



2008 National Postconsumer Report on Non-Bottle Rigid Plastic Recycling

Prepared for the American Chemistry Council

Introduction

The 2008 National Postconsumer Recycling Report on Non-Bottle Rigid Plastics is the second annual report on U.S. pounds of postconsumer non-bottle rigid plastics—packaging and non-packaging—recovered for recycling. Research for this report was conducted by Moore Recycling Associates Inc. of Sonoma, CA for the Plastics Division of the American Chemistry Council (ACC) of Arlington, VA.

Executive Summary

In order to determine an accurate estimate of pounds of non-bottle rigid plastic recovered in 2008, both domestic and export postconsumer markets were surveyed. A minimum of 361 million pounds of postconsumer non-bottle rigid plastic was recovered in 2008. This is an increase of 10.8% reported in 2008 over 2007.

The information obtained is based on postconsumer recovery data reported by 21 plastic processors/end-users and 26 exporters.

Use of rigid plastic containers and packaging has grown significantly over the past decade. Many rigid containers are made from polyethylene (HDPE) and polypropylene (PP) such as HDPE tubs, PP cups and similar food containers. As more and more buyers compete for the collected supply of polyethylene bottles, some reclaimers have begun processing non-bottle HDPE and PP containers to produce resin for new end products.

Plastic scrap prices were strong the first 3 quarters of 2008 showing very little fluctuation. In the fourth quarter, the market started to soften and then—with the market crash for recycled materials in late October 2008—demand and prices dropped drastically. Demand dropped from all time highs in July 2008 very low levels for some low-grade materials. Export market purchases came to an abrupt halt for most mixed-resin plastic scrap bales. Fortunately domestic buyers—although affected by the economic downturn—continued in business and in some cases increased their purchases of the non-bottle rigid material buying bales at bargain prices. The market began to rebound toward the end of the 1st quarter of 2009. Current pricing and demand, although not back to record high levels, is strong and steady. Most commodities have recovered to more than half their previous high price.

The market crash of 2008 highlighted the need for strong domestic processing. The key challenge to increasing domestic processing is collecting enough quality

Copyright © American Chemistry Council (2010)



material. In order to be profitable, reclaimers require a consistent supply of clean, single-resin material. Some of the barriers to getting quality material from mixed bales of non-bottle rigid plastics are:

- A lack of enforceable reclaimer-generated bale specifications for non-bottle rigid plastics,
- Pressure on MRFs to “divert” materials as inexpensively as possible coupled with their ability to ship low-quality, mixed resin bales to China with no consequences,
- A lack of consistent and clear education to consumers about recycling non-bottle rigid plastics.

The American Chemistry Council is partnering with other entities including the Association of Postconsumer Plastics Recyclers to address the barriers to increased non-bottle rigid recycling, but municipal officials are key to addressing the issue of improving the quality of bales generated at MRFs. Municipal contracts with MRF operators should require operators to create product bales that are not just saleable, but contain a minimum of waste or out-throws, as well.

As stakeholders work together and collection continues to expand, creating a consistent reliable supply of quality material, we will likely see new and vigorous investment in sorting and reclamation capacity for non-bottle rigid plastics.

Findings

In 2008, a minimum of 361 million pounds of non-bottle rigid plastics was collected for recycling in the United States. Approximately 62% of the material was manufactured into new products in the U.S. or Canada, and the remainder was exported, primarily to China. Since 2007, the ratio of export to domestic purchases has flip flopped. This is due to at least two factors

1) the crash in the market in the last quarter resulted in companies exporting for only 3 quarters of the year, since the 4th quarter produced little activity and almost no export of material and 2) the total for domestic material in 2007 was under reported, so Moore Recycling made an aggressive effort to identify additional domestic sources.

