Matching performance

End-of-life tyre pyrolysis oil is also used in production of **Orion Engineered Carbon**'s circular carbon black. The grade is engineered to match the performance of fossil-based specialty carbon blacks, offering the same dispersibility, high purity level, jetness and tinting strength, the company says. The black is also compliant with food contact standards and suitable for a wide range of applications including packaging, automotive, pipe, film and fibre.

"Current customers confirm that the new circular black is performing as well as regular specialty carbon blacks," says Kevin Milks, Orion Marketing Manager, Polymers and Batteries. "We're looking to partner with our customers to understand their

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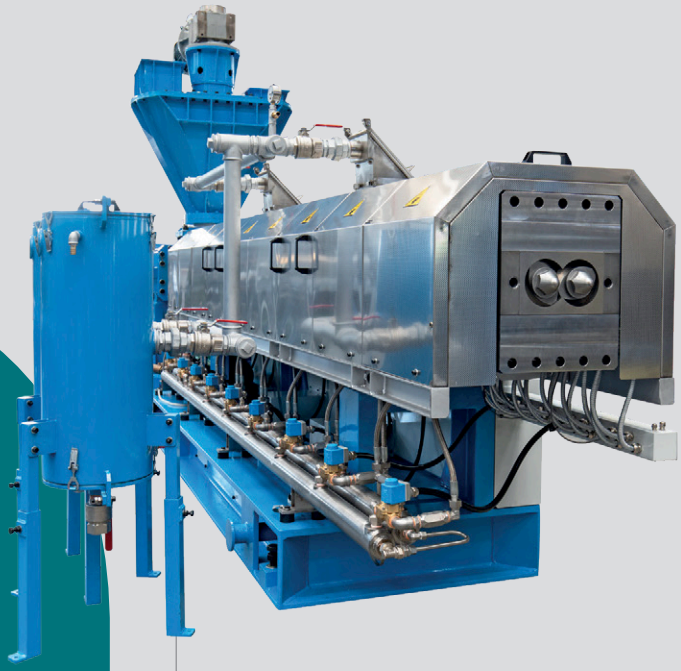

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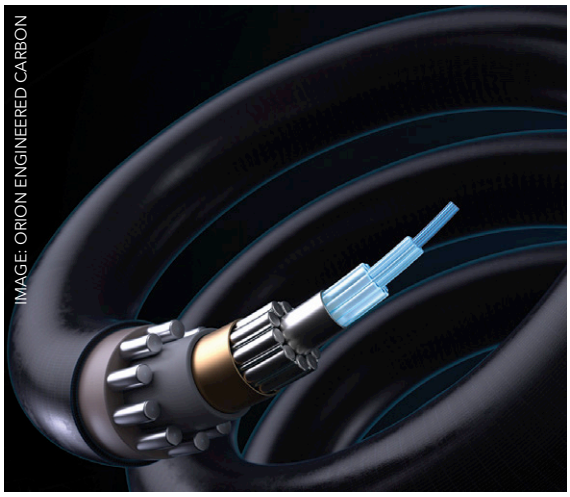
IMAGE: ORION ENGINEERED CARBON

**Right: Orion is heading a €12.8m project that aims to improve the quality and cut cost of circular carbon blacks produced from scrap tyres**

needs and develop grades to meet their specific performance requirements."

In September, Orion announced it is investing €12.8m (including €6.4m of German government and EU funding) to further develop and demonstrate a climate-neutral process for production of carbon black from alternative carbon sources. A project research facility is to be built at the company's innovation center in Cologne, Germany.

"The Clean Carbon Black Research and Development Project's aim will be to develop ways to reduce the carbon footprint and improve the yield and throughput, potentially lowering the cost of the material. Technological breakthroughs in this increasingly important field could have significant ramifications for energy integration and the molecular recycling of tyres," says Orion CEO Corning Painter.

## Sustainable whites

Turning from black pigments to white, the latest titanium dioxide ($TiO_2$) addition to the **Chemours** Ti-Pure Sustainability (TS) series is Ti-Pure TS-1510, described as a highly efficient rutile $TiO_2$ pigment for plastics applications. The new grade is said to be designed with "enhanced [higher] material bulk density" to improve production rates when using it in plastics compounding applications. For masterbatch producers, the company says the pigment's improved flow aids energy efficiency and allows more complete unloading with faster feed rates. Chemours reports an up to 30% increase in compounding line productivity when using the TS-1510 grade.

The higher bulk density reduces the space required for storage, which in turn can save on warehousing costs. Chemours also says it has adopted new bulk packaging designed to be recycled or reused. "These flexible intermediate bulk container (FIBC) packages are comprised of Type B woven polypropylene (PP) fabric, which does not contain additives that would contaminate or disrupt the PP recycling process. This provides an advantage over another common fabric, Type D, which is not recyclable due to the addition of conductive fibres," says Cherie Stancik, Product Development Manager, Plastics at the company.

**Below: Ti-Pure TS-1510 is the latest addition to Chemours' sustainable $TiO_2$ product line, promising up to 30% increase in compounding productivity**


IMAGE: CHEMOURS

A pilot reuse program is already available to selected customers and may be scaled to others in the future, says Stancik. It involves collecting used FIBCs from customers, then cleaning, inspecting for safety and quality, and, if needed, repairing bags before releasing them for reuse into the same application. Bags that are deemed unsuitable for reuse are shredded for recycling.

"At Chemours, we're continuing to evolve the sustainability of our offerings, including their packages, to meet customers' needs without raising costs. Addressing circularity by increasing the recyclability of our products is a critical part of our mission to deliver sustainable solutions," Stancik says. "This is more important than ever as the pressure on the plastics industry to reduce its environmental impact continues in the form of new government regulations, international guidelines, and consumer needs."

$TiO_2$ and specialty chemical group **Venator** announced last month it has completed and exited the Chapter 11 recapitalisation process it commenced in May of this year after facing what it described as "unprecedented macroeconomic headwinds, including significantly lower product demand and higher raw material and energy costs."

The company says the recapitalisation and restructuring has resulted in an improved balance sheet and has reduced its debt from more than $1bn to around $200m. "We are now better positioned to address what continues to be a challenging market. Venator has great potential for

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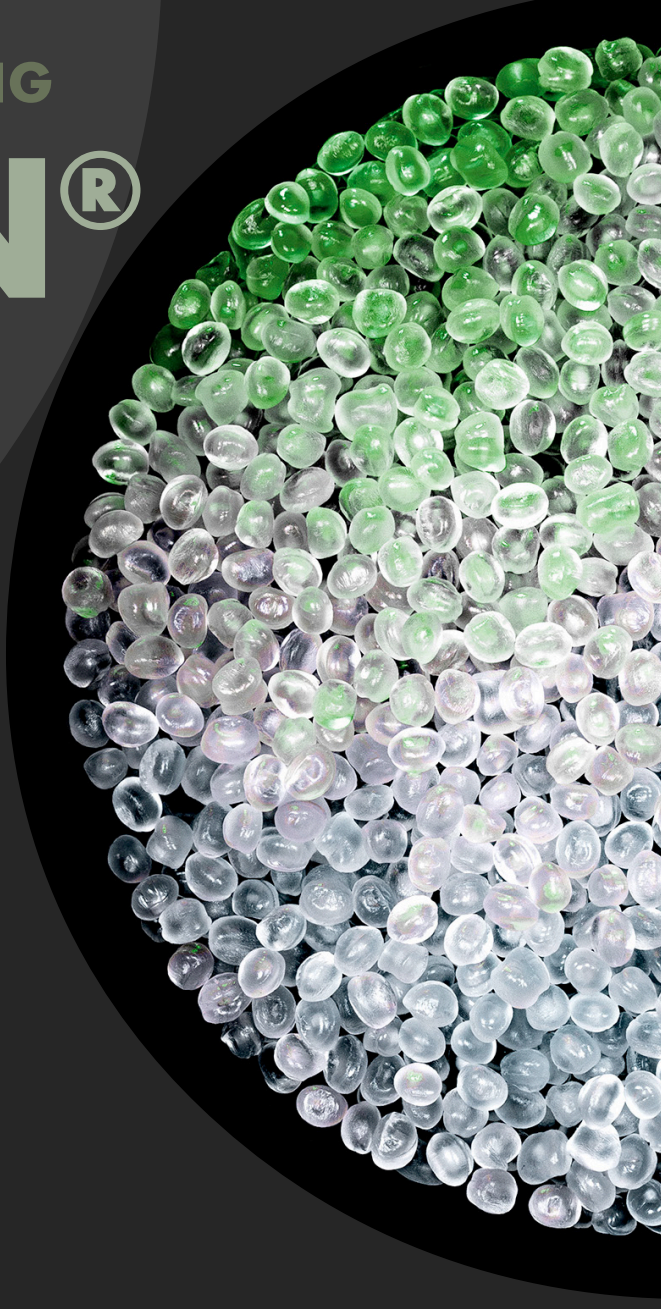

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IMAGE: VENATOR

**Above: Venator says it is better positioned to address a challenging $TiO_2$ market after exiting Chapter 11 protection last month**

long-term future growth," says President and CEO Simon Turner.

