Polyethylene (HDPE) Thin Wall Containers

For purposes of this design guidance document, thin walled packaging, also known as thin walled containers, are rigid plastic packaging with a wall thickness less than 0.08 inches and a volume of less than 2 gallons. Thin walled containers fall primarily into two groups – thermoformed/vacuum formed and injection molded. Examples of thin walled containers include dairy tubs, bakery packaging, sandwich packs, yogurt cups, drink cups, ice cream and margarine tubs, hinged containers, small buckets, small crates and baskets, and microwave and freezer containers. Flexible film, pouches or squeeze tubes are not included in this design guidance document.

Such thin wall packaging is most often made with HDPE, but can also be made from other grades of polyethylene such as low density polyethylene, LDPE. In this guidance, we use the general composition of PE so that guidance can apply to any grade of PE resin.

ATTACHMENTS

The basic design for recycling guideline to consider when making material choices for any attachment to a container is to consider its general compatibility with the base resin (PE) or the removal efficiency in conventional water-based separation systems that separate plastics by density. Attachments may include closures, closure liners, inserts, labels, pour spouts, handles, sleeves, safety seals, coatings, and layers. PE has a density less than 1.0 (the density of water) and will float in these systems. For efficient separation and removal in conventional sink/float separation systems, attachments should be made from materials with a density greater than 1.0 or be otherwise compatible with PE in the reclamation process. Materials with a density greater than 1.0 will sink in these systems and can be separated easily from the PE.

Attachments made entirely of PE are preferred, as non-polyethylene attachments reduce base resin yield and increase separation costs. Other attachment may include handles, inserts and pour spouts, in addition to others that might be developed. The use of non-PE attachments should not be adhesively bonded to the container and should readily separate from the container in conventional PE reclamation systems. If attachments are added to a container, they should be made from 1) materials with a density greater than 1.0, with the exception of PVC, which is undesirable and should be avoided, that will easily separate from PE in conventional separation systems or, 2) compatible materials such as pigmented, or preferably non-pigmented PE. The use of PP attachments, if necessary, should be employed at the lowest possible level of total container weight to minimize the presence of PP in PE that can degrade the physical properties of postconsumer PE. High percentages can contaminate the PE for many recycling applications, as these materials are difficult to separate from PE in conventional systems. If pour spouts are added to a container, they should be designed to leave no product residue and allow for complete removal of product contents when the
The uses of attachments that contain metallic components are discouraged and should be avoided. If adhesives are used to affix attachments, they should be water soluble or dispersible at 60°C to 80°C in order to be removed in conventional washing and separation systems. If adhesives are not removed efficiently, they may disperse on the PE regrind and embed unwanted contaminants. The use of other adhesive types is discouraged and should be avoided. (The APR has developed a testing protocol for adhesive manufacturers to evaluate the impact of adhesive products in conventional reclamation systems). Adhesive usage and surface area covered should be minimized to the greatest extent possible to maximize PE yield and avoid contamination. Silicone and rubber closure parts are not acceptable given the technically significant challenges they present to the process of recycling and the usefulness of the recycled plastic.

**COLOR**
The use of non-pigmented PE containers is generally preferred to pigmented containers as the non-pigmented containers have a greater number of potential applications. A light or translucent color is acceptable.

**LIDS & CLOSURES**
Plastic lids, lid stock or closures made from HDPE, LDPE, or PP are preferred to all others. Also preferred, are closure systems that contain no liners and leave no residual rings, or other attachments, on the container after the closure is removed. The use of lidding and closures that are non-pigmented or the same color as the container is desirable, if practical. The use of PVC for closures or closure liners is not acceptable. The use of metal closures is undesirable and should be avoided as they are more difficult and more costly to remove in conventional PP reclamation systems compared to the preferred closure systems (HDPE, LDPE, or PP). Closures made from steel are undesirable and should be avoided. Silicone and rubber closure parts are not acceptable given the significant technical problems in the process of recycling and to the utility of the recycled plastic.

