

How to make displays “POP” without losing fizz

SEE-THROUGHS

by David Salyer

Thanks to plastics innovations, display and package designers have more creative license than ever before. Virtually anything imaginable is possible with the strength and versatility of plastics. Selecting the best performing plastic among thousands of options can be challenging for even the most experienced designer. This guide offers useful tips and time-saving strategies for using a material that goes as far as the imagination without compromising cost, functionality or safety — copolyester.

Visual impact that's impact resistant

Creating visual impact that lasts throughout the life of the display can be a challenge, especially under extreme environmental conditions. But even under less extreme conditions, ill-suited material can have a tremendous impact on aesthetics and overall performance of your display.

For example, exposure to intense store lighting as well as direct or indirect sunlight is a leading cause of discoloration with some plastics. Prolonged exposure to these powerful rays and heat can affect the structural integrity of the plastic including its impact resistance. Over time, these effects can result in the following phenomena:

1. Hazing: a cloudy appearance
2. crazing: fine hairline surface micro-cracks
3. General discoloration

Aside from the obvious aesthetic and structural damage, crazing can also contribute to reduced chemical resistance in addition to weakened impact resistance.

That's where copolyester excels. If UV exposure is unavoidable, copolyester offers several options that can help minimize the effects of UV exposure. UV stabilized copolyester sheet includes a UV light inhibiting additive, which protects the base polymer from the deteriorating effects of UV light. It includes a thin UV resistant layer that is co-extruded onto the base plastic layer. This “shield” layer contains the protective additives that help the copolyester retain impact resistance, appearance and overall properties under extended exposure to UV light rays.

Temperature is another important environmental consideration. Elevated temperatures can cause warpage, shrinkage and deflection under load among other adverse aesthetic effects. Conversely, exposure to low temperatures can result in warpage or even cause your display to fracture upon impact or under load. In the case of higher temperatures, consider copolyester alloys available in sheet and film.

Food for thought

From sheet to profiles, nothing enhances the appeal of foods more than an attractive package coupled with an eye-catching display. Copolyester delivers the optimum balance of performance and aesthetic properties, while providing a safe, lightweight alternative to glass, wood, metal and other materials. Plus, most copolyester alternatives to these conventional materials hold up equally as well or even better.

Take clarity, for example. It's the hallmark of purity in many food packaging and display applications. But not all plastics retain clarity under temperature extremes, especially in freezer applications where the plastic must withstand freez-

ing temperatures for a period of time. That is where copolyester outperforms its counterparts — it is durable and retains crystal-like clarity despite freezing conditions.

To keep your displays and packages looking and working as good as new, copolyesters are tough enough to handle even the most demanding applications. Especially conducive to food applications, many copolyesters are FDA approved and offer a wide variety of processing options. For applications requiring color, copolyester resins color evenly and can be used with special color additives that meet FDA approval.

Also, FDA approval is not just limited to packages that come in direct contact with food. Applications such as displays and pricing channels, which are not in direct contact with food, may still be subject to FDA regulation. It is advisable to check with your material provider to determine the FDA regulations pertaining to your application.

Bend me, shape me

Plastic performance goes beyond the finished product. Performance under a wide variety of fabricating techniques is a must. Copolyester enables some of the most innovative fabricating techniques. The effects can be as dramatic as a vending machine that practically jumps out at you or as subtle as a pricing channel that is as easy to read after years of retail rigors as it was the first day of installation.

Fabricating techniques are critical design considerations when selecting any plastic material. Fortunately, copolyester offers a good deal of latitude. It's especially easy to work with and performs equally as



Spectar copolyester is available in a multitude of colors for vibrant displays from Eastman Chemical Company.

Did you know?

Although a polymer in its unaltered form may be NSF (National Sanitation Foundation) approved, once it is molded, extruded or formed into a product, the newly formed product must receive NSF approval as well. In addition, every colorant and additive must be tested and approved before it is allowed to have contact with drinking water or foods.

well under hot or cold forming without risk of breakage or stress-whitening.

Copolyester also offers added durability to withstand the demanding retail environment. For example, toughness is an important performance characteristic in profile applications such as pricing channels where frequent handling requires a heavier duty part.

It's important to discuss your application with the fabricator, beginning with part details. Draw depth, as well as part detail, largely influence the choice of materials. If the part requires highly detailed features, copolyester offers good flexibility and melt strength. It allows for deeper draws and reproduces highly detailed mold features. In fact, draw ratios of 6X to 7X have been successfully formed with copolyester resin.