Chinese $TiO_2$ producer **LB Group** continues to invest in capacity for production of its Billions pigment grades. A 100,000 tonnes/yr chloride process plant came on stream this year at its site at Chuxiong in south east China, intermediate $TiO_2$ capacity is being increased by 100,000 tonnes/yr at its Jinchang site in the north, and a 200,000 tonnes/yr finishing plant is in build at its Xiangyang facility in the east of the country. Key $TiO_2$ products for the compounding sector include Billions LR-108, a sulphate process grade, and Billions BLR-866, a chloride process grade suitable for polyolefin masterbatch production.

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- **www.venatorcorp.com**
- **www.lomonbillions.global (LB Group)**

***Footnote: Additional reporting by Chris Smith***

# Foam process aims for pigment-free opaque bottles

Physical foaming specialist Trexel and injection moulding machinery maker Husky Technologies are collaborating, along with several brand owners, to develop a design for injection stretch blow molding (ISBM) of bottles using MuCell foaming technology to create an opacifying centre layer.

The goal of the project is to achieve a light blocking bottle without the use of pigments, which would enable the bottles to be recycled in the natural PET recycle stream, according to Levi Kishbaugh, President and CEO of Trexel.

"The combination of Husky's proprietary multi-layer technology with Trexel's expertise in the dosing of supercritical nitrogen allows for consistent placement of the foam core in the multi-layer preform," Kishbaugh says. "Encapsulating the opacifying MuCell structure with solid PET layers ensures a high-gloss surface finish on the final product."

Kishbaugh says the foam core layer provides significant light blocking, although not matching the level that can be achieved with pigments. However, while studies are still ongoing, initial trials have shown the foamed bottle can be incorporated into the natural recycle stream without detrimental effect.

- **https://trexel.com/**
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# Moving ahead in bioplastics

***The bioplastics market is not large but bio-based and compostable materials can offer novel advantages in certain applications. Chris Saunders reviews the latest developments***


**Main image: Bioplastics are drawing attention. These toothbrushes, designed by Revelop and produced using a PHA compound from CJ Biomaterials, won a Red Dot design award this year**

Interest in bio-based and biodegradable – or more accurately compostable – polymers is on the rise, even if overall volumes are small. Data published by **European Bioplastics** (based on information from Nova-Institute) shows global bioplastics production – including bio-based versions of PE, PET and PA – amounted to 1.9m tonnes for 2022. That is less than 0.5% of global plastics production (400m tonnes for 2022 according to **PlasticsEurope** data).

However, although a niche market, bioplastics (which *Compounding World* defines as plastics produced from a bio-based source) can offer reduced environmental impact and simplified waste management options compared to some of today's fossil-based polymers. While actual environmental benefits vary depending on feedstocks, production methods, application, and end-of-life options, considerable strides are being made in the sector.

"Recent developments in bioplastics have accelerated as the industry builds on the technological improvements of the past decade. This is happening across the supply chain, from resin producers and converters to brand owners and retailers, as the needs of the market and the capabilities of the materials converge to provide real solutions for customer needs," says Dr Michael Mang, Vice President of Technology Commercialisation at US-based polyhydroxyalkanoate (PHA) producer **Danimer Scientific**.

"This acceleration derives from three interrelated areas. Firstly, design for functional performance highlights the fact that new material must work for the intended end use. The experience of packaging engineers in understanding how new materials perform has allowed bioplastics to fit more quickly into intended use cases," he says.

"End-of-life performance is another area where the foundation built over time accelerates the development of new materials," Mang adds. He says there has been a convergence between the company's ability to design for specific end-of-life performance and its customers' understanding of how end-of-life works in real-world biological disposal systems.

"For example, coffee pods in the European market are an opportunity for an industrially compostable resin because the pods are disposed of with coffee grounds still present. In this case, a resin intended for home composting was repurposed and adapted," he says.

Bioplastic developers such as Danimer also have to consider how their materials will be processed. "Conversion processing is a little-considered requirement for bioplastic use. There is an installed base of conversion equipment designed and engineered for specific petroleum-based plastics," Mang says.

## Adapting to scale

"Introducing bioplastics at scale requires adapting the process and the resin, creating significant economic incentives for equipment owners to transition to higher-value materials that support greater returns." He says the company has prioritised building this conversion adaptation into its resin design process.

Netherlands-based **TotalEnergies Corbion**

(formerly Total Corbion PLA) is a specialist in lactide monomers and a leading producer of polylactic acid (PLA), a bio-based and biodegradable polymer made from renewable resources. Its Luminy PLA portfolio includes both high heat and standard PLA grades. Currently all Luminy production is focused on its 75,000 tonnes/yr plant at Rayong in Thailand (plans to build a second production plant with a capacity of 100,000 tonnes/yr at Grandpuits in France were halted this summer).

Luminy PLA is already used in a wide range of applications but could be set for more diverse uses in future, according to Vladislav Jaso, Application Specialist at the company. "PLA is well known for its use in packaging and especially food packaging. However, as a versatile polymer it can also be used in durable applications," he says.

"PLA compounding is not much different to making compounds of traditional plastics, though attention needs to be paid to proper purging of the machine before compounding and pre-drying of the PLA material. Screw configuration will depend on the additives used but Luminy PLA can be processed on conventional compounding equipment where a co-rotating intermeshing twin screw extruder with a L/D ratio of at least 28:1 is preferred."

Control of crystallisation is a key consideration in development of PLA compounds, especially for injection moulded applications. "PLA and [the isomer] PDLA, often used as nucleating agent, can be added with two separate feeders or as a dry-blend mixture through a side feeder, after which there should be enough time and mixing capacity to ensure homogeneous mixing. A liquid feeder can be added if required, and it is recommended to have atmospheric and/or vacuum degassing sections along the barrel to remove volatiles," he advises.

**Below: Boplat's durable and colourful lunchboxes are injection moulded in Luminy PLA from TotalEnergies Corbion**

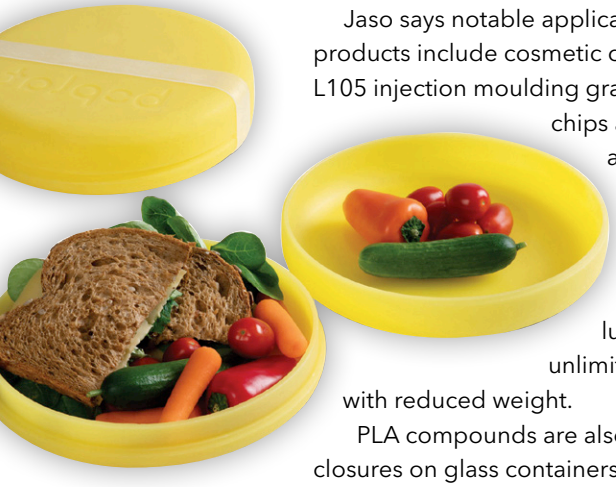

IMAGE: BOPLAT/ TOTALENERGIES CORBION

Jaso says notable applications for its Luminy products include cosmetic containers made from L105 injection moulding grade filled with wood chips and natural biodegradable binders. This is said to offer a stone/wood look and feel, good processing economics, and combines luxury and almost unlimited design possibilities with reduced weight.

PLA compounds are also used for caps and closures on glass containers where the PLA resin is combined with by-products of industrial side-streams and camellia seed shells. The compounds have been used to replace thermoset polymers where they are said to reduce environmental impact while providing a luxurious feel. Colour masterbatches are used to replace the coating process used in the incumbent product.

PLA compounds are also being used for children's toys because they are considered durable with good impact and heat resistance and excellent surface finish and colourability. In August this year, TotalEnergies Corbion introduced a 30% recycled content PLA grade to the UK market to coincide with the implementation of the plastics packaging tax (PPT).

## Growing in PLA

US headquartered **Natureworks** operates a 150,000 tonnes/yr PLA production facility at Blair in Nebraska. The plant started up in 2002 and produces PLA polymer under the Ingeo name using corn as a feedstock. The company, now a JV between US agriproducts group Cargill and Thai petrochemicals group PTT Global Chemical, has started construction of a second production plant in Nakhon Sawan Province in Thailand. Last month it gave an update on the project, which includes lactic acid fermentation from sugar cane, production of lactide monomer production, and an Ingeo PLA polymer line with 75,000 tonnes/yr capacity, saying it is on track for a 2025 start-up.

Natureworks offers a range of Ingeo grades, covering applications as diverse as food and cosmetics packaging – it has developed a coffee capsule system with Italy's IMA Coffee – through to non-wovens and medical products. The material is particularly well suited to filament-based 3D printing projects and earlier this year the company announced a partnership with Jabil to extend that to powder-based equipment. The Jabil PLA 3110P grade is said to provide a cost-effective alternative to PA12 for less demanding selective laser sintering projects.

