The Association of Postconsumer Plastics Recyclers

APR Design for Recyclability Guidelines
Section Excerpt

Please note: This is only one section excerpted from the Guidelines. The text of the entire document can be found elsewhere on the APR Website.

Natural HDPE Milk & Water Bottles (unpigmented homopolymer resin)

The basic design for recycling guideline to consider when making material choices for any attachment to the bottle is to consider its general compatibility with the base resin (homopolymer HDPE) 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. HDPE has a density or specific gravity 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 HDPE in the reclamation process. Materials with a density greater than 1.0 will sink in these systems and can be separated easily from the HDPE. (The density range of key plastic materials can be found on page 8).

COLOR Unpigmented, homopolymer HDPE used for milk and water bottles has the highest value and widest variety of end-use applications. Its lack of pigmentation makes it easy and economical to sort and separate from other plastic bottles. The use of pigments in homopolymer HDPE bottles is undesirable and should be avoided.

CLOSURES/CLOSURE LINERS Plastic 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 bottle after the closure is removed. For these reasons, ‘snap-on’ caps are preferred to ‘screw-on’ caps. The use of PVC for closures or closure liners is undesirable and should be avoided. The use of metal closures is undesirable and should be avoided as they are more difficult and more costly to remove in conventional HDPE reclamation systems compared to the preferred closure systems (HDPE, LDPE, or PP). The sum of PP and LDPE closure and attachments should

be limited to less than 5% of the total bottle weight. Closures made from steel are undesirable and should be avoided. Silicone polymer closure parts are discouraged as they may present significant technical problems in the process of recycling and to the usefulness 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 bottle. 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 bottle, 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 bottle, leaving no remains on the bottle. Shrink sleeves are preferred to adhered labels. Shrink sleeves made from PE or PP are preferred. The use of PVC sleeves or safety seals is undesirable and should be avoided. Foil safety seals that leave foil or remnants or attaching adhesive on the HDPE bottle should be avoided.

LABELS PP, OPP, HDPE, MDPE, LDPE, LLDPE, or PS label stock is preferred to all other label materials. The preferred label systems are shrink sleeve labels that require no adhesive, or those that incorporate the label directly on the closure. Paper labels are undesirable and should be avoided as they can increase contamination in the HDPE due to fiber and adhesive carry-over through the reclamation process. Similarly, metallized labels increase contamination and separation costs and should be avoided. The use of PVC labels is undesirable and should be avoided. Full bottle sleeves should be so designed that automatic sorting equipment can properly identify the resin used to make the bottle.

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

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 140 ˚F to 180 ˚F in order to be removed in conventional washing and separation systems. If adhesives are not removed efficiently, they may disperse on the HDPE 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 HDPE reclamation systems). Adhesive usage and surface area covered should be minimized to the greatest extent possible to maximize HDPE yield and avoid contamination.

DIRECT PRINTING/DECORATION Presently, all direct printing other than date coding, either for product labeling or decoration, contaminates recycled unpigmented, HDPE homopolymer in conventional reclamation systems. The inks used in direct printing may bleed ink or otherwise discolor the HDPE during processing, or introduce incompatible contaminants. In either case, the value of the HDPE for recycling is diminished or eliminated.

LAYERS While unpigmented, homopolymer HDPE bottles generally do not use a multi-layer construction, it is possible that future bottle designs might require the use of layers for specific product applications. The use layers that are not made from unpigmented, homopolymer HDPE is undesirable and should be avoided, *unless* they are compatible with or easily separable from HDPE in conventional recycling systems. If layers must be used, their content should be minimized to the greatest extent possible to maximize HDPE yield and reduce potential contamination and separation costs. (The APR's Champions for Change cooperative Testing Program invites consumer product, plastic bottle and bottle component manufacturers to work with APR member companies to determine whether new modifications to a regularly recycled plastic bottle 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, it appears that the use of degradable additives may result in shortening the useful life of the bottles of which they are a part and therefore affect the ability of such bottles 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. Degradable 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 recycle and durability, for the next use of the recycled bottle. (The APR's Champions for Change Cooperative Testing Program invites consumer product, plastic bottle and bottle component manufacturers to work with APR member companies to determine whether new modifications to a regularly recycled plastic bottle will impact conventional recycling systems prior to introducing the modification. The APR Guidance Documents form a necessary, but not sufficient, basis for test program design for degradable additives. Aging under specific environmental exposure is needed for the technical

assessment of the initial postconsumer bottle. Additionally, the next use applications must be tested under conditions of specific aging and environmental exposure to assure full service life and subsequent next use recycling.)

OTHER ATTACHMENTS Other attachments made from HDPE are preferred to all others as the use of non-HDPE 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. Non-HDPE attachments should not be adhesively bonded to the bottle and must readily separate from the bottle in conventional HDPE reclamation systems. If non-HDPE attachments are added to a bottle, they should be made from materials with a density greater than 1.0 that will easily separate from HDPE in conventional separation systems with the exception of PVC, which is undesirable and should be avoided. The use of PP or LDPE attachments, if necessary, and closures should be limited to less than 5% of the total bottle weight. Higher percentages can contaminate the HDPE for many recycling applications, as these materials are difficult to separate from HDPE in conventional systems. 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 140 °F to 180 °F in order to be removed in conventional washing and separation systems. If adhesives are not removed efficiently, they may disperse on the HDPE 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 HDPE reclamation systems). Adhesive usage and surface area covered should be minimized to the greatest extent possible to maximize HDPE yield and avoid contamination.

Silicone polymer closure parts are discouraged as they may present significant technical problems in the process of recycling and to the usefulness of the recycled plastic.

POSTCONSUMER CONTENT The use of postconsumer HDPE in bottles 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 may be used as a supplemental demonstration of proper RIC assignment.

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