Postconsumer Non-bottle Rigid Plastic:

| Year | Exported | Purchased for use in US or Canada | Total |
|------|-------------|-----------------------------------|-------------|
| 2008 | 137,132,799 | 223,642,898 | 360,775,697 |
| 2007 | 204,040,000 | 121,400,000 | 325,440,000 |

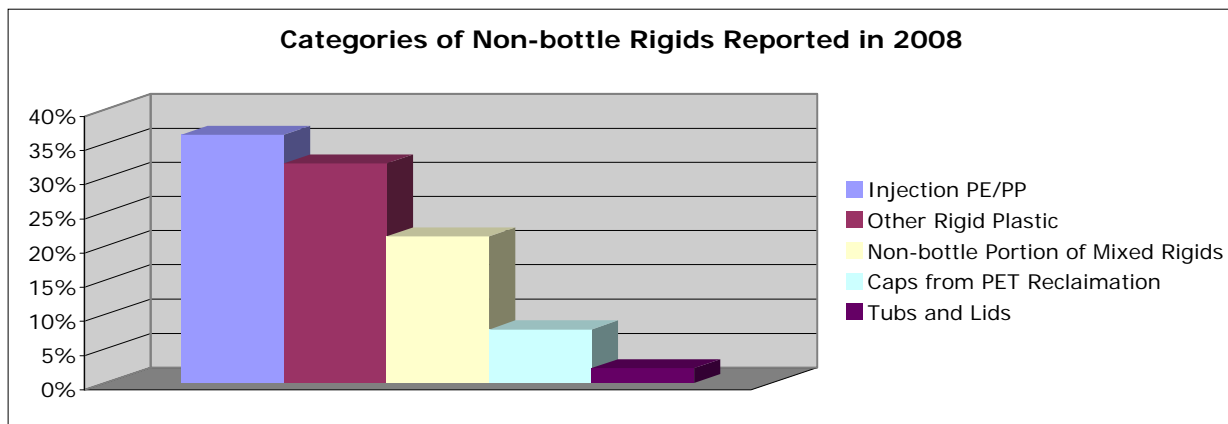
Non-bottle rigid plastic is sold in a variety of single-resin and mixed-resin categories. The value placed on most mixed-resin bales is dependent on the likely percentage of polyolefin plastics in the bale: higher percentages of polyolefin (Polyethylene – HDPE, LDPE and Polypropylene - PP) generally are in higher

Copyright © American Chemistry Council (2010)

demand. When sold into the marketplace, it is categorized in many different ways. Listed below are the most common mixed-resin categories, generally in order of value:

- Injection Plastic (also called Bulky Rigid Plastics) – primarily Polyethylene (PE) and Polypropylene (PP) and includes carts, crates, buckets, baskets, car bumpers
- Electronic Housings – primarily HIPS-ABS-PC
- Commingled Bottles and Containers – generally includes 3-7 bottles and 1-7 containers and/or all bottles and containers in some instances
- Tubs and Lids
- Mixed Rigid Plastics (also known as 1-7's, and 3-7's) – includes injection Polyethylene (PE) and Polypropylene (PP) mixed with 3-7 bottles and 1-7 containers
- Other Rigid Plastics – a “catch all” category defined on a case-by-case basis.

The following charts breaks down how the material was reported in the survey.¹



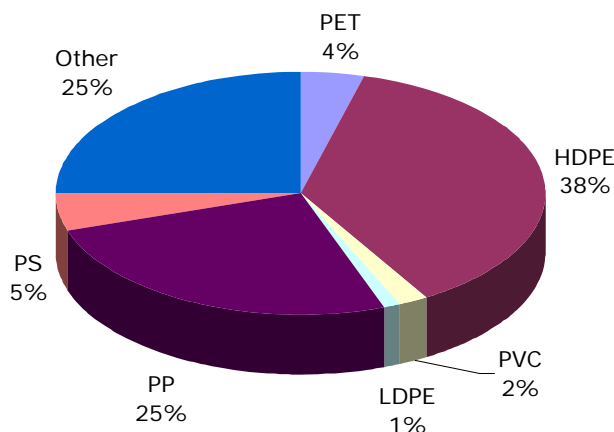
One of the barriers to additional demand for non-bottle rigid plastics is the lack of clear definitions and specifications for different types of baled plastic. This leads to a wide variety of quality and content of bales. Potential buyers of non-bottle plastic need a consistent supply and quality of feedstock. As noted later in the report, the rather random nature of the current collection and processing infrastructure in the US makes such consistent quality supply difficult.

