Introduction

The 2010 National Report on Postconsumer Non-Bottle Rigid Plastic Recycling is the fourth annual report on pounds of postconsumer non-bottle rigid plastics—packaging and non-packaging—recovered for recycling in the United States. Research for this report was conducted by Moore Recycling Associates Inc. for the Plastics Division of the American Chemistry Council.

Executive Summary

A minimum of 826 million pounds of postconsumer1 non-bottle rigid plastic was recovered in 2010. This represents a remarkable increase of 72% over 2009. This increase is due to increased non-bottle rigid collection efforts by communities around the country and to continued progress in getting more companies to report this data: especially the recovery data from the commercial sector. The growth in non-bottle rigid plastic collection is consistent with the findings from the report, Plastic Recycling Collection: National Reach Study released in May 2011.

This report documents that 58 percent of non-bottle rigid plastic scrap was procured by domestic (U.S. and Canadian) users versus exported off-shore. The report also indicates that plastic scrap prices and demand were consistent throughout 2010.

Non-Bottle Rigid Plastic Recovered Year over Year (by Resin)

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1 Throughout this report the term “postconsumer” refers to used plastics that have served their intended purpose; this includes both plastics that have been used by consumers and plastics that have been used by businesses. Commercial materials are usually recovered outside of curbside or drop off collection programs and include items such as totes, pallets, crates, and other commercial packaging. The EPA defines postconsumer as a material or finished product that has served its intended use and has been diverted or recovered from the waste destined for disposal, having completed its life as a consumer item. According to this definition, a business qualifies as a consumer of those goods. In contrast, post-industrial material is defined by the EPA as materials generated in manufacturing and converting processes, such as manufacturing scrap and trimmings/cuttings. This report does not include post-industrial recycling.
In order to determine an accurate estimate of pounds of non-bottle rigid plastic recovered for recycling in 2010, Moore Recycling surveyed both domestic and export postconsumer markets. The information obtained is based on U.S. sourced, postconsumer recovery data reported by 27 U.S. and Canadian plastic reclaimers and 25 exporters. Both exporters and domestic reclaimers reported that 2010 was a more profitable and steady year than 2009. Survey feedback included some concerns with the quality of mixed bales, but overall plastic reclaimers and end-users felt more positive about market conditions and demand in 2010 than 2009.

Plastic scrap prices and demand were steady throughout 2010. Buyers report that current demand is strong and steady. Other than non-ferrous metals, plastic scrap has the highest economic value per ton, of the five major scrap material categories (plastic, non-ferrous, steel, paper, and electronics) illustrating that plastic is a valuable resource that should be captured.

Plastic recycling industry innovation is allowing companies to process non-bottle, mixed plastic materials once thought to be unusable or only cost effective if exported. For example, 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. There are also U.S. reclaimers that have the sorting and processing technology and the end product applications that allow them to mix together a number of different resins.

Reclaimers indicate that they require a reliable supply of quality-consistent material. Currently, most scrap plastic is sold on a spot-market basis. According to reclaimers, this uncertainty of supply is a barrier to investment. Reclaimers identified other barriers to getting quality material from mixed bales of non-bottle rigid plastics including:

- A lack of clear terminology and reclaimer-generated bale specifications for non-bottle rigid plastics,
- Incentives for MRFs to “divert” materials as inexpensively as possible coupled with their ability to export low-quality, mixed resin bales,
- A lack of consistent and clear education to consumers about recycling non-bottle rigid plastics.

The American Chemistry Council (ACC) and the Association of Postconsumer Plastics Recyclers (APR) continue to work to address these barriers. Failure to address the issues of quality and contracted supply, will obstruct progress in developing more non-bottle plastic reclamation. Conversely, as stakeholders work together and collection continues to expand—creating a consistent, contracted supply of quality material—the marketplace will have the requisite conditions to secure capital for investment in sorting and reclamation capacity for non-bottle rigid plastics. As

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2 Moore Recycling surveys and counts material from companies that wash or extrude unwashed material into a clean feedstock or end product.
part of next year’s survey, questions on expansions and upgrades to facilities will be included in order to report on what investments are taking place and how those investments affect domestic reclamation.

**Methodology**

Data on recovered postconsumer non-bottle rigid plastic is collected alongside data on plastic bottles and film during the Postconsumer Plastic Recycling Survey. For this report, the survey gathers data on mixed rigid plastic and material reported as segregated by resin. Segregated resin material includes plastic coming out of the commercial sector that has met its intended use as packaging or for transport, such as pallets, crates and totes or material collected through special collection programs, such as battery casings. The methodology overall has not changed since the first report, but in the last two years, Moore Recycling has identified and gathered data from additional reclaimers of segregated resins and postconsumer material coming out of the commercial sector.

