Plastics in Packaging

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IS IT A TRAY? IS IT A MASK?

How plastics companies are becoming superheroes by producing protective equipment on their packaging lines

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Strong and stable

BASF's Sicopal Black K 0098 FK enables black plastics to be detected by near-infrared light

Faced by increasing demands around plastics recycling, colourants and masterbatches need to perform on numerous fronts. Noli Dinkovski reports

As every packaging manufacturer will know, picking the perfect colour is one thing – but ensuring consistency from batch-to-batch is a whole different science altogether.

Homogenisation of a blend, including the dispersion of the masterbatch during dosing, plays a big role in minimising colour and product performance variations. Yet, discrepancies can occur – often when switching suppliers or changing the host polymer.

And it's that switch of material that is mostly keeping makers of colourants and masterbatches awake at night. As the drive for plastics to become more sustainable gathers pace, there is an ever-greater onus on them to create pigments and additives that match the consistency and stability demands of recycled plastics. So, how well are they faring?

As with all plastics processing, stability is essential when it comes to colour matching, says Thomas Catinat, operations manager at UK-based Broanmain Plastics. Thermal resistance and durability also need to be considered, he adds.

"It's precisely for this reason why most processors avoid using a high percentage of recycled plastic mixes for the base polymer," Catinat explains. "The more of the plastics that is reprocessed, the greater the molecular-structure changes. This loss of chemical properties affects the composition and, therefore, is likely to affect the compatibility of all the ingredients within a blend."

It's not a dilemma lost on colourants makers. The biggest challenge facing the sector is the push to utilise more and more post-consumer recycled (PCR) resin, suggests Jared Arbeter, technical sales manager at Riverdale Global.

"This can create many problems when manufacturing parts, such as processing issues, slowed cycle times, colour variation, physical strength, consistency in strength, and more," he says.

According to Arbeter, Riverdale Global can help customers eliminate the associated problems when using PCR. The US company says recent tests show that its +Restore liquid additive, which works alone or in a blend with Riverdale's liquid colours, is even more effective than originally claimed for improving the performance of plastics regrind based on post-consumer waste.

The test results indicate that at relatively low usage levels, the +Restore liquid additive enables processors running 100 per cent post-consumer PP to obtain products with "virgin-like" properties, Riverdale adds.

"These test results, and similarly encouraging data for HDPE, show that plastics processors can use the +Restore additive to meet sustainability goals by actually upcycling post-consumer waste," says Arbeter. "The +Restore molecule has a functional group that readily reacts with pigments, fibres, or fillers in the resin, while a different segment of the same molecule is designed to couple with the polymer."

As the industry moves towards a circular economy, the purity and integrity of plastics streams is becoming ever more crucial. And when it comes to sustainability, there is a growing expectation that the package itself "has to provide all the answers", argues Nicolas Rivollet, global director of strategy and marketing at Penn Color,

"Packaging is expected to answer consumer concerns over the environment, while complying with guidelines and legislation, and meeting bold brand commitments," he says. "This is

Above and left: Masterbatch and pigment consistency can be challenged when changing polymers
Below: Sustainable packaging is still expected to meet shelf-appeal and safety expectations

putting a lot of pressure on packages, specifically PET bottles, which are the most widely-used plastics packages on the planet."

Rivollet describes Penn's pennaholt masterbatch as a "breakthrough innovation", as it can make white opaque PET packages more compatible with recycling streams as well as improve the performance of the non-clear rPET in the end-application.

Launched in 2019, pennaholt is said to reduce titanium dioxide usage by 50 per cent while maintaining high opacity for shelf-life, and premium whiteness for shelf-appeal. In January, pennaholt II was introduced with additional options to further reduce or even totally eliminate titanium dioxide, as well as an option that has no inorganic content.

Meanwhile, Rivollet expects that within five years, chemical recycling will complement mechanical recycling to take care of packages that today are deemed "detrimental to recycling".

"A critical challenge will be to improve the cost-competitiveness of chemical recycling, counting on the contribution of colours and additives specifically 'formulated for circularity'," he says. "The contribution of colours and additives to sustainability will need to be implemented without compromising on shelf-appeal, performance and the safety of the packages."

Another US firm, Milliken & Company, says ▶

it is "advancing the circular economy" by contributing to better recycling.

Millad NX 8000 Eco is the latest addition to its NX 8000 range of PP additives. It says brand owners and converters can use the clear, transparent PP produced using this additive to replace alternative materials, thereby improving their options for making more recyclable, mono-material products such as a PP bottle or container, together with a PP label and cap.