Out of the 361 million pounds collected for recycling, 194 million pounds (or ~54%) could be classified as durable goods, including items like pallets, crates, carts, 5 gallon buckets, and electronic housings. A large percentage of non-bottle rigid plastics collected for recycling was polyolefin material (HDPE, LDPE, PP). This material generally has the highest value with both domestic and export markets because of the variety of products into which it can be used and its comparative ease of re-use processing compared to the other resins.

¹ Seventy-three percent of the “Other Rigid Plastic” material reported was further described either as a specific resin, a mix of resins, or type of product (hangers, pallets, etc.). The other 27% was not further identified.

The chart below illustrates the percentage breakdown of individual resins.²

Postconsumer Non-bottle Rigid Plastic



The “other” resin category comes from three sources. One is the material reported as “Other Rigid Plastic” but not further identified into a specific resin, (i.e. store returns, electronic/computer scrap, etc.). The second source is material reported as a resin other than 1-6 (e.g., polycarbonate or ABS). The last source is from the percentage of mixed bales allocated as “other” during the 2008 hand separated bale sorts. A portion of the material was resin other than 1-6 and a portion in the mixed-resin bales was visually unidentifiable and was put in the “other” category. There are proposals pending for a new mixed bale sort using resin identification equipment to further refine the percent mix of these bales.

Collection

Non-bottle rigid plastics are captured in a variety of ways. Some are collected as part of commercial recycling efforts (e.g., used crates and pallets or some e-scrap) and other material is collected at the community level. Community programs vary widely from curbside to drop-off depending on what materials municipal collection programs accept, and how and to whom MRFs market their materials. There are also examples of companies starting their own community based non-bottle rigid plastic collection programs for both their own products and for specific resins.

Curbside

Material recovery facilities (MRFs) generate wide variations in the quality of bales of non-bottle rigid plastics because there are many potential combinations of

² The majority of the breakdown is based on percentages from a hand separated bale sorts done in early 2008 on Injection Plastic bales and Commingled Bottle and Container bales. No data is currently publicly available with a resin break out of Tubs and Lids programs. The chart also includes data reported by specific resin type and not part of a mixed bale.

product types and resins in this broad category and because community programs vary widely in their consumer education and their descriptions of which non-bottle rigid plastics they collect. Most municipalities that collect non-bottle rigid plastics accept household containers, but a growing number also are adding bulkier rigid plastics, such as toys, lawn furniture, laundry baskets, etc. Shown below is a small sample of how various communities ask for rigid plastics.

