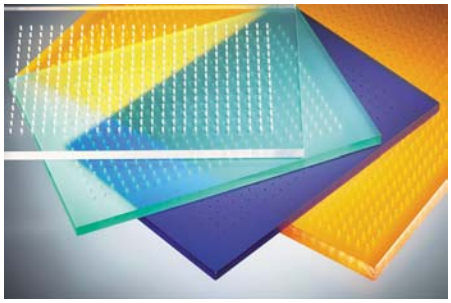
Building sustainability into the fabrication process with PETG copolyester

PLASTICS MACHINING AND EQUIPMENT

by Chad Frazier and Ken Lilly

Given today's economic challenges and rising consumer demand for more sustainable products, many retailers are taking measures to reduce the amount of energy expended and waste produced across the supply chain. One area, however, may be overlooked when it comes to reducing a store's environmental impact: point-of-purchase displays. Maximizing merchandising space and grabbing consumer attention at the point-of-purchase (P-O-P) also requires functionality and eye-catching design. Fortunately for architects, designers and fabricators, a material solution exists that enables them to push the envelope of creativity and design while still prioritizing the mandate for sustainability.

PETG copolyester, which possesses excellent design flexibility and impact resistance, also has environmental benefits. Select PETG copolyesters can be manufactured without using bisphenol-A (BPA), as well as other chemicals such as halogens, lead and mercury. Further, the energy (per pound) used in the extrusion of PETG copolyester is 3.5 times less than acrylic (PMMA). These inherent environmental benefits can be maximized by leveraging sustainable extrusion and fabrication processes including downgauging, reusing trim scrap, thermoforming, mechanical fastening and hot line bending.



A premier product for point-of-purchase displays and in-store fixtures, Eastman Spectar™ Frost PETG copolyester offers design flexibility, ease of processing and exceptional durability.

Downgauging: less material, still tough

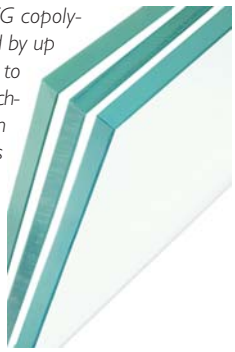
The toughness of PETG copolyester enables the material to be downgauged by up to 20 percent compared to acrylic without sacrificing durability. To put this savings into perspective, if a single video store replaced its acrylic shelves with 10,000 pounds of PETG copolyester shelving, the energy saved could power five homes or take 3.3 cars off the road every year.

That same video store would also reap the benefits of PETG copolyester's impact resistance. The impact resistance (puncture energy at max load, ASTM D3763 for 6 mm sheet at 73°F (23°C) of PETG copolyester (53 ft-lb) is about 18 times that of general purpose acrylic (PMMA) (3 ft-lb) and about 2 times that of impact modified acrylic (PMMA) (26 ft-lb). For retailers, this translates in long-lasting displays that do not need to be replaced often, saving on costs and reducing the amount of disposed plastic.

Reduce, reuse, regrind

During the sheet manufacturing process, PETG copolyester can be recycled by regrinding and reintroducing significant trim scrap into the virgin stream without sacrificing the material's properties. Architects and designers may be seeking materials that can be recycled, reused and are low-emitting, particularly those that are pursuing Leadership in Energy and Environmental Design (LEED) certification. This voluntary certification program can be applied to any building type and any building lifecycle phase. Sustainable building projects encourage choices that include recycled and recyclable materials content. LEED certification can enable retailers to enhance their environmental profiles while demonstrating leadership and innovation.

Knowing the recycle source (post-industrial or post-consumer) is advised. Work with a trusted partner to obtain contaminate-free, recycled PETG copolyester to ensure retention of physical properties and visual aesthetics.



Eastman Spectar™ PETG copolyester can be downgauged by up to 20 percent compared to acrylic. For vibrant, eye-catching displays, fabricators can use a variety of techniques to create intricately shaped designs with Eastman Spectar™ PETG copolyester, including thermoforming, mechanical fastening and hot line bending.