Biodegradable polyesters such as PLA can be difficult to process and final products can suffer from brittleness. German chemicals group **Wacker** has used two of its additive products – Vinnex or Vinnex Eco and the Genioplast Pellet – in conjunction to improve both characteristics. The Vinnex range of polymeric organic additives are based on polyvinyl acetate and are said to have a proven track record when it comes to modifying biodegradable polyesters. The Genioplast Pellet range of silicone-based additives for thermoplastics compounding act as processing aids by reducing friction.

Wacker application engineers explored the effects that a combination of these additive

# Aiming for all-plastics biodegradability

Spanish plastics technical institute **Aimplas** has been working on a European project to develop chemical and biotechnological pretreatments capable of converting synthetic plastics to biodegradable materials. The work is part of the BioICEP project (Bio Innovation of a Circular Economy for Plastics), project, which commenced in February 2020.

Pretreatments being examined by Aimplas include microwave-assisted thermochemical degradation, which it says has yielded promising results by turning non-biodegradable plastic waste such as LDPE into easily biodegradable materials that totally degraded in less than 28 days. It has also studied depolymerisation of polyamides and use of reactive extrusion technologies to change the polymer structure to improve biodegradation.

IMAGE: AIMPLAS

The final proposed solution involves three technologies that are said to enhance, accelerate or increase degradation of plastics beyond current levels. The first consists of chemical disintegration processes to reduce molecular weight, including a new microwave-based technology. The second involves biocatalytic digestion with improved enzymes while the third process employs optimised microbial strains.

› **www.aimplas.net**

**Left: The BioICEP project aims to find ways to convert traditional polymers to biodegradable materials**

systems could have in a study focusing on unfilled PLA and chalk-filled polybutylene succinate (PBS). PLA is known for its rigidity and brittleness and low rate of crystallisation. It also displays poor thermal stability while its high melt viscosity and low melt strength make processing difficult. PBS, by contrast, exhibits mechanical properties similar to those of polyolefins and is a flexible, tough material with high tensile strength.

The biopolyesters used in the screening were compounded on a KraussMaffei ZE-25 twin-screw extruder then pelletised and processed into various test specimens, including injection-moulded panels, flow spirals, blown film and compression moulded panels. These were tested and assessed in accordance with industry standards and compared using non-additivated biodegradable polyesters as references. According to Wacker, the results showed that the Vinnex and Genioplast additives complement each other and exert a greater influence when employed in combination rather than separately. Processing properties and material properties were said to benefit greatly.

IMAGE: CJ BIOMATERIALS

**Right: Drinking straws from Dongil Platech extruded in a PLA/PHA bioplastic blend from CJ Biomaterials**

South Korean company **CJ Biomaterials**, which is a subsidiary of food ingredients producer CJ CheilJedang and a significant producer of PHA, has partnered with cosmetics company Riman Korea to create PHA/PLA blends for packaging its Incellderm skincare products. The company says PHA can be used to improve the functional characteristics of a broad range of polymers, where they can be applied to increase biorenewable content. They are also said to work well as modifiers with biopolymers such as PLA, where they can help accelerate biodegradation and improve functional performance. The PHA/PLA blend material will be used to package Riman's Incellderm Active Cream EX, Dermatology First Package Booster EX, and Vieton Oil Mist, which between them account for sales of more than 5.4m unit/yr.

The company has also teamed up with Dongil Platech to develop a drinking straw using PLA and its PHACT marine biodegradable bioplastic. The use of plastic straws and their presence in the environment is causing concern around the world and generating interest in alternative solutions.

## Novel performer

CJ Biomaterials claims to be only producer worldwide of amorphous PHA (aPHA). This is a more rubber-like version of PHA that offers fundamentally different performance characteris-

tics to the conventional crystalline or semi-crystalline forms. The company says interest in aPHA as a performance boosting component in bioplastic compounds has increased over the past year in a wide range of end markets, including cosmetic packaging, food packaging and organic waste management.

The company says in the food packaging market in particular, brands are responding to consumer demand for products with more bio-based content and end-of-life options such as composting. It says aPHA provides a practical solution as it is TUV OK-certified for industrial and home composting and is both soil and marine biodegradable. Recent tests have shown that blends of PLA and aPHA can be made home compostable (pure PLA can only be composted in industrial plant) if the aPHA/PLA ratio is greater than about 0.5. The company says this is significant as it extends the range of applications for PLA/aPHA blends to areas such as flexible packaging.

"The use of aPHA has increased over the past year as more organisations have started working proactively to replace plastic with more sustainable solutions, but we expect the speed of adoption to continue to accelerate. Right now, there is a lack of understanding about the value and unique advantages of aPHA. It's similar to the 1950s when polyethylene was introduced. The market had to figure out what the new material was and how to use it effectively before they could start working with it," says Raj Krishnaswamy, VP, Research & Development at CJ Biomaterials.

He cites the example of cosmetic packaging developed for CJ Olive Young, which is a leading

IMAGE: CJ BIOMATERIALS


**Left: CJ Biomaterials says its aPHA bioplastics can be used to create home compostable PLA/PHA blends**


**Right: These reusable drinking cups are produced in Woodly's wood-based bioplastic and in use in Finland**

health and beauty retail chain in Korea. "The new cosmetic case was developed by combining aPHA with PLA to replace acrylonitrile butadiene styrene [ABS]. Some developed countries and leading cosmetic brands are actively making efforts to replace ABS, which is a petroleum-based, non-biodegradable plastic, and the PLA/aPHA blend introduced an eco-friendlier alternative. More recently, we worked with Banila to develop the world's first 100% biobased cosmetic jar using aPHA technology."

This October, CJ Biomaterials was awarded a German 2023 Red Dot Design Award for the PHA Head-Up Toothbrush, developed in collaboration with Australian eco-designer company Revelop. The toothbrush was a winner in the 'Sustainable' category within the Design Concept discipline. "We hope recognition in the Red Dot Design Award will help to promote the advantages of PHA and accelerate the commercialisation of PHA-based products by demonstrating the versatility of its applications in various end products," says Max Senechal, Chief Commercial Officer of CJ Biomaterials.

## Wood solutions

Produced in Finland using wood cellulose, **Woodly** is a part renewable polymer said to display characteristics similar to conventional fossil plastics while being both carbon neutral and recyclable. The material, which is 40-60% bio-based depending on the grade, was selected recently by several entertainment venues for production of reusable drinking glasses as part of a programme to promote sustainability in the leisure and tourism industry.

"With these reusable glasses, we're not only reducing our environmental footprint but also providing our customers with a greener option that contributes to a more sustainable nightlife culture," says Kimmo Sirviö, Chairman of the Board of SKA-Ravintolat, a nightclub involved in the scheme.

Woodly currently offers two product lines. The 100 series grades are said to be suitable for both blown film and cast film extrusion. Films are clear and transparent and can be thermoformed. The 200 series are developed for injection moulding and also offer transparency and clarity. Woodly materials are said to be suitable for food contact applications but are not compostable. Hromatka Group's **Guzman Polymers** was appointed distributor for Woodly in Spain, Portugal, Italy and Turkey earlier this year.

Bio-based compounds are not just restricted to PLA and PHA – a number of performance polyamides are also either fully or partly bio-based. Turkish compounder **Eurotec**'s Techmidbio line of part of fully bio-based engineering compounds are based on polyamides such as PA5.6, PA5.10, PA11, PA6.10, PA10.10 and PA10.12. Developed as replacements for PA6 and PA66 in automotive and white goods applications, the company says bio-based content depends on the matrix material and reinforcement type.

Examples include Tecomidbio NI40 CR30 BK111 HS, which is a PA6.10 reinforced with 30% recycled carbon fibre formulated for automotive applications, and Tecomidbio NR30 NL CA, an unfilled and heat stabilised PA11 offering high dimensional stability, low moisture absorption and low density. The company has also developed part bio-based grades offering the high hydrolysis required for connectors and housings used in electric vehicle cooling systems. These include Tecomidbio NQ40 GR30 NL HS 30% glass fibre reinforced PA5.10 and Tecomidbio NI40 GR30 NL HS 30% glass fibre reinforced PA6.10.

Tecobio is a fully biodegradable product line based on PLA, PBS, TPS and PBAT blends with natural or synthetic additives and reinforcements. Tecobio PL30 WR30 NL is a 30% wood filled PLA designed for use in pens, toothbrushes and cutlery. Tecobio PL40 MF25 NL 01 is a 25% mineral filled PLA/PBS blend that developed for cutlery requiring higher heat resistance.