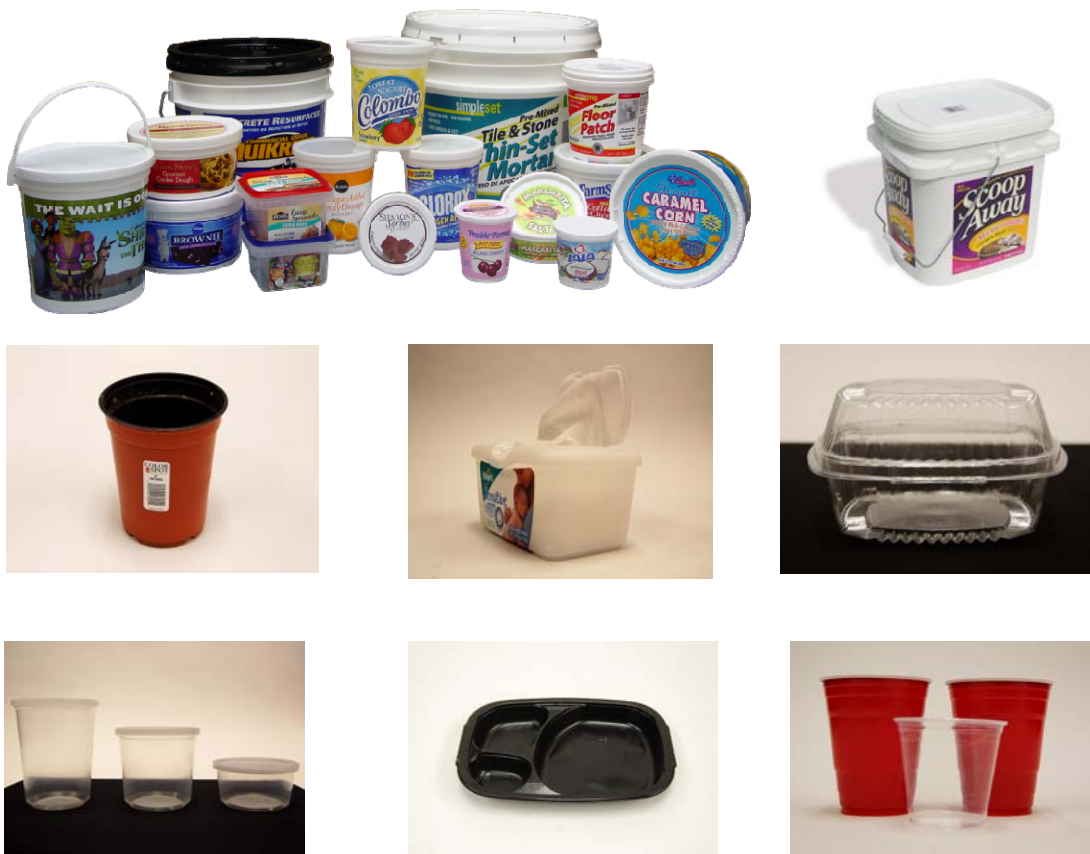
Some are brief:

- All Household Containers 1-7
- All Bottles and Containers 1-7
- All Plastic Containers
- All Rigid Plastic Containers
- Plastic Tubs and Bottles
- Plastic Food and Beverage Containers (bottles and tubs)
- Any material made of plastic, the recycling code is not necessary.
- Rigid Plastics with the Recycling Numbers 1-7
- All Bottles and Containers Labeled #2, 4, or 5
- All Clean Plastic
- Plastics Labeled 1-7
- All Plastic Bottles, Tubs and Lids

Others are more detailed:

- Recycle all plastic labeled on or near the bottom with a 1-7 recycling symbol. Beverage bottles (soda, water), bleach and household cleaner bottles, egg cartons, flower pots, foam packing (hard packing around computers or stereos), food containers (cottage cheese and margarine tubs, yogurt cups), plastic bags (bread, dry cleaning, grocery, newspaper, produce, shopping bags), prescription bottles, rigid plastic swimming pools.
- PET: soft drink bottles, photo film canisters; HDPE: detergent containers, plastic water/milk containers, pails, t-shirt bags; PVC: sprinkler pipe; LDPE: trash can liners, shrink wrap, grocery bags; PP: yogurt containers, luggage, drinking straws; PS: plastic plates, cups egg cartons, food trays; Other: Tupperware and mixed plastic containers, plastic toys, flower/plant containers, no mixed products (i.e. plastic/metal combination)
- Plastics - Milk cartons, soft drink liter bottles, water bottles, liquid detergent bottles, fabric bleach bottles, shampoo bottles, all household product containers with #1, #2, #3, #4, #5, #6 & #7 stamp and plastic toys and tools if identifiable by one of these numbers.

Below are common examples of non-bottle rigid plastic *containers* and *packaging* that might be accepted in community programs. This does not represent all rigid *packaging* or *plastics*. As noted above other bulkier plastics (e.g. toys, 5-gallon buckets, lawn furniture, laundry baskets) may also be accepted in some community programs.



The number of community programs handling mixed rigid plastics increased significantly over the past few years because of record high prices in 2008 and—until the fourth quarter of 2008—strong demand from domestic and export buyers. Buyers placed an increasingly higher value on this material beginning in mid-2005 when virgin resin prices for PE jumped. High virgin resin prices made mixed rigid plastics an attractive low-cost raw material. This coupled with public officials' desire to recycle as much material as possible, fueled an increase in collection.

