

CIRCULAR

considerations

In the second of a two-part review, **Dan Weissmann** discusses the new landscape for blow moulded packaging

The 'new landscape' for product design was one of the core themes at the Society of Plastics Engineers Annual Blow Molding Conference in Chicago, USA, late last year. Design, which, of course, is fundamental to product development and improvement, has been greatly affected by new market drivers, most notably environmental considerations that manifest in various initiatives and goals regarding sustainability and the circular economy.

While design initiation elements remain the same, new constraints must be added, according to David Heisner, senior industrial design manager at Graham Packaging. In addition to the environmentally-related aspects, he told conference delegates that there is an emphasis on consumer expectation, enhanced safety, and convenience.

"E-commerce also adds new demands on both products and packaging to prevent damage in handling and shipping systems, and in having a positive experience while unpacking," he added.

Even before considering sustainability, the goals of functionality, appearance, low packaging weight, and compatibility with manufacturing capabilities, all unquestionably affect material preference.

"Even more, there may be additional overriding company goals like use of sustainable, bio-based, and/or recyclable materials, recycle content, and greenhouse gas reduction, while still meeting performance and economic targets," Heisner said.

This new landscape requires a high level of collaboration with the customer and suppliers, as well as within the organisation, for an effective development process and, ultimately, a successful product.

Andreas Lichtenauer, business development manager at FHW-Moulds, explained how his company – which specialises in larger-size containers – has developed packaging based on a thorough understanding of performance requirements at initial design and concept stage.

"Additional elements that provide for better performance might also be considered," he told the conference. "Specifically, rib reinforced corners, which provide more top load rigidity and the possibility to lower article weight, and an anti-glug device for improved pouring."

Tooling features for processing improvement were also suggested. The inclusion of shell cooling of the mould can reduce cooling time to de-moulding, as the design of coolant flow passages follows the moulding surface closely, Lichtenauer added. Shell cooling is said to deliver all-around equal cooling performance, higher and faster heat removal, and less article deformation.

Other performance-boosting features include in-mould temperature monitoring, and push-pull extrusion die ring adjustment for changing the parison cross-section in the optimisation of wall thickness distribution.

FHW-Moulds points to the development last year of more than 50 designs of tools with customers that have yielded environmental results. The company claims that these sustainability projects saved 9,400 tonnes of plastics, which it says is equivalent to 47 million fabric softener bottles lined up from Bottrop, Germany, to Sydney, in Australia – also measured as 5.7 million kilowatt hours of energy, and 26,800t of carbon emissions.

Post-consumer recycled (PCR) content incorporation, performance modification, and light-weighting were covered in several presentations. W Müller, for example, manufactures multilayer extrusion technology and offers a wide variety of options, from two to seven layers, in order to build wall structures that could include layers of PCR, colour, foam, or a functional layer, such as a barrier.

One trend generating interest is having a virgin material layer on the inside of containers to prevent the migration of compounds likely absorbed in the wall, in previous use, and now present in the PCR. Without a proper barrier, these compounds would migrate into the packaged content in the new blown bottles containing PCR, affecting smell and taste.

In its presentation on barrier packaging for olefins, Inhance Technologies pointed out that migration from coloured PCR is higher than from natural HDPE PCR. Coloured bottles come from a diverse range of packaged goods, from cosmetics to household and automotive chemicals, while natural colour PCR likely originates from a large volume application,

such as milk bottles.

Also, the wash process of natural PCR, the reuse of which is usually targeted at containers that must meet food-contact regulation, is more intensive.

One option to prevent taste or smell effects from olefinic PCR is Inhance's ReciLoc odour locking technology. ReciLoc is said to lock odours and contaminants in all grades of polyolefin PCR resin, preventing migration into packaged contents and the environment.

Another offering from Inhance is Enkase, a barrier geared to prevent the escape of volatiles from various chemicals stored in polyolefin packaging. Enkase relies on



Cypet Technologies claims that in larger containers, PET is more efficient than HDPE



Left: Trexel offers two foaming systems to enable firms to lighten their packaging

this effect in several countries and by recycling guideline-setting organisations.