In addition, copolyester can be formed at lower temperatures, making it possible to use heat sensitive screen printing inks and paints where the sheet is pre-printed and then thermoformed or heat shaped. Since pre-drying is typically not necessary, labor and handling costs are reduced.

Performing under stress

Post forming techniques can also affect performance. Copolyesters maintain a smooth, clean edge when die cut, punched or drilled among other fabricating and post forming techniques.

If the display contains multiple parts, consider how those parts will be assembled. The use of screws, rivets and other hardware works well with copolyester. However, other plastics such as acrylic can crack when fasteners are used. Some plastics such as ABS or PVC can "stress whiten" around high stress areas and when cold bent.

Regardless of material, your design should always allow for thermal expansion and contraction. Provide slotted holes or slightly oversized holes to permit the plastic to move as it heats or cools. This will reduce the potential for part warpage as well as ease stress levels at fastening points.

Adhesives may be a viable alternative for part assembly. Copolyesters are compatible with a variety of adhesives including polyurethanes, epoxies, acrylics, UV curable adhesives and others. Proper selection of an adhesive for the specific end-use application is critical. Polyurethane, epoxy and UV curable adhesives have been successfully used with copolyesters in commercial applications. These adhesive systems can develop "structural bonds" that are permanent and durable.

Keep in mind the following basics when working with adhesives:

- Design your part with "lap-shear" bond joints where possible.
- Avoid placing the joint in a "peel" type failure orientation.
- Avoid "edge bond" joint designs where high stress loads may be applied to the joint.
- Provide ample bond area to distribute impact energies and load forces over a large area.

When selecting an adhesive, always consider the end-use environment. Remember to consider load forces, impact forces, temperature extremes, chemical exposure, FDA requirements, and how the part is to be installed or repaired in the field.

Solvent bonding is another possible assembly option for copolyester. Selecting a solvent or solvent cement that is best suited for your specific plastic is critical to the durability and functionality of the finished part. Use of an improper solvent can cause the plastic to haze or become brittle and fail. Improper solvent selection can cause fabrication problems such as longer curing times, joint "blush" or other aesthetic issues. Avoid using a "lap bond" design when bonding with solvents or solvent cements. This type of bond joint traps too much solvent be-

tween the two bond surfaces and causes bond whitening, brittleness and other adverse affects. Solvents are typically used for "edge bonding" fabrication methods. Solvent bonding requires proper bond joint preparation and skillfulness to obtain a finished part that's durable and aesthetically pleasing.

Avoid using solvents if the part is under high stress. A plastic part that is highly stressed can fail dramatically when exposed to even a mild solvent. Stress exacerbates the adverse effects of a solvent.

Effective effects

In addition to effects created during the fabricating process, copolyester enables an array of post fabricating options for really adding sizzle to displays and packaging. For example, copolyesters allow an image to be "distortion printed" onto a flat sheet, which is then thermoformed. The resulting thermoformed part exhibits the image in its proper register and appearance.

Polycarbonate and acrylic sheet typically require a higher thermoforming temperature to obtain the proper draw depth. These higher temperatures can burn or discolor the delicate flexible polyurethane based inks that are required to



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conform during the thermoforming operation. Copolyesters enable deeper draws, capture greater mold detail, and obtain more uniform wall thickness in comparison to other plastics.

And nothing draws more attention to displays and packaging than the intrigue of 3-D and "lenticular" images. Copolyester can produce brilliant image rendering and is also easily printed with UV cured or solvent type printing and silk screen inks. Many copolyesters offer added versatility in that graphics can be applied in-mold or on labels or overlays.

Copolyesters can be decorated with decals, "heat transfer printing" and other methods. Always contact the resin supplier for advice on the best way to apply these decorating techniques to your specific plastic.

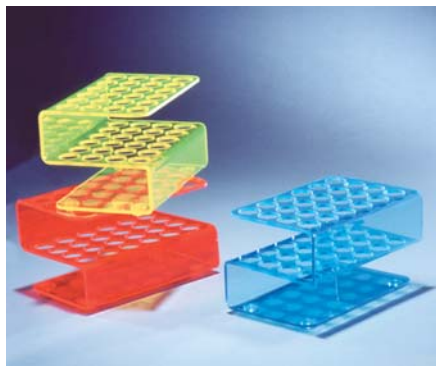
Printed graphics offer flexibility in creating visual appeal that is also cost-effective, making copolyester a good choice for its ability to directly accept a variety of printing techniques including pad, screen and flexography. Know the chemical characteristics of the ink when selecting materials as well as any curing methods that may be required. Several copolyesters have good chemical resistance to solvent-based inks. They also perform well with UV cured ink systems while retaining their inherent color and clarity when exposed to UV light.