**CLICK ON THE LINKS FOR MORE INFORMATION:**

- **www.european-bioplastics.org**
- **https://plasticseurope.org/**
- **https://danimerscientific.com**
- **www.totalenergies-corbion.com**
- **www.natureworksllc.com**
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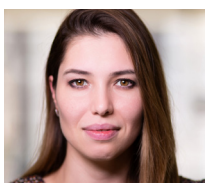

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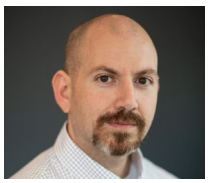

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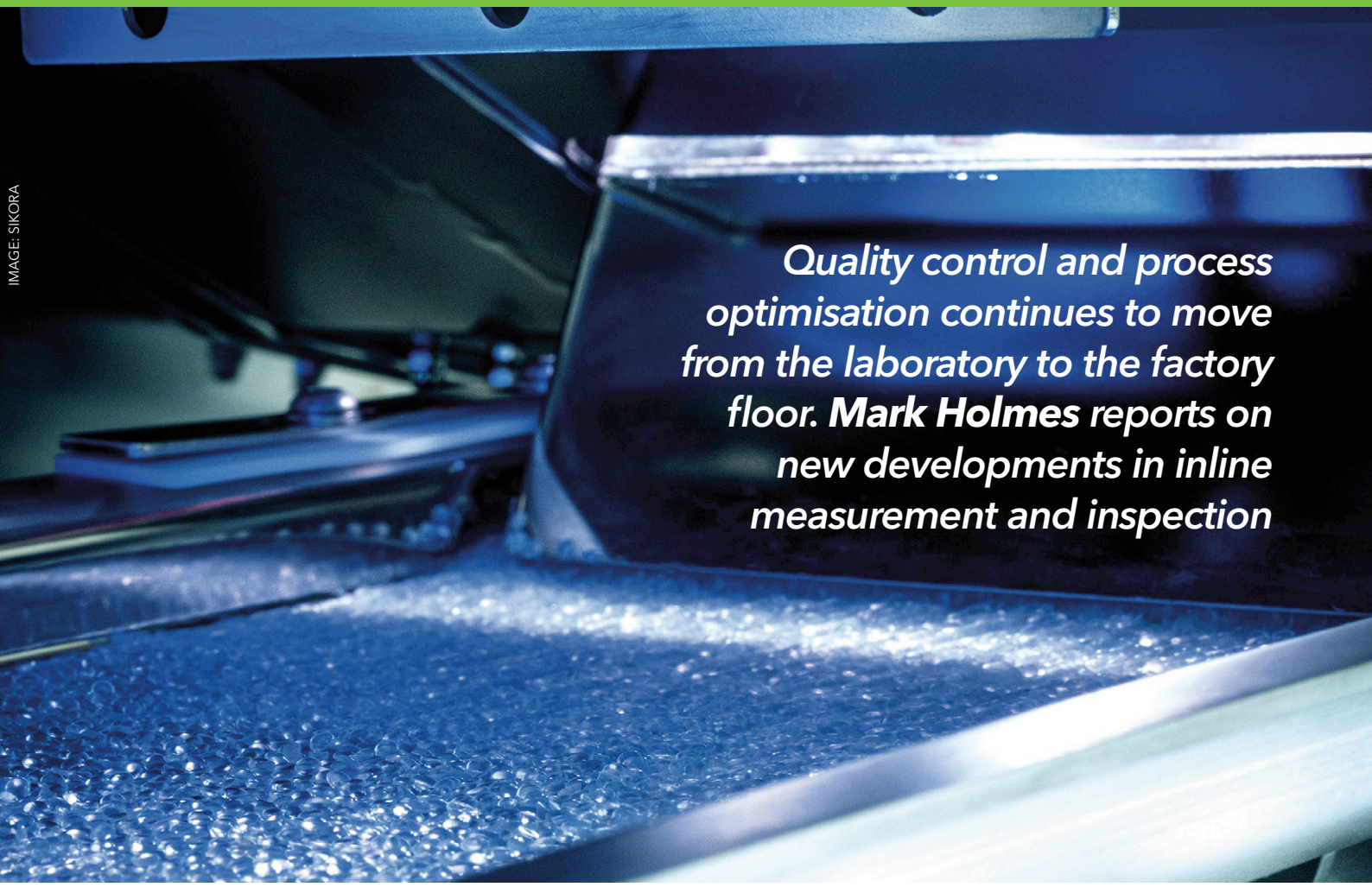


IMAGE: SIKORA

*Quality control and process optimisation continues to move from the laboratory to the factory floor. **Mark Holmes** reports on new developments in inline measurement and inspection*

# Measuring up in real-time

Growing demand for real-time product quality and process characterisation, as well as the ongoing shortage of skilled compounding plant operators, continue to drive interest in and deployment of inline measurement and inspection systems. Having lab-standard data available online can speed up decision making, reducing the risk of off-spec production.

Following the introduction of the RecyColor automated colour control system last year for recycling applications, Germany-based **ColVisTec** says it is continuing to explore the use and application of artificial intelligence (AI) solutions in its inline measurement and inspection systems. "We are currently working with the South German Plastics Institute **SKZ** on innovative measuring probes for near infrared (NIR) measurements for applications directly in the polymer melt. With an increased emphasis on recycling, we see the detection of impurities and avoidance of contamination as crucial," says Fuat Eker, Director of Sales, Marketing and Customisation.

"In addition, we see the market for inline technologies continuing to grow. Customers demand the highest quality, both in compounding virgin material and in recycling. We have also been seeing a shortage of skilled labour for some time now," he says. "Decision making towards technological solutions is now mature. Inline monitoring with real-time material quality information directly from the process is one key element of that technological solution. This also addresses seamlessly the loss of experienced employees in the coming years as they retire."

ColVisTec says that an inline measurement and inspection system for plastics compounding provides the process manager or operator with continuous information about the status of their production progress without having to wait for results from samples tested in the laboratory.

"The InSpectro X records the raw spectrum of the polymer in the melt. From this, a lot of additional information can be obtained, such as homogeneity, dispersion and distribution of the formulation components in the polymer matrix, and yellowing/degradation. In addition, any process variations, drifts or single events including feeding errors, vacuum, melt filter problems such as

**Main image: Inline technologies such as Sikora's Purity Scanner Advanced pellet inspection system raise quality and can cut the time between detection to rectification of process issues**

IMAGE: COLVISTEC

**Right: A ColVisTec inline probe installed in the die to provide fast insight into the extrusion process**

accumulations, breakthroughs, contamination, filtration and mixing performance can all be determined," Eker explains.

Understanding an extrusion process requires proper characterisation of a complex multi-parameter system, according to Eker. "Quality relevant process parameters, as well as their process windows, can be determined easily. For this purpose, ColVisTec offers ReTA (Residence Time Analysis), a special and unique software tool. With this software, residence times are detected quickly and with fine resolution, which avoids the collection and complex analysis of samples and long waiting times," he says.

"ReTA analyses residence times (dwell) that are measured in seconds with the InSpectro X. After three mouse clicks, all residence time relevant data are calculated and displayed in figures, as well as graphically. This fast method allows, for example, the optimisation of the screw configuration for a specific recipe, determination of process windows for speed and throughput, and determination of screw wear," Eker says.

The ReTA software allows optimisation of the extruder and the process to be achieved quickly and easily, Eker says, adding that the InSpectro X inline technology can also provide extruder application real-time information about the current status of the process via the colour of the processed product, measured detected directly in the polymer melt.

## Continuous need

According to ColVisTec, any continuous production process requires continuous monitoring of product quality but inline process monitoring in extrusion is particularly relevant because many different formulation components must be produced homogeneously and constantly over extended periods. Measuring technologies that only record machine data and do not provide information on the processed product are not sufficient as the quality demands of customers are increasing and the costs –both in time and money – of off-spec production must be avoided.

The company highlights that a customer recently developed a new formulation for a product, as well as the process for its production, using inline measurement and inspection. "The customer decided to use a premix of two components in order to use a single feeder. The expectation of this approach was that it would provide a better and more homogeneous product. We supported the customer in this project with inline measurement in the extruder using InSpectro X and a reflectance probe. InSpectro X quickly showed that segregation was taking place. The material was particularly inhomogeneous ," says Eker.

"Based on rational data, we proposed that the two components of the formulation should be introduced through two feeders in a split feeding process. This resulted in a consistent material and a robust process," he says.

AI is attractive as a potential tool in terms of inline measurement and inspection. Eker says that any AI-based algorithm requires relevant and reliable data. In a continuous process, a lot of machine data – for example, pressure, temperature, speed and throughput – has been available for quite some time and he encourages its use. However, he emphasises that quality data, such as viscosity, dimensional data, and homogeneity, as provided by ColVisTec's InSpectro X, raises this to another level and allows a batch of material to be produced and documented from the first to the last pellet.

Continuous measurement collects and stores a lot of data, so it is necessary to be able to analyse it quickly and in detail to gain knowledge from it. For this purpose, ColVisTec has developed RedLog, a new software product that was introduced at last month's Fakuma trade fair in Germany and will be shown at the Compounding World Expo in Cleveland in the US later this month. RedLog presents an overview of measurement data from a whole year and is able to zoom into a single raw data file (if required) with an emphasis on data visualisation of an individual batch. Various options allow 2D and 3D representations that can also be graphically and number based.