To ensure the most accurate information:

- Moore Recycling’s markets database is continually updated to include current exporters and reclaimers of plastic scrap;
- An online survey is submitted by email and staff follow up appropriately (email and/or phone) to collect the data; and
- The data is vetted through follow up calls, speaking to other industry contacts and reviewing other sources of recycling industry information.

**Markets Database**

Moore Recycling continually updates an in-house database of plastic exporters, processors, reclaimers and key brokers. Through work with ACC, the Association of Postconsumer Plastics Recyclers (APR), the Plastic Recycling Corporation of California (PRCC) and the National Association of PET Container Resources (NAPCOR), and web sites PlasticsMarkets.org and PlasticBagRecycling.org, Moore Recycling Associates regularly receives requests from new contacts for material and markets. Contacts are also identified through published market databases and conversations with suppliers, such as material recovery facilities (MRFs), and key reclaimers.

**Data Collection and Analysis**

Moore Recycling uses a web-based, custom-designed survey system to gather data. Every year Moore Recycling explores ways to improve the quality and timeliness of the survey. In this latest survey, questions viewed by responders were streamlined. For example, when asked about material purchases—bottles, mixed & non-bottle material, film—if the responder only purchased bottles, they would only see questions about bottles. Efforts like this help elicit a better
response rate by reducing the size of the survey for each responder to only include the areas pertinent to their particular operations. An email with a unique link and message is sent to each contact. After an adequate amount of response time has passed, Moore Recycling staff send follow-up emails and make telephone calls to retrieve data. This follow up process can take weeks or months depending on responses. To encourage participation, free advertising on PlasticsMarkets.org is offered to those who respond promptly.

All suitable data is entered in the online survey tool directly by the company being surveyed or by Moore Recycling staff when the survey is completed over the phone, by email or fax. As it is received, the data is reviewed for accuracy and follow up calls are made, as needed. After data collection is complete, the data is compiled and categorized based on the detail reported. The final data totals are reviewed, analyzed, and then reported with as much detail as possible without compromising confidentiality. Describing as clearly as possible how the data is collected, and what is and is not included in the survey, provides readers of this report with the transparency needed to cross reference our results with other industry data.

**Survey Categories**

Recently, APR’s Non-Bottle Rigid Plastic Recycling Program identified seven different types of mixed rigid bales containing non-bottle rigid plastic and assigned them names. In this latest survey, Moore Recycling asked for data using these seven bales types, as well as a few other mixed bale categories. The survey asks for segregated resin material, including post commercial. Based on the APR’s work, the following mixed rigid plastic bale categories were used:

- **All Rigid Plastic (ARP)**- All **bottles**, AND all household non-bottle **containers** (includes thermoform packaging, cups, trays, clamshells, food tubs), AND all **bulky** rigid plastic (includes carts, crates, buckets, baskets, toys, lawn furniture)
- **Pre-picked Rigid Plastic (PPK)**- All household non-bottle **containers** (includes thermoform packaging, cups, trays, clamshells, food tubs), AND all **bulky** rigid plastic (includes carts, crates, buckets, baskets, toys, lawn furniture). Very few bottles
- **Bottles & Containers (B&C)**- All **bottles**, AND all household non-bottle **containers** (includes thermoform packaging, cups, trays, clamshells, food tubs). Very few bulky items
- **Small Plastic Containers (SPC)**- All household non-bottle **containers** (includes thermoform packaging, cups, trays, clamshells, food tubs), with very few bottles and no bulky items
- **Bulky Rigid Plastic (BRP)**- All **bulky** rigid plastic (includes carts, crates, buckets, baskets, toys, lawn furniture). No bottles or containers
- **Tubs & Lids (T&L)**- PP, PE non-bottle household containers, including buckets
- **Olefin Bale (OLF)**- PP, PE **bulky** rigid plastic, may include PP, PE bottle and/or non-bottle household containers
The survey asked for the following additional categories:

- **HDPE Colored Bottles with PP/PE containers**
- **Other Mixed Rigid Plastic** – a “catch all” category defined on a case by case basis
- **Mixed Electronic Scrap** – primarily HIPS, ABS, PC
- **Post Commercial or Otherwise Segregated Individual Resins**: PET, HDPE, PP, LDPE, PS, PVC, ABS, PC and Other

**Findings**

In 2010, a minimum of 826 million pounds of non-bottle rigid plastics was collected for recycling in the United States. Approximately 58% of the total material reported was reclaimed in the United States or Canada, and the remainder was exported overseas, primarily to China.

