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Coex Foam Labels Keep Beverages Cold

By Pat Toensmeier

An old labeling technology with new features has given a foam-packaging producer entrée to a potentially lucrative market—low-volume microbreweries and other specialty container operations.

The company, Commodore Plastics LLC of Bloomfield, NY, developed a technique for coextruding polystyrene (PS) foam shrink-label stock that insulates aluminum, glass and polyethylene terephthalate (PET) beverage containers, keeping liquids colder, for longer. The label also provides breakage protection to glass.

The technology is called Labec. In an interview with Brad Braddon, president of Commodore Plastics, and Gary Duncan, who consults for the company, the pair said that for target applications such as microbreweries, labels can be applied economically to aluminum cans and glass bottles in shrink tunnels on filling lines, in runs of as little as 10,000 to 20,000 containers.

Braddon and Duncan say that Labec foam PS labels on aluminum cans keep beverages colder an average of 15 to 20 minutes more than plain cans. This is based on a beverage-temperature gain without the label of 20 to 30°F over 1 hour. “The label resists two conditions,” says Duncan. “Convective warming of liquid caused by ambient temperature, and conductive warming from holding a can.”

Glass is, of course, a better insulator than aluminum. Even so, glass bottles get a minor coldness benefit from the label. Equally important, though, are resistance to breakage during handling and transit owing to the cushioning of the foamed PS, and a dry, comfortable grip for users.

The idea of foamed insulation labels is not new. In the 1980s, a product called Plastishield was marketed by glass bottle-maker Owens-Illinois (now O-I), which eventually sold the technology to American Fuji Seal. Commodore licensed the technology it uses from
Sekisui Chemical Co. Ltd. in 2007, and built a line to develop applications.

What emerged was a two-layer structure with an outer skin of PS coextruded over foam. Four grades of PS foam are available, in 5-, 6-, 8- and 10-mil thicknesses. The skin is typically 10% of the structure’s thickness, Duncan says. The foam is low density — 0.3 g./cu. cm. — and adds practically no weight to a container. A paper label, Duncan remarks, typically has two times the density of the foam, or 0.6 g./cu. cm., while a 2-mil polypropylene (PP) label is 0.9 g./cu. cm. The foam coextrusion, in fact, has the same material yield as 2-mil PP labels — 15,000 sq. in./lb.

Commodore’s initial efforts to fine-tune the technology for aluminum and glass containers hit some speed bumps, Braddon says. “The trick is to get the printed outer skin and inner foam layer to shrink at the same rate during application,” he
Coex Foam Labels Keep Beverages Cold

says. The company tweaked the formulations of both layers and experimented with shrink rates. Researchers settled on lowering the shrink temperature of the foam to match that of the skin, to achieve a fast and precise fit.

One challenge the company faced was the variable temperatures of shrink tunnels. Pulsed infrared (IR) and convective heat sources produce temperatures in the range of 350 to 450°F. Tunnels that use IR cal rods for heat have settings as high as 600°F, but interior heat in the range of 400°F. The labels are engineered to shrink evenly and consistently within this temperature range.

The shrink labels, Duncan says, match the shape of any container. Heat tunnels, moreover, operate at an application rate that is compatible with canning and bottling production. The labels are printed in machine direction and applied with roll-on equipment. Duncan says this results in more efficient material use and eliminates a costly secondary seaming step common to shrink sleeves.

One notable feature of the labels is aesthetics. Labels can be printed, hot-stamped for a premium look, metallized and embossed, among other options. Product security and anti-counterfeiting features are readily added, along with Braille characters.

Duncan says the labels have ergonomic benefits, as well, due to the comfort the foam layer provides. The labels can also improve the recyclability of containers. If left on aluminum cans or ground up with glass bottles, Commodore estimates that the fuel value of the coextrusion replaces 5 to 8% of the natural gas used in recycling. On PET bottles, the low density of the labels reportedly makes them easier to float off containers in separation processes than paper and other shrink-fit materials.

The Labec labels are described as “a bit more expensive” to use than roll-fed labels or sheet-fed wrap-around film labels. Nevertheless, when printing benefits, protective packaging for glass, efficient material utilization and other factors are considered, Commodore says costs are competitive with other labeling methods. ■
In-Situ Polyethylene Nanocomposites

Metalocene catalysts are more flexible in forming polyolefins than other catalysts such as Ziegler-Natta catalysts. This flexibility is due to different catalyst promoter fillers and copolymers. However, adding large amounts of copolymers for maximum catalytic activity is a problem. Al-Harthi et al. produced polyolefin nanocomposites using an aluminum nitride nanofiller promoter with a metallocene catalyst. A metalocene such as zirconocene is mixed with aluminum nitride in a reactor. The reactor is then charged with toluene and methylaluminumxane co-catalyst. The mixture is heated at a constant temperature and ethylene added. This results in polymerization forming a polyethylene nanocomposite without the use of copolymers. Polymerization is quenched by acidic methanol and unreacted monomer is vented from the reactor. The resultant polyethylene nanocomposite is washed in methanol and dried.

Smooth Composite Molds

Composite molds have been around for some time but they are difficult to machine or repair and tight surface tolerances are impossible. Callis developed machinable composite molds with good surfaces for use in molding composites. The mold body is made up of layers of quasi-isotropic chips of randomly oriented fiber bundles impregnated with a resin. The use of randomly oriented fiber chips allows post-cure machining with tight tolerances and finish. The quasi-isotropic material is a sheet or layer of chips that forms an uncured prepreg 0.06 to 0.1 inch thick.

Lighter Antballistic Materials

Many different kinds of composite structures provide protection against explosions and projectiles such as armor for personnel, vehicles, and aircraft. Continued development focuses on optimization, weight, maintainability, and cost. Ballistic projectiles and explosions produce blast waves and fragments. Studies show that a structure exposed to both the blast wave and fragments will collapse more readily than exposure to the blast wave or fragments alone. Bartus, Husman, and Vaidya developed an antiballistic material consisting of a backing substrate, a layer of energy absorbing plates, a thermoplastic binder, and long thermoplastic fibers. The plates include ceramic and metal plates. The long fibers (12 to 38 mm) include thermoplastic polyurethanes, polypropylene, nylon-based polymers, polystyrene, acrylonitrile butadiene styrene, styrene acrylonitrile, polyestersulfone, polyetherimide, polyphenylene sulfide, polyetheretherketone, and polyetherketone fibers.

PLA Shrink Films

Polyactic acid (PLA) films can be manufactured by either blown film or casting and tenner techniques. However, cast PLA films have excessive shrinkage in the machine direction, resulting in curling, which limits applications. Tweed and McDaniel developed a heat-shrinkable PLA film with little or no (0% to 5%) shrinkage in the machine direction. The films are based on blends of two or more grade of PLA resins including additives, such as antiblock, slip, plasticizers, and viscosity enhancers. The resin blends consist of 50 to 90 wt% of a PLA resin with 11 to 13 wt% D-lactide and 10 to 50 wt% of a PLA resin with 1 to 2 wt% D-lactide. The films are formed by extrusion casting, temperature conditioning and tenner stretching.

Better Glossy Surfaces

High-density polyethylene (HDPE) is generally a strong and stiff material with low oxygen and moisture vapor transmission resulting in good barrier properties. The combination of environmental stress crack resistance, strength, stiffness, raw material cost and barrier properties makes these materials good.