According to German company **Sikora**, which manufactures inline pellet inspection systems, the

market for inline measurement and inspection equipment is being driven by demand for high performance technical plastics, in particular for the medical, aircraft and automotive industries. "These require the highest quality standards, as well as reliable control and processing of raw materials. Accordingly, the requirements for the purity of these materials are particularly high. We see a strong demand for high purity materials by compounders, as well as all plastics manufacturers and processors worldwide," says Ralf Kulenkampff, Head of Sales, Plastics.

"Our customers appreciate the highest detection rates, process stability, reliability and simple handling offered by our system. This applies to all customers, from cable manufacturers and raw material producers to contract sorters and compounders. We have a strong R&D department that is continuously working on new solutions. Through close cooperation with the customer, successful solutions have already been developed and incorporated as standard into the device," he says.

Due to the modular system design of Sikora's Purity Scanner Advanced pellet inspection system, different camera types can be used depending on the particular material being inspected. In addition to optical cameras, which reliably detect black specks and discolouration, an X-ray camera can be installed to detect metallic contaminants.

Many systems on the market use a maximum of two optical cameras, the company claims. However, these can quickly reach their limits due to relatively low coverage and field of view. For this reason, Sikora offers the option of a third optical camera. This offers a significantly higher detection rate and is particularly advantageous where a Purity Scanner Advanced system is integrated directly into a production line, as inline multiple sorting with a typical two-camera system is not possible.


IMAGE: SIKORA

Sikora says that the Purity Scanner Advanced system automatically separates out detected contamination through a blow-out unit. While the three-camera set-up provides a higher detection rate, optimisation of the sorting is important and it has developed a hybrid blow-out feature for this reason. This allows the customer to define in advance which impurities in the material represent uncritical contamination, for which there is a smaller blow-out unit. This might include, for example, small, light-coloured black specks that frequently occur in material. The larger blow-out unit is then specified for critical contaminants, such as metal inclusions, that can impair the functionality of the end product.

## Pellet inspection

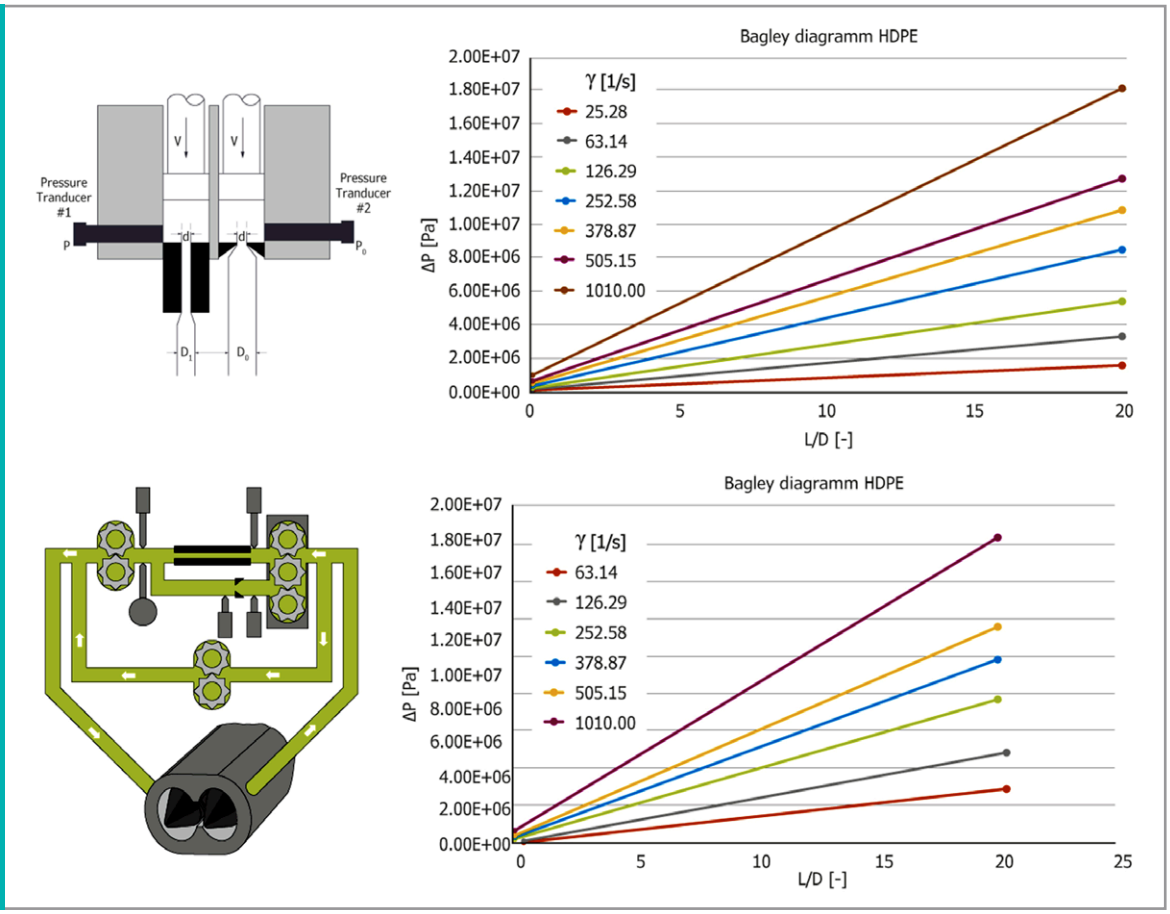
Italy-based **Industrie Polieco-MPB** is a large European compounder of polyethylene and polypropylene. It uses Sikora sorting systems for quality control to inspect and sort pellets used for production of films for food packaging. It is using a Purity Scanner Advanced unit to inspect for impurities at the final step of its process for production of maleic-anhydride grafted functional polymers. These polymers are used as adhesives and/or coupling agents and are used in products that will come into contact with food and/or drinking water including tie-layers in multilayer food packaging films or multilayer pipes for hot and cold water installations.

Sikora says that its system is reliably detecting pellets with colour deviations, as well as pellets with small black spots on the surface. These are both defects that can occur due to side-reactions during production of grafted polymers. The system automatically sorts out all detected contamination starting at a size of 50 microns. Furthermore, it provides various statistics as well as an image gallery of the detected contamination, which helps in optimising production.

"During the development and continuous improvement of our production processes, we have been able to minimise the formation of black spots and of pellets with colour deviations," says Marina Ausonio, Research & Development Executive at Industrie Polieco-MPB. "However, the presence of such defects cannot be completely avoided. Sorting systems like Sikora's Purity Scanner Advanced have the essential task to get rid of such residual defects so that we can provide our clients with a superior quality material."

German company **Göttfert** has developed an inline rheometer for continuous measurement of extensional viscosity during extrusion. The company says that online process monitoring of

**Left: Sikora's Purity Scanner Advanced pellet inspection system is designed for 100% inline inspection**




**Figures 1a and 1b: Comparison and example measurements with Bagley correction for a twin die capillary rheometer (top) and Göttfert's RTS inline rheometer (bottom) with long and short dies**

***Source: Göttfert***

rheological properties is essential for fast and effective process control of polymer production in polymerisation and pilot plants, as well as in compounding operations.

## Continuous MFR

Currently, the most common task for online capillary rheometry has been continuous determination of melt flow rate (MFR) and melt volume rate (MVR) in order to adjust production slots for an individual polymer specification more quickly. To characterise the processability of a polymer, other rheological parameters, such as shear and elongation viscosity, are also of particular interest.

The Göttfert inline rheometer (RTS) is an online die rheometer with two capillaries that measure simultaneously. The arrangement is similar to the process for making laboratory measurements using a twin-die capillary rheometer. The measurement is carried out with a long and a short capillary, with the pressure loss of each capillary plotted over the length/diameter (L/D) ratio of the die and extrapolated to L/D of zero using the Bagley correction to determine entrance pressure loss,then corrected for the shape of the velocity profile by Rabinowitsch-Weissenberg. Using the Cogswell model, elongation viscosity is calculated from the entrance pressure loss and the apparent shear stress and shear rate of the long capillary (Figure 1a and 1b).

Experiments with a high-pressure capillary rheometer are often the only way to determine viscosity at higher, process-relevant shear rates. The measuring principle requires different corrections to be made to get true shear rate and shear stress. When these corrections are made, reliable viscosity data can be obtained. Göttfert says that which corrections are actually necessary, and the order in which they are applied, depends on the individual application.

The company says the advantage of the use of the long die and zero length die in the RTS is that existing bores on existing devices can be used to retrofit or convert to this test method. This arrangement, which is also possible in the company's MBR-TD bypass system, opens up the possibility of measuring melt index in addition to measuring shear and elongation viscosity.

Göttfert has checked the arrangement against comparative measurements made with its RG75 capillary laboratory rheometer. These were made with a capillary configuration of 40/2 and 0/2 mm L/D for the laboratory system and 60/2 and 0/2 mm on the RTS online device. Two LDPE materials were examined.

The company says the investigation was carried out at an average shear rate range of 20-1000 $s^{-1}$

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and the viscosity was corrected in each case using Bagley (entrance pressure loss) and Rabinowitsch Weissenberg. Elongation viscosity and elongation rate were calculated using the Cogswell model from the entrance pressure loss, which is determined by the Bagley correction, and apparent rheological data. Elongation viscosity function determined in this way provides a simple description of the visco-elastic processes.

