



2015 National Post-Consumer Non-Bottle Rigid Plastic Recycling Report

March 2017

Prepared by Moore Recycling Associates Inc. for the
American Chemistry Council

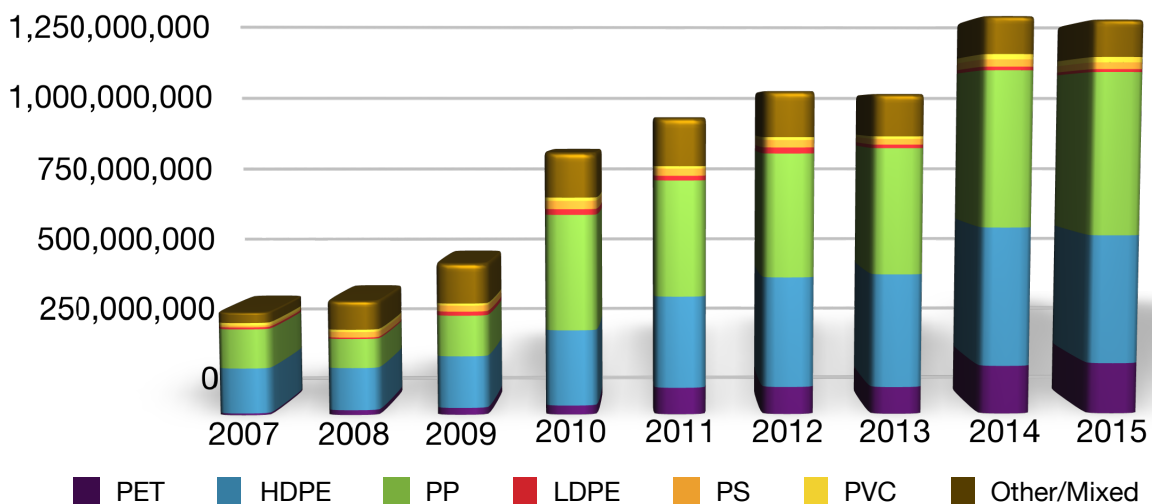
Introduction

The 2015 National Post-Consumer¹ Non-Bottle Rigid Plastic Recycling Report is the ninth annual report on pounds of post-consumer 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 1.24 billion pounds of post-consumer non-bottle rigid plastic were reported as recovered for recycling in 2015, the second highest year on record and nearly four times greater than eight years ago. The total in 2015 decreased 45 million pounds, or 3.5 percent compared to 2014. Domestic purchases increased overall, by 1.9 percent, and exports dropped by 13 percent compared to 2014. U.S. and Canadian reclaimers continued to procure more material than export buyers. U.S. and Canadian reclaimers acquired approximately 67 percent of the material reported in 2015, which is up nearly four percent compared to 2014 and these reclaimers continue to lead resin segregated plastic purchases.

U.S. Non-Bottle Rigid Plastic Recovered Year to Year by Resin² (pounds)



¹ The Environmental Protection Agency (EPA) defines “post-consumer” as a material or a finished product that has served its intended use that is then diverted or recovered before it is disposed. It is the material consumers and businesses recycle; it does not include manufacturers’ waste, which is commonly reused in the original manufacturing process. The EPA defines “pre-consumer” on the EPA website as material that is recycled before it is used by a consumer (EPA Home; Pacific Southwest. Waste. Solid Waste. Reduce, Reuse, Recycle, Buy Recycled, Oct. 15, 2015. <<http://www3.epa.gov/region9/waste/solid/reduce.html#br4>>). This study uses EPA’s definition throughout this report, wherein “post-consumer” refers to plastics that have been previously used for their intended purpose by consumers and businesses. Commercial materials that have met their intended use are often recovered outside of curbside or drop-off collection programs and include items such as totes, pallets, crates, and other commercial packaging. This report does not cover the recycling of post-industrial (pre-consumer) materials. An example of post-industrial material is scrap and trimmings that are generated in manufacturing and converting processes.

² PET - polyethylene terephthalate, HDPE - high-density polyethylene, PP - polypropylene, LDPE - low-density polyethylene, PS - polystyrene, PVC - polyvinyl chloride

The export market reported a decrease in purchases of both plastic segregated by resin as well as mixed rigid plastic. Domestic markets reported a significant decrease in purchases of mixed resin rigid bales, but an increase in purchases of plastic segregated by resin. The type of mixed resin rigid bales purchased also shifted in 2015, with more bulky rigid plastic purchased as a separate commodity from smaller mixed rigid plastic. Overall, purchases of mixed resin rigid material decreased by nine percent in 2015 compared to 2014.

To arrive at an estimate of the pounds of post-consumer plastic recovered for recycling in 2015, Moore Recycling surveyed both domestic and export markets for all post-consumer plastic (as well as some key players within the value chain, such as MRFs, brokers, and end users). This report's findings are based on data reported voluntarily representing the recovery of U.S.-sourced, post-consumer material. Thirty-five U.S. and Canadian plastic reclaimers³ and 25 exporters contributed to the non-bottle rigid totals in this report. The 2015 results are representative of reporting from three additional reclaimers and three additional exporters compared to 2014. There are also over 30 U.S. and Canadian PET reclaimers that respond annually to a separate survey specific to PET bottle reclaimers, which contributes to the non-bottle rigid PET results in this report.