Other dramatic effects can be achieved with printed graphics by using an overlay of plastic sheet. Combining the benefits of copolyester film with the special optical effects of "lenticular" offers a powerful tool for making an image come alive. Copolyesters have been used successfully in the production of extremely precise "lenticular" films that can be printed with images that "flip-flop" and have 3-D or other unique optical effects.

Today's copolyesters offer a broader range of coloring options than ever before including FDA approved colorants. From muted earth tones to vibrant fluorescent colors, coloring options can be combined with other additives including metal flake and pearlescent pigments for maximum appeal.

Better safe than sorry

In today's demanding marketplace, there is no substitute for a thorough consideration of how the display, part or structure may have to function in a real-world environment. Conduct your own "failure analysis" by thinking through a potential design failure that may result from misuse or abuse (e.g., rough handling during installation or children climbing on a display).



Spectar copolyester, available in a multitude of colors, is easy to fabricate.

The following is a general list of important safety points to consider when working with any plastic. *It's not a substitute for conducting your own due diligence.* Discuss your specific application with your vendors, suppliers and end-use customers to achieve the form, function and fitness-for-use design criteria that will assure safe performance for the life of your display or package.

Typical design considerations include:

- Total life expectancy.
- Liability assessment should failure occur.
- Environmental conditions.
- Creep under load at maximum end-use temperature.
- Static load bearing characteristics.
- Vibration fatigue effects.
- Notch sensitivity of the selected plastic material.
- Impact resistance during shipping and handling as well as installation and use.

Many of these material properties are included in the material manufacturer's data sheets. Other data must be obtained from the end-use customer.

In addition to failure analysis, keep in mind the following general guidelines. If failure of a part or display could result in injury or worse, be sure to design the parts with a safety factor of at least 2X to 3X. Even though copolyester has the toughness required for a variety of applications, improper part design, fabrication or installation can adversely affect the performance of the end product.

When designing with any plastic, keeping proper radii on thermoformed parts can help maintain toughness and durability. Avoid sharp corners, which can cause cracking due to high stress concentration points. Keep sawed, die-cut and drilled edges clean and smooth. Burrs and rough edges can create a notch, which leads to

a high stress point that can reduce toughness and lower impact strength.

Chemical resistance must always be considered in the overall design as well as how a polymer may react when it comes in contact with other polymers. Some polymers exhibit adverse affects when they come into direct contact with other polymers. For example, highly plasticized PVC, e.g., rubbery fishing worms, can "solvent melt" into some plastics while having no effect on cellulosic polymers. The material's manufacturer can advise on what polymer combinations to avoid.

Identify all chemicals that the plastic may encounter in its life such as cleaners, perfumes, soaps, oils, fumes, gases, etc. The degree of chemical resistance required could vary from high resistance for a package containing aggressive chemicals, to low resistance for a display that may only experience incidental contact with common household cleaning chemicals. In either case, chemical resistance alone is not enough. Chemical resistance could be a greater factor when you consider environmental temperature or mechanical stress conditions under which the plastic is exposed. For example, a perfume display alone may not require significant impact resistance. However, impact resistance could be compromised if the display is exposed to highly aggressive scent oil, solvent and other potent chemicals found in today's perfumes.

Where possible, avoid the use of aggressive solvent cleaners. Use mild soaps and water for cleaning. If steam or hot water is required for sterilization, select high temperature and moisture resistant plastics. Aggressive solvent and hot cleaners can chemically attack, warp, haze or craze the plastic, causing aesthetic and structural damage.

Let your imagination run wild

Creating an electrifying display or package design that's both safe and effective is entirely possible with copolyester. And pound for pound, copolyester delivers the optimum price/performance ratio. With the versatility of copolyester, you'll serve multiple purposes without over specifying or driving up costs.

Let your imagination run wild as you conjure up exciting and innovative display and package designs. Copolyester will continue to turn your concepts into reality. ■

David Salyer is principal applications development representative, Eastman Specialty Plastics. For more information, contact Eastman Chemical Company, P.O. Box 431, Building 280, Kingsport, TN 37662 USA; (423) 229-4669, (800) EASTMAN, fax (423) 229-1525, e-mail: spectara@eastman.com, www.eastman.com or www.spectar.com.