The curves for the two LDPE materials measured at 190°C show the characteristic curve of the strain hardening for the elongation viscosity due to the polymer branches in the test material (Figure 2a and b). Both materials have the same MFR of 4 g/10 min, so cannot be differentiated using the MFR method. Göttfert says the viscosity slope shows only relatively minor differences, but elongation viscosity differs significantly with the second material displaying a much more flexible course of elongation hardening with higher values.

Numerical analysis provides a clearer picture, the company says (Table 1). While there is no selectivity for the melt index, extension viscosity shows a clear difference of over 60% as a result of the different branching, whereas the viscosity gives an opposite evaluation. However, shear viscosity correlates with average molecular weight. It says this example shows that a clear material differentiation with different molecular weight distribution or branching is possible via elongation viscosity. This has not been detectable through the methods frequently used up to now, such as determination of melt index, the company says.

**Table 1: Comparison of the selectivity of melt index, viscosity and elongation viscosity for two LDPE materials**

| Material | LDPE1 | LDPE2 |
|---|---|---|
| Melt index [g/10 min] | 4 | 4 |
| Difference [%] | - | 0 |
| Shear viscosity [Pas] at ý=1/s | 5611 | 5006 |
| Difference [%] | - | -10.8 |
| Elongation viscosity maximum [Pas] | 18600 | 30500 |
| Difference [%] | - | +64% |

*Source: Göettfert*

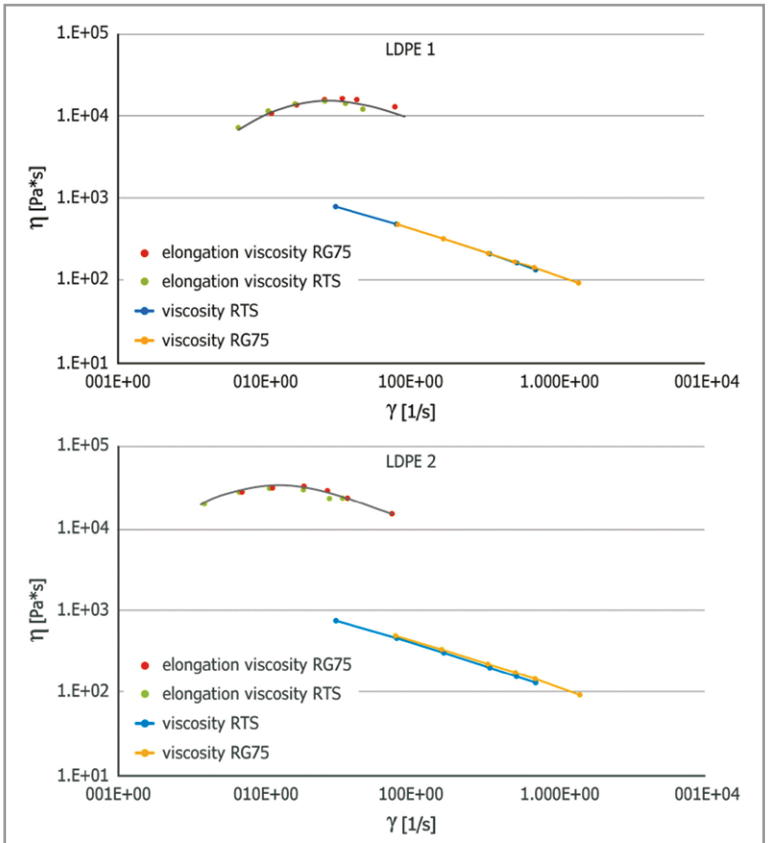


**Figure 2a and 2b: Comparison of shear and elongation viscosity measurements between online and laboratory measurements of two different LDPE materials.**
*Source: Göttfert*

## Leasing options

US-based **Equitech International** has introduced a new leasing scheme with the aim of making its inline UV-Vis colour measurement technology more accessible. The company says that, until now, the cost of in-line colour measurement has been a barrier to companies that have a need to implement this technology in their production lines. It says access to its in-line UV-Vis colour measurement technology is now possible for a few thousand dollars per month, eliminating the need for capital expenditure.

According to Equitech, colour can convey information indicating the consistency and quality of products. It has long been measured by taking samples from the process line and analysing them using laboratory spectrophotometers. However, offline colour measurement provides information about past events – whether they took place an hour, a shift or a day ago. For example, offline colour measurement cannot detect pulsating feeders, drifting processes and uncontrolled startup phases.

The company says the advent of Industry 4.0, machine learning and AI, means that quality control systems will migrate from laboratory analysis to real-time quality assurance, providing information about the current process but also potentially into the future using predictive analytics.

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- **www.colvistec.de**
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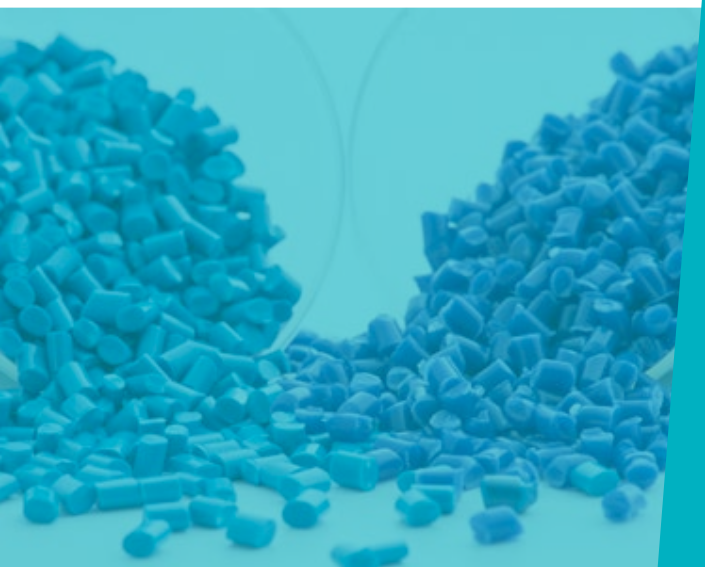

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# Achieving a better mix

***The latest mixing technology developments aim to improve dispersion while minimising energy use in both compounding and blending applications, writes Mikell Knights***

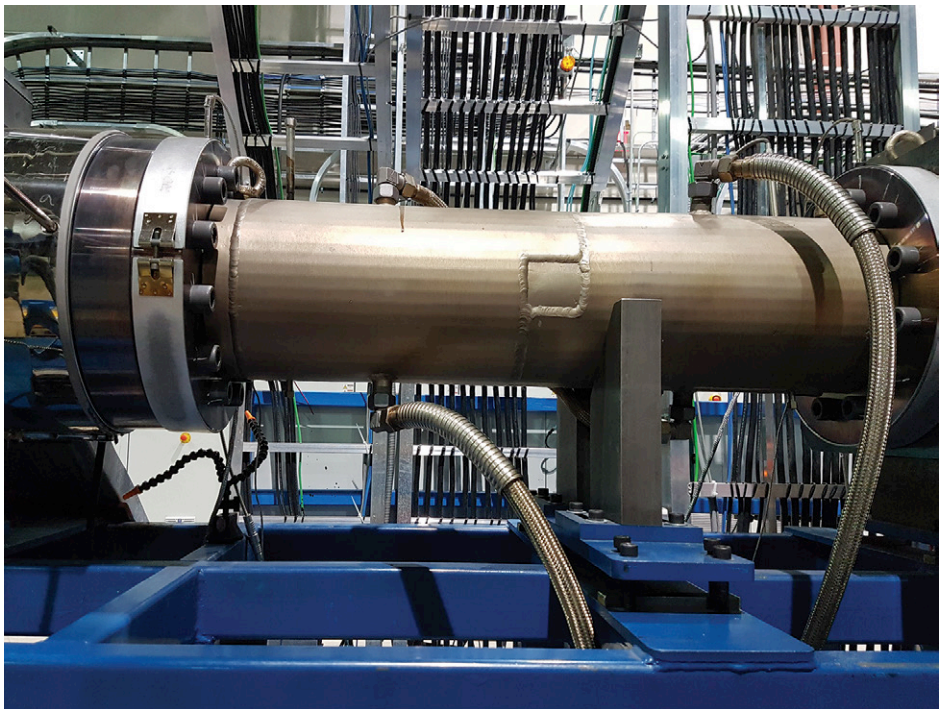


IMAGE: PROMIX SOLUTIONS

**Main image: The Promix static cooling mixer fits between compounder and pelletiser to improve physical and thermal homogeneity**

Developments in high-speed mixers and hybrid mixing technologies are targeting improvements in dispersion, energy efficiency, monitoring and control, providing compounders with solutions able to handle a widening array of processing types and the challenges that come with them.

Continuous mixer specialist **Farrel Pomini** has long argued it is the optimal technology for processing temperature sensitive materials because of the controlled levels of shear imparted into the polymer blend. The chamber and rotor cooling features permit increased heat extraction during processing as well as minimal residence time which limits thermal exposure, the company says.