### Non Bottle Rigid Plastic - Domestic Versus Export

![Graph showing domestic versus export for non-bottle rigid plastics from 2007 to 2010.]

Seventy eight percent of the resin-segregated plastic collected was processed in the United States or Canada. Sixty five percent of the mixed resin plastic collected was exported offshore to areas—primarily China—where the infrastructure exists to sort scrap and use it for new products.
### Postconsumer Non-Bottle Rigid Plastic Recovered

<table>
<thead>
<tr>
<th>Year</th>
<th>Exported</th>
<th>Purchased for use in United States or Canada</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>2010</td>
<td>350,869,617</td>
<td>475,783,142</td>
<td>826,652,759</td>
</tr>
<tr>
<td>2009</td>
<td>236,104,896</td>
<td>243,115,190</td>
<td>479,220,086</td>
</tr>
<tr>
<td>2008</td>
<td>137,132,799</td>
<td>223,642,898</td>
<td>360,775,697</td>
</tr>
<tr>
<td>2007</td>
<td>204,040,000</td>
<td>121,400,000</td>
<td>325,440,000</td>
</tr>
</tbody>
</table>

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 demand.

When mixed resin bales are sold into the marketplace, they are categorized in many different, often conflicting, ways. The industry has not yet fully adopted the bale definitions and specifications created by APR, leading to a wide variety in quality and in content of bales. Buyers of non-bottle plastic need a quality-consistent supply of feedstock. APR’s Non-Bottle Rigid Plastic Recycling Program is working on this through dissemination of their bale terminology (as mentioned in the Methodology section of this report) and by creating model bale specifications for the seven different types of mixed rigid bales.³

The following charts show the sources of the non-bottle rigid material reported in the survey.

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³ APR has already released model bale specifications for two of the seven mixed resin bale types. They can be found here: [http://plasticsrecycling.org/rigid-plastics/public-access-rigid-plastics-information/model-bale-specifications](http://plasticsrecycling.org/rigid-plastics/public-access-rigid-plastics-information/model-bale-specifications)
A large percentage of non-bottle rigid plastics collected for recycling was polyolefin material (HDPE, LDPE, PP). This material generally has the highest value in both domestic and export markets because of the wide range of manufacturing uses and relative ease of processing. Some reclaimers are using non-olefin resins mixed with olefins for their end product, but most mixed-resin buyers remove the non-olefin portion of mixed rigid bales prior to manufacturing. These reclaimers may rebale the non-olefin portion for sale where there are markets. Some could be recovered for energy value, although at this time Moore Recycling cannot document what portion is recovered for energy. Some could also be disposed of as solid waste.4

The chart below illustrates the percentage breakdown of the individual resins making up the non-bottle rigid plastic recovered for recycling in 20105.

![Postconsumer Non-Bottle Rigid Plastic Recovered in 2010 (by resin)](chart.png)

<table>
<thead>
<tr>
<th>Resin</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>PET</td>
<td>28,330,822</td>
</tr>
<tr>
<td>HDPE</td>
<td>238,835,472</td>
</tr>
<tr>
<td>PP</td>
<td>363,423,496</td>
</tr>
<tr>
<td>LDPE</td>
<td>17,856,056</td>
</tr>
<tr>
<td>PS</td>
<td>25,983,792</td>
</tr>
<tr>
<td>PVC</td>
<td>10,247,714</td>
</tr>
<tr>
<td>Other/Mixed/Unknown</td>
<td>141,975,406</td>
</tr>
</tbody>
</table>

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4 The data reported conservatively accounts for this by removing the non-olefin portion of mixed bales reclaimed in the U.S. or Canada, unless Moore Recycling staff know the non-olefin plastic was actually reclaimed domestically based on the responder. Material sold to another reclaimer or for export would be counted by the reclaimer of the non-olefin material or the exporter.

5 The breakdown is based on material reported as specific postconsumer non-bottle rigid plastic resins, as well as percentages applied to each of the mixed rigid plastic categories. The percentages applied to the mixed rigid plastic reported are based on hand-separated bale sorts done in 2010/2011. The 2009 report used the available 2010 bale sort data.
The “Other” resin category includes three sources. The first is the material reported as “Other Mixed Rigid Plastic” but not further identified as a specific resin or specific mix of resins, (e.g., electronic/computer scrap). The second source is material reported as a resin other than one of the six identified (e.g., polycarbonate or ABS). The third source is from the percentage of mixed bales allocated as “other” during the 2010/2011 hand-separated bale sorts (a portion of the material was resin other than Resin Identification Codes #1-6 and a portion in the mixed-resin bales was unidentifiable and was put in the “other” category).