In 2008, twenty-eight of the one hundred largest U.S. cities collected non-bottle plastics through curbside programs. Of the 28 cities collecting non-bottle rigid plastics, 12 collect all bottles and containers, and 16 collect rigid plastics beyond bottles and containers. Most of the 28 cities are located in California or along the West Coast. Liz Bedard, Director of APR's Rigid Plastics Recycling Program, conducted internet research into the plastic recycling program of the largest city in each state and found that of the 49 cities which had available information, 28 have curbside collection of #1 – 7 plastics beyond bottles recycling.

Copyright © American Chemistry Council (2010)

Most MRFs (particularly on the West Coast) sort out the higher value plastic (PET and HDPE bottles) and then bale the remainder of the rigid plastics together and market these as “mixed rigid” plastic bales. Some MRFs have tailored their sorting operations to meet domestic or local market specifications.

Other types of collection

Communities also have drop-off collection programs for specific types of products, the most wide spread in the category of non-bottle rigid plastics are the e-scrap collection programs. In many cities electronics are banned from being placed in the garbage. These programs provide a place for electronic products to be disposed of and also produce the majority of the plastic electronic and computer scrap reported in this survey—6% of the total non-bottle rigid material reported.

Used products from businesses, also referred to as post-commercial, also are considered postconsumer. These products have met their intended use and are typically gathered when there is a large enough quantity and sold directly by a commercial business to brokers or reclaimers. These products include totes, crates, pallets, etc. Such commercial materials are often products used for transporting and storing other goods. Reclaimers that specialize in processing post-industrial material often will take this material because it is usually sold as a large quantity of a single resin or product type and is typically cleaner material than you might find coming off a curbside stream.

There is a growing trend of manufacturing companies creating community collection programs for their own products or to amass a specific resin that isn't contaminated by the curbside stream. These programs typically are mail-back or drop-off programs. As with most recyclables, drop-off programs allow for more control over what is received and the material is cleaner. Companies with these programs conduct them at their own cost as a corporate responsibility initiative and for the supply of raw material.

Quality

As with other commodity materials experiencing record high prices in 2008, quality was not always a priority with the export market. This was due to strong competition and a lack of direct feedback between converters and suppliers. This is changing somewhat because of the market correction in late 2008. The Plastics Recycling Committee of the China Plastics Processing Industry Association (PRC-CPPIA) estimates that at the end of 2008, 39% of the plastic processors in China went out of business. Those that remain and the domestic buyers are attempting to focus more on quality, but the nature of how China imports and handles scrap plastic is stifling these efforts. Processors in China tend to be small family-based businesses that purchase from brokers—they have no direct connection with their overseas suppliers and no ability to give those suppliers feedback on material quality.



Marketplace

Domestic Capacity

The total North American capacity for processing non-bottle rigid plastic is approximately 530 million pounds per year. Just over half of the capacity is into mixed-resin products such as lumber, railroad ties, garden products and transport packaging. These users prefer the olefin fraction but in some cases will tolerate and use some non-olefin bottles and containers.

There is a strong market for clean large PE and PP items. Most of these buyers are seeking bulky rigid materials such as buckets, crates, tubs, toys, storage bins and lawn furniture. These buyers are less (or in some cases not at all) interested in small HDPE containers such as yogurt cups and butter tubs, which require washing prior to end use.

2008 Market

During the first and last quarters of the year, the domestic market was the price leader for most grades of rigid plastic except the very lowest mixed grades. The export market, primarily China, had the stronger price during second and third quarters, and all year for low-grade mixed material, offering record high prices for all grades in the summer.