It adds that it sees significant feeding challenges in handling recycled materials and biopolymers which, due to their temperature sensitive nature, present difficulties that will require innovations in processing and feeding technology. The irregular shape of recycled material feed stock and the low bulk density of materials such as biopolymers are churning the wheels of developments, the company says.

The company's R&D department is working on developments that improve efficiency and contribute additional value for customers, citing its continuous mixer design as being well suited to applications including recyclate processing, direct mechanical recycling and chemical recycling. In such applications, energy efficiency of processing equipment is important not only to maintain profitability, but also to impart less specific energy into the polymer, to minimise heat history and maintain molecular structure.

Farrel Pomini marked both the 175th anniversary of its formation and the 60th anniversary of the introduction of its Farrel Continuous Mixer (FCM) technology earlier this year. This is based on two counter-rotating, non-intermeshing rotors running within a large free volume mixing chamber. This allows for liberal material circulation and good distributive mixing, while the specialised rotor geometry enables efficient levels of shear and excellent dispersive mixing.

Other key features include a single large feed port that allows materials to be fed into the mixer separately or as a pre-blend, while liquids can be injected directly. The system is also energy efficient. "Energy efficiency is often a primary consideration when selecting compounding equipment and can be a competitive advantage for processors," the company says.

## Static improvements

Co-rotating twin-screw extruders perform the main mixing task in compounding processes, where different plastic raw materials including additives, colour masterbatches, blowing fluids, or recycled


IMAGE: FARREL POMINI

**Right: Farrel Pomini celebrated the 60th anniversary of its FCM continuous mixing technology earlier this year**

plastic fractions must be plasticised and mixed before pelletising, says Rolf Huesser, CEO of **Promix Solutions**. However, shifting some of that task to a device that incorporates static mixing and cooling technology can deliver benefits.

Intended for installation between the outlet of the twin-screw extruder and the pelletiser, the Promix cooling mixer is designed to further mix and homogenise the raw materials and additives while providing precise temperature control and additional melt cooling. Its patented technology is said to combine a static mixer and high-performance static melt cooler. It features a lattice of hollow metal bars that intersect with each other and are designed to provide highly efficient mixing of the melt with cooling over its cross-section.

Thermal oil can be circulated though the bars to provide control of melt temperature prior to pelletising. Promix says that an excessively high temperature of the material prior to pelletising will result in inconsistent granule size, reduced production capacity or could even shut down the process.

The Promix unit is said to allow mixing to be carried out at high capacity without compromising quality. It provides effective yet gentle mixing, avoiding high shear intake and degradation of the compound. The cooling mixer technology is available for lab-scale applications processing a few kg/h up to industrial lines with throughputs of more than 10,000 kg/h.

Promix technology is already being applied in injection moulding applications. In one example, an Asia-based manufacturer of inhaler housings was struggling with colour streaks in their injection moulded parts, leading to above-average reject rates and higher quality control and inspection costs. Increasing the back pressure, the usual solution for this type of defect, provided a slight improvement but resulted in longer cycle times and, consequently, lower productivity.

"If you look closely, you will find machines in a lot of injection moulding companies are not running optimally and (are producing) injection moulded parts that are causing problems. You can think of increased cycle times, part warpage, colour streaks, high masterbatch consumption or weak points in flow seams," says Promix Solutions' Heusser. He says after installing a Promix mixing nozzle colour streaks were eliminated with cycle times being shortened by a further four seconds, which resulted in an overall productivity increase that the customer put at 12.5%. The investment costs were paid back within two months.

**The Promix cooling mixer combines static mixer with advanced integrated thermal regulation to lift compound and pellet quality**

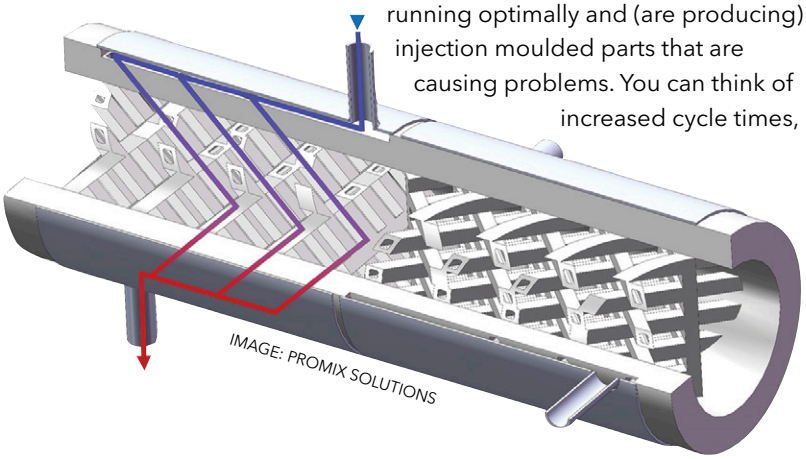


IMAGE: PROMIX SOLUTIONS

## Multiplicative mixing

US single-screw systems maker **Randcastle Extrusion Systems** has developed a type of multiplicative mixer for compounding applications that Chief Executive Officer Keith Luker calls the Molecular Homogenizer. He says there are two types of multiplicative mixers: static and dynamic. The Molecular Homogenizer is a dynamic multiplicative mixer, Luker says, claiming design and processing advantages over both static mixers and twin-screw extruders by providing dynamic multiplicative mixing.

Static multiplicative devices emulate the Baker's Transformation, a mathematical concept that describes how a continuous process multiples the result. Luker says a simple way to explain the concept is to consider a piece of string that is repeatedly stretched, divided and reassembled. While the transformation itself (the process of folding and stretching) is simple, when it is applied many times the outcome becomes highly complex and difficult to predict.

Typical multiplicative devices for polymers emulate the Baker's Transformation, with the most common multiplicative device being the twisted ribbon, which has a multiplier of two (meaning it doubles the layers with every twist), according to Randcastle. After eight twists, the twisted ribbon makes 256 layers.

However, a disadvantage of static multiplicative

mixers is that they are only better mixed in two dimensions. "That is their fundamental flaw because what's needed is better mixing in three dimensions," says Luker. The Molecular Homogenizer has a multiplier of 100 and, treated like a two-dimensional static mixer, he says its seven mixing elements make 100 trillion layers.

Randcastle says the Molecular Homogenizer, like a static mixer, is simply designed, works the same no matter how the mix changes, and once installed does its job without operator intervention. The device also does not use pressure to convey the mix as is required with a static mixer, so output is not compromised. And, unlike a twin screw extruder, it does not require taking apart and reassembling. More details of the function of the device can be found in *Compounding World*'s **recent article** on alternative compounding technology

### Changing requirements

Production practices in mechanical process engineering are changing due to new requirements and the need for more frequent product changes for compliance with stricter occupational and environmental protection restrictions, says Hans-Joachim Jacob, Senior Expert Process and Applications at **Ystral**, a Germany-based mixing and dispersion technology specialist. He has identified five trends in mechanical process engineering that processors need to be aware of to enhance productivity (**more here**).

Forward-looking process technologies rely on process intensification to achieve more efficient use of time, energy and raw materials. Jacob says Ystral's Conti-TDS disperser is operated outside of the vessel and designed to concentrate the processes of wetting and dispersing in one dispersing zone with an effective volume of only approximately a quarter of a litre. Compared to a high-speed dissolver operated inside the vessel, it generates approximately 30,000 times higher volume-specific power – crucial for successful dispersion – while the rotor-stator system builds up shear forces a thousand times higher for extremely short material dwell times.

More rigorous specifications concerning occupational safety, growing hygiene demands, and use of sensitive electronics mean processes must operate free from dust, gas and fumes. Conventionally, powder materials are added in an

open process. Jacob says health hazards can be avoided with direct powder induction systems. Closed circuit addition also avoids contamination of the product being mixed. Ystral's technological solutions can seal powder and liquid components off from the ambient air by means of sterile filters.

Another trend is to the use of a flexible machine and plant design as a response to requirements such as variable batch sizes and ever more frequent product changes. Manufacturers must be able to produce many product versions and newly developed products in an order and user-oriented way. With a rigid design, machines and plants must be replaced completely in case of a process change. Jacob says that Ystral's modular principle can be adapted and extended in accordance with requirements.

Finally, he says changes in process technology are varied and do not always point in just one direction. While for example, there is a development towards a reduction in batch sizes in some industries, others are moving in the direction of larger output quantities and continuous inline processes. However, independent of the direction a trend in an industry moves, Jacob says future solutions must enable decreased production costs, shorter production times, improved plant efficiency, lower energy consumption and more efficient use of raw materials.

**Below: Ystral says today's mixing plant must be flexible and efficient, while meeting tougher safety standards**

## High speed models

The **Caccia Myx** division of Plantech-CST – part of the Italian Synchro Group of companies, – has developed its third generation of high-speed mixers. According to Paolo Gasparotto, General Manager of Syncro Plantech North America, the company has invested in new mixing developments over the past two years, bringing in-house resources and building on more than twenty years of market experience in terms of design and project management.