The following chart shows the sources of non-bottle rigid plastic collected for recycling broken out by material going export versus staying domestic.

**Non-Bottle Rigid Plastic by Source (millions of lbs)**

As noted above, a large portion of the Bulky Rigid bales and segregated resin material (406 M lbs) is reclaimed domestically; whereas a high percentage of mixed rigid bales are exported overseas where there is more capacity to sort by resin.

**Collection**

Non-bottle rigid plastic is increasingly captured in a variety of ways. Some is collected as part of commercial recycling efforts (e.g., used crates and pallets, or some e-scrap); other material is collected at the community level. Community programs vary widely from curbside to drop-off depending on which materials municipal collection programs accept, and how and to whom MRFs market their materials. There are also special collection programs for items such as e-
scrap and battery casings. Some companies have started community-based non-bottle rigid plastic collection programs for their own products or for specific resins. Each of these programs is described in more detail below. All of these programs contributed to significant growth in non-bottle rigid plastic collection in 2010, but as noted above, newly-surveyed commercial recycling efforts and material from special collection programs contributed the most.

Curbside

MRFs generate wide variations in the quality and types of non-bottle rigid plastic bales—in part because there are many potential combinations of product types and resins in this broad category, and in part 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, and other items.

Some 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. Others mix all rigid plastic together. Yet other MRFs have tailored their sorting operations to meet domestic or local market specifications, generally focusing on the olefin plastics.

The number of community programs handling non-bottle rigid plastics continues to grow dramatically. ACC commissioned a study to determine the percentage of the U.S. population with access to recycle different types of plastic. The results show that 40% of the U.S. population has access to recycle all non-bottle rigid plastic containers and another 15% can recycle some non-bottle plastic. This study also found that the public is very confused about which types of plastic are recyclable. The report recommends abandoning the use of the ASTM Standard (Resin Identification Code) and developing new standardized language and pictures to describe items acceptable for plastic recycling. ACC provided funds to APR and Moore Recycling to work together to develop the “Education without Numbers” project. The first draft was vetted by community recycling coordinators earlier in 2011. APR and Moore Recycling are expected to present the revised educational language in early 2012.

Drop-off and Other Types of Collection

Some communities have drop-off collection programs for specific types of products, including e-scrap collection programs. As with most recyclables, monitored drop-off programs allow for more control over what is received and keep material cleaner. In many cities, electronics are banned from being placed in the garbage. These programs provide a place for electronic products to be taken for recycling. Electronic scrap—much of it from these types of programs—comprises 9% of the total non-bottle rigid material reported. Most state laws require that lead-acid

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6 Plastic Recycling Collection: National Reach Study released in May 2011
automobile batteries are recycled and not disposed of in a landfill. The plastic battery casings make up a significant part of the non-bottle polypropylene recycled every year.

Reclaimers that specialize in processing post-industrial material often accept postconsumer material from commercial businesses, because the material is usually generated as large quantities of a single resin or product type, and it 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. For example, Preserve® and its partners created the Gimme 5 Program, which has collection bins at retail locations (primarily grocery stores) for polypropylene. The Preserve program accepts polypropylene yogurt cups, Brita® water filters and other polypropylene plastic by mail. Preserve also sells its toothbrushes, made from recycled polypropylene, in a returnable plastic sleeve. Companies with these programs conduct them at their own cost as a corporate responsibility initiative and for the supply of raw material.

There are compelling reasons to add non-bottle rigid plastics to recycling collection programs:
- Most MRFs are already pulling and selling non-bottle rigid plastic
- Domestic and export markets are available
- Several mixed resin grades have a high scrap value (consistently higher than old corrugated cardboard)
- A steady supply encourages domestic investment in reclamation capacity
- Expanding collection to all clean rigid plastics has the potential to reduce public confusion about which plastics can be recycled thereby helping to increase the volume of all plastics collected including those already part of the program
- Manufacturers need assurance that there will be a steady supply before they invest in using PCR (postconsumer resin)
- Collecting all rigid plastic provides an opportunity to increase diversion/recycling rates

**Marketplace**

**Quality**

At present, the U.S. lacks effective, widely-available quality standards. This is due to unclear and inconsistently used terminology and symbols, competition for supply, and a lack of direct feedback between some export purchasers and U.S. suppliers. Most domestic buyers and some exporters focus on bale quality, by providing feedback to suppliers, because the lack of
adherence to quality standards adds cost to the recycling system, which can be an impediment to the development of additional reclamation capacity.