**SLEEVES & SAFETY SEALS**
If tamper resistance is required in specific product applications, it should be an integral design feature of the container. The use of tamper resistant or tamper-evident sleeves or seals is discouraged as they can act as contaminants if they do not completely detach from the container, or are not easily removed in conventional separation systems. If sleeves or safety seals are used, they should be designed to completely detach from the container, leaving no remains on the container. Shrink sleeves are preferred to adhered labels. Shrink sleeves made from PE or PP are preferred. The use of PVC sleeves or safety seals are not acceptable. Foil safety seals that leave foil or remnants or attaching adhesive on the PE containers are not acceptable.

**LABELS**
PP, OPP, HDPE, MDPE, LDPE, LLDPE, or PS label stock is preferred to all other label materials. Metallized labels increase contamination and separation costs and should be avoided. The use of PVC labels is undesirable and should be avoided. Paper labels are undesirable and should be avoided as they can increase contamination in the PE due to fiber and adhesive carry-over through the reclamation process. Labels should be as minimal as possible and not exceed 60% of the package coverage.

INKS & ADHESIVES
Inks must be chosen that do not bleed color when agitated in water. Label inks that bleed and can discolor the PE regrind in the reclamation process, diminishing or eliminating its value for recycling. (The APR has developed a testing protocol to assist label manufacturers in evaluating whether label ink will bleed in conventional PE reclamation systems).

Adhesive usage and surface area covered should be minimized to the greatest extent possible to maximize PE yield and avoid contamination. The use of "hot melt" adhesives is undesirable and should be avoided unless the adhesive readily separates from the plastic and does not cause problems in the reclaiming process. Label adhesives should be water soluble or dispersible at temperatures between 60°C and 80°C in order to be removed in conventional washing and separation systems. If adhesives are not removed efficiently, they may disperse on the PE regrind and embed unwanted contaminants. Residual adhesives must not scorch, discolor, haze or form black specks at plastic processing conditions. The use of other adhesive types is discouraged and should be avoided. (The APR has developed a testing protocol for adhesive manufacturers to evaluate the impact of adhesive products in conventional reclamation systems).

DIRECT PRINTING/DECORATION
Presently, all direct printing other than date coding, either for product labeling or decoration, contaminates recycled PE in conventional reclamation systems. The inks used in direct printing should not bleed ink or otherwise discolor the PE during processing, or introduce incompatible contaminants. In either case, the value of the PE for recycling is diminished or eliminated. Ink coverage should be minimized.

LAYERS
Some PE container designs require the use of layers for specific product applications. The use of non-PE layers is undesirable and should be avoided, unless they are compatible with or easily separable from PE in conventional recycling systems.

Current PE recycling systems can tolerate the use of EVOH layers. If layers must be used, their content should be minimized to the greatest extent possible to maximize PE yield and reduce potential contamination and separation costs. (The APR's Champions for Change™ Testing Program invites consumer product, plastic container and container component
manufacturers to work with the APR protocols to determine whether new modifications to a regularly recycled plastic container will impact conventional recycling systems prior to introducing the modification. The APR Guidance Documents should be the basis for test program design.

**ADDITIVES**

Based on public product performance claims, the use of oxo-degradable and/or biodegradable additives in P- may result in shortening the useful life of containers of which they are a part and therefore affect the ability of such containers to be recycled. Of equal or greater concern, the effect of having degradable additives in the recycling stream on reclaiming processes and the technical performance of recycled resin is currently unclear. Overall, oxo-degradable and biodegradable additives should not be used without an evaluation confirming that their expected use will not materially impair the full service life and properties, including successful recycling and durability, for the next use of the recycled thin walled container. Testing should be conducted per APR’s Degradable Additives and Polyethylene and Polypropylene Recycling Technical Compatibility Testing Guidance.

Any mineral filler must NOT raise the package specific gravity above 0.98 gm/cc.

**POSTCONSUMER CONTENT**

The use of post consumer PE in containers is encouraged, whenever possible.

**RESIN IDENTIFICATION CODE, RIC**

The use the correct Resin Identification Code symbol of the proper size as detailed in ASTM D7611 is encouraged. Meeting the APR Critical Guidance for a specific resin is a supplemental demonstration of proper RIC assignment.
PE Thin Wall Packaging excerpt from
The APR Design™ Guide for Plastics Recyclability