"The NX 8000 Eco offers faster production rates for injection moulders, with average energy savings of more than 10 per cent for the production of clarified PP parts," says Allen Jacoby, senior vice president of plastics additives at Milliken. "It also addresses concerns related to migration, especially in food-contact applications, by reducing specific migration limits without adding any new ingredients to the formulation. This enhances food safety and security, thereby helping to minimise food waste."

Bound up within the sustainability agenda is the push for more regulation (with the EU acting as lead region) to ban selected single-use plastics, while improving waste collection and recycling rates.

Some brand owners are getting ahead of the game by adopting voluntary 'recyclable by design' guidelines. As part of this, the replacement of carbon black to better enable sorting and recycling of black coloured waste is gaining momentum, says Marc Dumont, head of the global industry management group for plastic at BASF's Colors & Effects division. His division is soon to be part of DIC Corporation after the two firms agreed a €1.15 billion ($1.27bn) deal last year.

"Our new Sicopal Black K 0098 FK is a successful alternative for carbon black that enables black plastics to be detected by the near-infrared (NIR) light technologies of plastics waste management facilities," he explains.

Dumont says Colors & Effects further supports the industry with safer raw materials, by evaluating all components and the purity profile of pigments closely. "In addition, we see a trend for stable pigments surviving multiple processing, which is a prerequisite for mechanical recycling, and also suitable pigments for the re-colouration of plastics recyclates," he says. "Here again, K 0098 FK is excellent in multiple-step recycling like, for instance, industries working with closed-loop recycling schemes."

Also citing regulation as a major challenge, Chinese company Shantou Best, which supplies masterbatch for all types of film, says much of its current R&D focus is on polyethylene (PE) and biaxially-oriented polypropylene (BOPP).

"There is currently a great opportunity for applications promoting global environmental-friendly and degradable material," says Shantou Best general manager Yang Bo. "We hope BOPP and PE functional masterbatch will fulfil the idea of mono-material packaging, and it will be better for recycling and reuse."

Enclosures made using Chroma Colour pigments

Bo adds that Shantou Best's masterbatches are used in over 70 per cent of Chinese BOPP production lines, with "many kinds of grades" available.

> **"There is currently a great opportunity for applications promoting global environmental-friendly and degradable material"**

Another additive masterbatch maker for films with eco-friendly aspirations is Polyvel. According to director of global sales and marketing Kenneth Malin, what separates the company from its competitors is its ability to handle liquid, low-melting-point, and heat-sensitive additives in loading levels from 5 per cent active to 70 per cent active.

"Polyvel's melt-flow modifier and odour manager masterbatches help recyclers add value to both PCR and post-industrial recycled packaging feedstocks, helping to add new life to single use packaging," he says.

Malin is also keen to point out that Polyvel is at the forefront of the biopolymers market, which is growing slowly but steadily. "We've worked with polylactic acid (PLA) producers for many years and have developed a complete line of additive masterbatches optimised to improve PLA properties for use in extruded foam and cast or blown film processes," he explains.

Other manufacturers are more guarded about the potential of biopolymers. While suggesting they are niche today, Jacoby at Milliken believes there is a "bright future" for biopolymers in many applications.

However, despite involvement in the market, Chroma Color Corporation says application of biopolymer technologies has had "mixed results", making it difficult for the company to focus in on a particular product to develop.

"At present, we have not witnessed much of a legitimate demand in the market," says Chroma Color's chief executive Tom Bolger. "Our focus remains on developing colouring solutions for use in rPET and PCR resins, which are growing at a very strong pace."

Giving further weight to his argument, Bolger adds that improved sorting at recycling depots is boosting the rPET and PCR market.

"Materials recovery facilities are adding sensor technology that is helping them do a better job of sorting materials," he says. "Companies buying recycled materials are finding higher-quality materials to use in consumer packaging products. Thus, the package on the shelf will be more similar to a virgin resin package." P

More information from:

BASF Colors & Effects	*colors-effects.eu*
Broanmain Plastics	*broanmainplastics.co.uk*
Chroma Color Corporation	*chromacolors.com*
Milliken & Company	*milliken.com*
Penn Color	*penncolor.com*
Polyvel	*polyvel.com*
Riverdale Global	*riverdaleglobal.com*
Shantou Best	*bestpolybatch.com/en*