Overall, plastic scrap prices were strong for the first three quarters of 2008, showing very little fluctuation. In the fourth quarter, the market started to soften and then—with the market crash in late October 2008—demand and prices dropped drastically for all recycled materials. Demand dropped from all time highs in July 2008 to very low levels for some low grade materials. Export market purchases came to a drastic halt for most mixed-resin plastic scrap bales. Fortunately domestic buyers—although affected by the economic downturn—continued in business and in some cases increased their purchases of the non-bottle rigid material, buying bargain bales.

As previously identified, approximately 38% of the non-bottle rigid plastics collected in the United States were exported to China in 2008 (down from 63% in 2007). The late October 2008 free fall of demand and price for rigid plastic scrap in China has highlighted the need to expand domestic markets for non-bottle plastics. The potential domestic end market for non-bottle plastics is very large, but as previously noted, there are several barriers to realizing the potential domestic market demand. The primary barrier is the lack of emphasis on quality. MRFs are under pressure to “divert” as much material as possible, and the lack of a feedback mechanism on exported material increases the ability of MRFs to ship low-quality, mixed-resin bales at relatively strong prices.

End-Use Markets

As noted, other than electronic housings, buyers base the value of non-bottle mixed-resin bales on the amount of polyolefin plastics in bales. The primary domestic end

uses for non-bottle rigid plastics are composite products, such as lumber and railroad ties, and relatively thick-walled injection products such as pots and crates. In addition, a number of companies compound these materials and sell to manufactures that make shapes and forms, such as wheels for roll carts, or roto-molded products such as tanks and carts.

The domestic infrastructure to use the non-polyolefin (PET, PVC, PS) non-bottle plastics has not yet developed. In order for this market to develop, domestic users will require a consistent supply of clean, single-resin material. To generate such a supply will require at a minimum:

- Consistent, clear education to consumers about what products to put into their curbside bins.
- Enforceable reclaimer-generated bale specifications for the various categories of non-bottle rigid scrap plastics.

In addition, this report is a step toward documenting the availability of raw material. There also is a need to detail the types and efficacy of plastic recycling technologies, illustrate further the depth of current and potential demand for products made with recycled materials, and package information about rigid plastic recycling for the banking community to enhance the opportunity for investment. The American Chemistry Council is partnering with other entities including the Association of Postconsumer Plastics Recyclers to address several of these steps, but this effort will not bear fruit unless municipal officials address the issue of improving the quality of bales generated at MRFs. Municipal contracts with MRF operators should require the operator to create product bales that are not just saleable but have a minimum of waste or out throws as well.

As these actions occur and collection continues to expand, creating a consistent reliable supply of quality material, we will likely see new and vigorous investment in sorting and reclamation capacity for non-bottle rigid plastics.

Additional Information

The Plastics Division of the American Chemistry Council provides resources to communities, businesses and consumers to assist them in increasing awareness and education of the recycling of plastic bottles and containers. For information about non-bottle rigid plastics recycling visit www.americanchemistrycouncil.org/plastics. Also, visit www.plasticmarkets.org for markets and information about handling guidelines.

The 2008 National Postconsumer Recycling Report on Non-Bottle Rigid Plastics has been prepared to provide information to parties interested in the recycling of plastics, in particular non-bottle rigid plastic materials. Facilities developing a recycling process and all entities involved in the chain of collection, processing, distribution, and sale of recycled products have an independent obligation to ascertain that their plans, actions, and practices meet all relevant laws and represent sound business practices for their particular operations. Facilities may

vary their approach with respect to particular operations, products, or locations based on specific factual circumstances, the practicality and effectiveness of particular actions and economic and technological feasibilities. This report is not designed or intended to define or create legal rights or obligations. ACC does not make any warranty or representation, either express or implied, with respect to the accuracy or completeness of the information contained in this report; nor does ACC assume any liability of any kind whatsoever resulting from the use of or reliance upon any information, conclusion, or options contained herein. The American Chemistry Council sponsored this report.

This work is protected by copyright. The American Chemistry Council, which is the owner of the copyright, hereby grants a nonexclusive royalty-free license to reproduce and distribute this workbook, subject to the following limitations: (1) the work must be reproduced in its entirety, without alterations; and (2) copies of the work may not be sold.