**Domestic Capacity**

In the U.S. there is at least 636 million pounds per year of non-bottle rigid plastic reclamation capacity, which includes washing or using unwashed material directly into a pellet or end product. There is also at least 100 million pounds of non-bottle reclamation capacity in Canada that draws on U.S. sourced material in addition to Canadian sourced. It is important to acknowledge that there is a significant amount of grind capacity in both the U.S. and Canada, for plastic scrap that is clean enough to be used unwashed, which is not included in the reclamation capacity reported above. This material is often sold as regrind to manufacturers that use it as they would a washed flake or pellet.

Less than one-third of this capacity is made 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 a small amount of non-olefin material.

Most of the remaining capacity is for clean and often larger PE and PP items. Most of these buyers are seeking bulky rigid materials such as buckets, crates, battery casings, toys, storage bins and lawn furniture. There has been some investment, and growing interest, in the capacity to handle small containers such as cups, deli containers and tubs, which usually require washing prior to end use. This developing category represents about five percent of the total non-bottle rigid capacity.

There are compelling reasons to improve the domestic reclamation infrastructure for all plastic recycling, including non-bottle plastic recycling. The plastic recycling industry has the highest employment rate, when compared to other materials recycled or any material disposed (Seldman 2006), while, according to a Friends of the Earth study done in 2010, exporting materials causes job loss in the United States. Also, recycling plastic utilizes embodied energy and extends the life of limited resources (Cascadia 2009). To do so, there is a need to test the efficacy of various types of plastic sorting technologies and to document the depth of current and potential demand for products made with PCR. Such information, combined with an emphasis on bale quality and long-term supply agreements, will enhance the opportunity for investment in plastic reclamation capacity.

**2010 Market**

In addition to the survey, Moore Recycling tracks the non-bottle rigid plastic recycling market throughout the year. Other than non-ferrous metals, plastic scrap has the highest economic value per ton, of the five major scrap material categories (plastic, non-ferrous, steel, paper, and electronics). Once again, export market demand was greater than domestic demand for most
grades of mixed rigid plastic. The domestic market was able to out-compete exporters for higher-grade (clean) bulky rigid plastic, especially during the first half of 2010.

Buyers reported that plastic scrap prices and demand remained strong and steady throughout the year for most grades. There were some small price spikes in the spring, but they were short-lived. Pricing and demand for high grade material was strong because it requires less processing and is therefore less costly to reclaim.

**End-Use Markets**

The primary domestic end uses for non-bottle rigid plastics are pipe, buckets, automotive products and other relatively thick-walled injection products such as pots and crates. A significant portion of the non-bottle rigid plastic collected is used in composite products, such as lumber, pallets and railroad ties. In addition, a number of companies compound these materials and sell to manufacturers that make shapes and forms, or roto-molded products such as tanks, drums and carts. Consumer products like cutting boards, toothbrushes and razors are also being manufactured with PCR.

**Conclusion**

This 2010 Non-Bottle Rigid Report shows a dramatic increase in recovery from 2009 to 2010. This increase is due to the fast growth in non-bottle rigid collection efforts by communities around the country as documented by the report Plastic Recycling Collection: National Reach Study published in May, 2011, and also because of continued progress in increasing the number of companies that report data. Increased reporting of 2010 data was especially strong for segregated resins recovery coming out of the business sector and special collection programs. Yet despite a dramatic increase, Moore Recycling staff believe that the survey is still missing a significant amount of material recovered from the commercial sector.

Reclaimers report that continued development of the infrastructure for recycling non-bottle rigid plastics, requires a consistent supply of quality material. Currently, most scrap plastic is sold on a spot-market basis. This uncertainty of supply is a barrier toward investment because, to generate a supply of quality raw material for use into new products requires investment into sorting and reclamation capacity. This report is a step toward documenting the availability of raw material. In future surveys, questions regarding expansions and upgrades to facilities purchasing non-bottle rigid plastic will be included to better understand and report investments in infrastructure for non-bottle rigid plastic to complement the data on recovery.

**Additional Information**

The Plastics Division of the American Chemistry Council, which provided funding to Moore Recycling Associates to prepare this report, provides resources to assist communities,
businesses and consumers in increasing awareness and education on the recycling of plastic bottles, containers and plastic bags and film. For information about recycling non-bottle rigid plastics recycling visit www.americanchemistry.com/Plastics. Also, visit the Moore Recycling Associates maintained site www.plasticsmarkets.org for markets and information on handling guidelines.

The 2010 National Report on Postconsumer Non-Bottle Rigid Plastics Recycling 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.

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