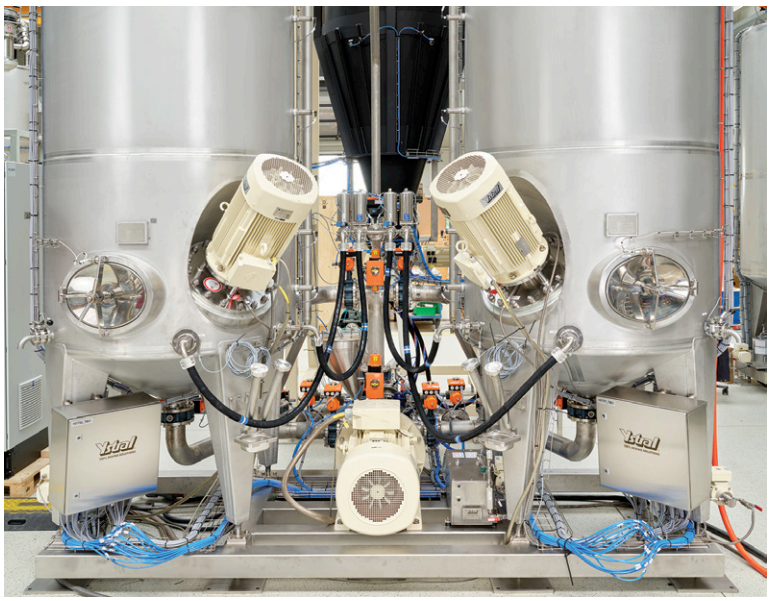


IMAGE: YSTRAL

At this year's Plast trade show in Milan, the company presented a project for a complete mixing and cooling system for PVC that Gasparotto says combines the distinctive expertise in engineering with technical features from Caccia Myx and Plantech-CST.

He says the Heating-Cooling Mixer RCH+RCC meets the highest requirements for preparation of rigid or plasticised PVC dry blend, guaranteeing good blend quality and high throughput with easy production changes and maintenance. The RCH mixers are used where friction mixing is required. The tools rotate at high speed to induce heat into the mixing material by friction, applying only as much energy as is necessary while ensuring gentle material treatment and good dispersion of the various components is achieved. RCH mixers are built in a modular design and include an inclined discharge valve that ensures efficient emptying of the mixing vessel.

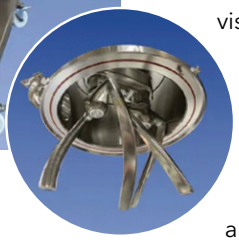
Syncro-Group also developed the HP Horizontal Cooler RCC unit for rigid or plasticised PVC dry blends, featuring agitators engineered to ensure optimal contact of the product with the cooling surface. This mixer line now has a newly designed structure and water cooling circuit to maximise efficiency. It also features adjustable blades to reduce product deposits in the cooling chamber.

RCO horizontal coolers are used where large capacity and good cooling efficiency is required. They feature a special "U" design that allows cooling and homogenisation of several batches from the mixer. In many applications RCO horizontal coolers are used as holding vessel. The RCV Vertical Cooler mixers are used in cases of restricted space requirement where ease of cleaning combined with cooling efficiency are needed. The company also offers the RCT Container mixer as a versatile solution where good homogenisation, colouring and dispersion quality is required.

On the business side, the company has recently established a new US headquarters – Syncroplantech North America – at Charlotte in North Carolina, from where it will provide sales and technical support across all divisions of the Syncro Group. This includes Syncro Srl, Plantech-CST with Caccia Myx Division, Eur.ex.ma, Plasmec, SB-Dry and Acelabs.

US mixer manufacturer **Ross** has broadened its lineup of double planetary mixing systems for handling ultra-high viscosity materials. The Sanitary Double Planetary Mixer model DPM-4S


IMAGE: ROSS



**Left: The latest addition to the Ross mixer line up is the Double Planetary Mixer model DPM-4S**

and Sanitary Discharge System model DS-4S provide an engineered portable mixing solution for efficient processing of medical grade silicone formulations in a portable workstation.

The company says it has developed a new model in its VersaMix Multi-Shaft Mixer line, for processing of medium to high-viscosity products. The VM-450 gallon VersaMix model features three independently driven agitators, including a two-wing center-mounted agitator with contoured bottom and Teflon scrapers to efficiently motivate viscous product throughout the mixing zone. A long helical flight agitator produces better top-to-bottom mixing and a dual propeller agitator low shear, high flow mixing, the company says.

Ross also added a model its line of Dual Shaft Mixers, which it describes as robust and versatile systems that are powerful enough to handle batch dispersions, suspensions and emulsions with viscosities up to several hundred thousand centipoise. The company says its custom-built Ross FDA-3500 unit has a maximum working capacity of 3,500 gallons and is designed with a two-zone stainless steel dimpled jacket for heating/cooling. It is also a multi-agitator system.

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- **www.farrel-pomini.com**
- **www.promix-solutions.com**
- **www.randcastletechnology.com**
- **www.ystral.com**
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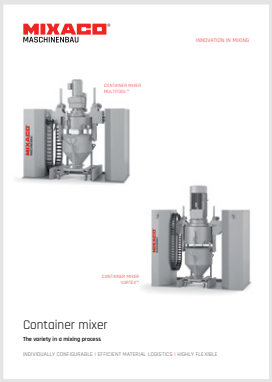


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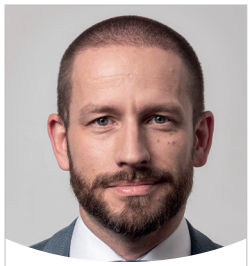

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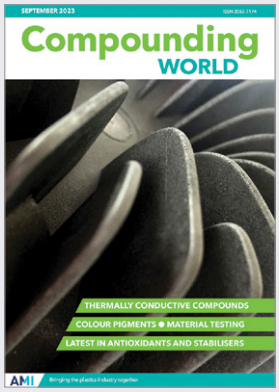


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**Plastics Recycling World October 2023**
The October edition of Plastics Recycling World takes a look at innovations in extruders for plastics recycling. It also includes a review of the state of chemical recycling investment and explores the latest in recycling additives and odour reduction.

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**Pipe and Profile October 2023**
The October 2023 edition of Pipe and Profile Extrusion magazine looks at the latest in pipe inspection techniques and standards. It also explores developments in materials handling equipment, pipe for the oil and gas industry, and innovations in oriented PVC pipe.

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**Film and Sheet October 2023**
The October 2023 issue of Film and Sheet Extrusion magazine includes feature articles on recycling/ granulation, extruder developments, biaxial film and mineral fillers. There is also a preview of exhibitors at PEWE North America.

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Compounding WORLD
Film and Sheet EXTRUSION
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Plastics Recycling WORLD

## GLOBAL EXHIBITION GUIDE

| | | | |
|---|---|---|---|
| 2023 | **15-16 November** | Compounding World Expo USA, Cleveland, USA | www.compoundingworldexpo.com/na/ |
| | **15-16 November** | Plastics Extrusion World Expo USA, Cleveland, USA | www.extrusion-expo.com/na/ |
| | **15-16 November** | Plastics Recycling World Expo USA, Cleveland, USA | www.plasticsrecyclingworldexpo.com/na/ |
| | **15-16 November** | Polymer Testing World Expo USA, Cleveland, USA | www.polymertestingexpo.com/na/ |
| | **22-25 November** | PlastEurasia, Istanbul, Turkey | https://plasteurasia.com/en/ |
| | **28 Nov-2 Dec** | IPF Japan 2023, Chiba, Japan | https://www.ipfjapan.jp/english/ |
| | **13-15 December** | Arabplast, Dubai, UAE | https://arabplast.info/ |
| 2024 | **4-6 March** | Plast-Alger, Algiers, Algeria | https://www.plastalger.com/ |
| | **23-26 April** | Chinaplas 2024, Shanghai, China | www.chinaplasonline.com |
| | **6-10 May** | NPE 2024 | www.npe.org |
| | **4-7 September** | Indoplas, Jakarta, Indonesia | www.indoprintpackplas.com |
| | **11-12 September** | Compounding World Expo EU, Brussels, Belgium | https://eu.compoundingworldexpo.com/ |

## AMI CONFERENCES

| | |
|---|---|
| **20-22 November 2023** | Fire Resistance in Plastics, Berlin, Germany |
| **22-23 November 2023** | Recycling Flexible Packaging, Barcelona, Spain |
| **29-30 November 2023** | PVC Formulation Asia, Bangkok, Thailand |
| **14-16 November 2023** | Waterproof Membranes, Cologne, Germany |
| **5-6 December 2023** | Polymers in Footwear, Nuremberg, Germany |
| **5-6 December 2023** | Polymer Engineering for Energy, London, UK |
| **29-31 January 2024** | Thermoplastic Composites, Tampa, FL, USA |
| **27-28 February 2024** | PVC Formulation America, Cleveland, OH, USA |

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

**www.amiplastics.com**

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