Trexel used the conference to report on the ability to lightweight while maintaining physical performance. The company offers two foaming systems, MuCell, which provides direct gas injection onto the melt stream, and TecoCell, a chemical blowing agent blended with the resin. It claims to have developed the smallest foam cell structure able to improve uniformity and higher surface quality. Director of R&D Sam Dix's presentation concentrated on the incorporation of a foamed PCR as a middle layer.

"By increasing the thickness of the foam layer wall, stiffness can be maintained or even exceeded, in spite of the foam's lesser mechanical properties, hence maintaining product performance," said Dix. "The resulting overall product weight is lower, and savings of 8-12 per cent can be realised. In addition to the savings in material, productivity is also improved as the endothermic blowing agent absorbs heat, hence shortening cooling times.

"A middle layer in PET preforms, formed through the MuCell process, results in bottles with opacity without the need for a colour addition. Foamed layers do not affect recyclability or introduce any undesirable additives into the recycling stream."

The successful sorting of post-consumer products for recycling is paramount to the generation of high-value PCR. Watermarking of packaging can greatly improve the culling of specific items, such as materials from the recycling stream. Custom Etch discussed the incorporation of watermarks within the texture/surface of a product.

"Watermarks are reproduced on the product off the laser-etched mould," explained Chad Hase, director of advanced manufacturing for the company. "Most plastics forming processes, for example, injection moulding, blow moulding and thermoforming, will pick up the images successfully. They are imperceptible to the naked eye but can be read by a scanner or cellphone app."

The embedded information identifies the specifics of the product – for example, the material. Additional information can be provided through the Digimarc Product Passport system. At the same time, having a specific identifier can be used in product authentication, tracking, and for anti-counterfeiting. Customers'

engagement could also be initiated by scanning the watermark.

Coating was the main theme of Jimmy Chow's presentation, who highlighted the benefits of KHS's new generation E-Series Plasmax coating machine line. The firm's engineering product manager told delegates that silicon oxide coatings have proven themselves in many applications for extending shelf-life by reducing permeation and absorption, and preventing migration. The coating enables weight reduction where performance targets allow it, he said, while silicon oxide does not affect PET recycling.

"The new E-series system is modular and can be adapted to individual demands of throughput, covering a bottle size range from 150ml to 1.5 litres," explained Chow. "Process optimisation and control accuracy increased optional rates, also resulting in reduced costs. It is easily integrated with bottle production lines."

Cypriot firm Cypet Technologies, which specialises in blowing PET into large size containers, presented developments that expand the reach of PET containers, while also covering how handling and storage of them can be more efficient.

An industrial bulk container of 1,000l capacity has been added along with a machine to blow containers of this size. An offshoot of this development is a 1,000l domestic water storage blown tank. Among the enhancements are integrally moulded handles added to various containers, which offer a larger gripping opening, and a stackable design (where the neck nests within the container above it), reducing stacking height and increasing stack stability.

Along with the development of the large size blow moulding machine, the productivity of existing machines – for the production of containers from 4l to 35l – has been increased through redesign to add injection and blow cavities. In larger containers, PET is more efficient than comparable HDPE containers in terms of material used, processing energy use, and emissions.

While the wide spectrum of presentations at the conference covered an array of topics related to packaging, blow moulding technology, materials, product design and production – ever-present was the emphasis on recycling, PCR incorporation, and more efficient operations. In essence, there was a clear demonstration of the recognition and commitment to meet industry responsibilities, through active participation in the efforts towards circularity and a more sustainable landscape. **EP**

More information from:

Custom Etch custometch.com

Cypet Technologies cypet.eu

Graham Packaging grahampackaging.com

FHW-Moulds fhw-moulds.com

Inhance Technologies inhancetechnologies.com

KHS khs.com

Trexel trexel.com

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