Thermoforming: saving energy, saving time

Thermoforming with PETG copolyester enables intricate shapes for in-store fixtures and displays, but it also saves energy and time for fabricators. Unlike polycarbonate, PETG copolyester does not need to undergo a pre-drying process prior to thermoforming sheet. The use of PETG copolyester instead of polycarbonate or acrylic can result in an energy savings of up to 20 percent per sheet. In a comparison of acrylic, PC and PETG copolyester, the energy used to thermoform sheet (not including pre-drying) equated to 11,260, 10,645 and 8,460 Btu, respectively.

Eastman Spectar™ PETG copolyester is BPA-free.

Panels produced with Eastman's patented Encapsulation Technology and Eastman Spectar™ PETG copolyester incorporate decorative images, textiles and botanicals to attract consumer attention at retail.

These energy savings are attributed to the lower temperature and decreased amount of time required to thermoform sheets of PETG copolyester. For ideal thermoforming of standard 3 mm gauge sheets, oven temperatures should be kept between 392°F-482°F (200°C-250°C) and the material should be heated to between 275°F-311°F (135°C-155°C). Temperatures on the lower end of the spectrum lend themselves to larger parts with shallow draws while the higher end of the spectrum enables deep-drawn parts and intricate details.

High durability, no VOCs with mechanical fastening

Mechanical fastening is a technique used to bond a variety of materials, including wood, metal and plastic, which broadens the design possibilities for in-store fixtures and P-O-P displays. Utilizing contrasting elements in a design can be used to create a more customer-friendly retail environment. Fortunately for fabricators and retailers, mechanical fastening also provides environmental benefits by eliminating the need to solvent bond materials, which can produce volatile organic compounds (VOCs). VOCs are emitted by a number of building materials and can cause adverse health effects in some cases. PETG copolyesters that are GREENGUARD Indoor Air Quality Certified® help ensure better indoor environments.

PETG copolyester is an ideal material for mechanical fastening because its impact resistance reduces the likelihood of cracking or breakage. Screws that are made specifically for plastics should be used when mechanical fastening PETG copolyester. When bolting parts together, fabricators must allow for thermal expansion and contraction by drilling oversized holes.

Hot line bending: extend lifespan, reduce time and energy

Replacing entire displays or even broken parts can be a financial burden for many retailers. Often, breakage occurs on fixtures or shelves that have been bonded together; however, hot line bending PETG copolyester provides enhanced strength around corners of shelving and displays, which are subject to abuse from shopping carts or climbing shoppers. Hot line bending PETG copolyester also saves time and energy for fabricators. Including heat up and cool down, the total process time to hot-line bend a 4 mm thick sheet of PETG copolyester and acrylic is 148 and 220 seconds, respectively.

Hot line bending is ideal for fixtures that require rounded corners, as this process does not produce jagged or sharp edges. To hot line bend PETG copolyester, heat one side of sheet to 212°F-248°F (100°C-120°C) and bend to desired angle. Depending upon the size of the heated area, the sheet can be bent to a predetermined angle. To optimize results, the heated area should be at least twice the sheet's thickness and no more than three to five times the size. A cooling jig is ideal for holding the part in place until the shape is set.

Conclusion

More than ever, retailers are tasked with creating inviting and environmentally-friendly stores that entice even the most frugal shoppers. With PETG copolyester, retailers, extruders and fabricators can reap the benefits of both design flexibility and sustainability with long-lasting displays, fixtures and shelving.

Downgauging the material and reusing trim scrap reduces the amount of disposed plastic without sacrificing impact resistance or diminishing PETG copolyester's aesthetic properties. Leveraging fabrication techniques, such as thermoforming, mechanical fastening and hot line bending, to create innovative designs further contributes energy and cost savings. Materials are square one for strengthening a company's environmental profile, and building sustainability into the extrusion and fabrication processes for retail applications with PETG copolyester is a solid first step. ■

Chad Frazier is technical service representative and Ken Lilly is technical associate for Specialty Plastics Film and Sheet, Eastman Chemical Company, headquartered in Kingsport, TN, USA. For more information about Eastman and its products, visit www.eastman.com or contact Lucy Stewart, global trade media relations, at (423) 229-4229 or globalmediarelations@eastman.com.