Methodology

Data on recovered post-consumer non-bottle rigid plastic are collected through a voluntary, annual plastic recycling survey that also gathers data on bottles, film and other plastics. For this report, the survey gathers data on both mixed rigid plastic and non-bottle material segregated by resin. The latter is often, but not exclusively, post-consumer material from the commercial sector. Commercial material includes products such as packaging for transport—pallets, crates, and totes—and material such as battery casings, which are collected through special programs.

The following steps are taken to prepare the report:

- Moore Recycling continually updates its markets database to include current exporters, reclaimers, and other handlers of plastic scrap;
- Moore conducts an electronic survey of market participants in plastic recycling to collect data; and
- Moore undertakes a follow-up step for survey-collected data, to help check the accuracy of the data through follow-up calls, conversations with industry contacts, and reviews of other public sources of recycling industry information.

³ Moore Recycling surveys and counts material from reclaimers, which are defined as companies that wash post-consumer material or otherwise process unwashed material into a clean feedstock or end product.

Data Collection and Analysis

Moore Recycling continually updates a proprietary database of plastic exporters, processors, reclaimers, and key brokers to help ensure that the survey reaches the key plastic scrap buyers from North America.⁴

Moore Recycling uses a custom-designed web-based survey system to gather data. Although the overall methodology has not changed since the first report, Moore Recycling continually seeks ways to improve the completeness and timeliness of the survey responses. For example, in 2015, Moore added PP Bottles and Containers, and PP Bottles/Containers and Bulky as new categories to the mixed rigid plastic section. Moore Recycling works to update the commodity categories and the terminology used by the industry in order to provide the key materials to report, to avoid misunderstanding, and to further support harmonizing the terminology⁵ used in the industry. The [model bale specifications](#) released by the Association of Plastic Recyclers (APR) are a key resource in this process.

An email with a unique link and message is sent to each contact. After an adequate amount of response time has passed, Moore Recycling employees send follow-up emails and make telephone calls to retrieve data. This follow-up process can take weeks or months, depending on responses. Data are entered into the online survey tool, either directly by the company surveyed, or by Moore Recycling staff in conjunction with the relevant company. Incoming data are reviewed for accuracy, and follow-up calls are made as needed. After data collection is complete, Moore Recycling compiles the data and categorizes them based on the detail reported.⁶

The final data totals are reviewed and analyzed; then, they are reported in as much detail as possible without compromising the participating companies' confidentiality. In order to determine trends and identify anomalies that may require further vetting, the analysis includes year-to-year comparisons of the totals, material categories, and trends among export and domestic buyers. Describing how the data are collected, as well as what is and is not included in the survey, provides readers of this report with the context necessary to cross-reference the results with other available industry data.

⁴ Through Moore Recycling's project work in the industry and websites it manages—[PlasticsMarkets.org](#), [RecycleMorePlastic.org](#), and [PlasticFilmRecycling.org](#)—Moore Recycling regularly engages with companies and new contacts in this sector. Moore also identifies potential buyers through published market databases and conversations with suppliers, such as material recovery facilities (MRFs) and key reclaimers.

⁵ Bale specifications released by APR are in alignment with the Plastic Recycling Terms and Tools resource, intended to help harmonize terminology across the plastic recycling value chain. This resource can be found at <https://www.recycleyourplastics.org/recycling-professionals/education/terms-tools-app/>.

⁶ Moore Recycling conducts the survey and maintains the confidentiality of individual responses; no individual company data are released, nor are any specific data that do not include at least three companies reporting.

Survey Categories

To collect data on non-bottle rigid plastic, Moore Recycling surveyed mixed rigid plastic categories as well as non-bottle rigid categories, which were segregated by resin and product type. All of the mixed rigid plastic bale categories contain some non-bottle material. The categories may be a mixture of resins, or some combination of bottles, containers, bulky items, and other non-bottle rigid plastic. Most are a combination of both resin and product type. The non-bottle rigid plastic portion⁷ of the mixed rigid bales reported by respondents is calculated for this report by applying the content percentages of resin and product type from the 2014/15 mixed rigid bale composition study.⁸ Previous reports dating back to 2011 used the 2011 composition study.⁹

The 2015 survey included the following mixed rigid plastic bales that are generated from curbside or drop-off collection¹⁰:

- **HDPE Colored Bottles with Containers** - Primarily HDPE bottles, with some HDPE or PP household containers, no bulky items.
- **PP Small Rigid Plastics (formerly PP Bottles and Containers)** - Primarily polypropylene bottles, non-bottle containers and other small rigid items, no bulky items
- **PP All Rigid Plastics (formerly PP Bottles/Containers and Bulky)** - Primarily PP bottles, non-bottle containers and bulky items (bulky is described below).
- **1-7 Bottles and Small Rigid Plastics (formerly All Rigid Plastic: No Bulky)** - 1-7 bottles and caps, small non-bottle rigid containers (includes cups, trays, boxes, clamshells, tubs, pots, deli containers, cartons, and blister)
- **1-7 All Rigid Plastics (formerly All Rigid Plastic: With Bulky)** - 1-7 bottles and caps. All non-bottle rigid containers (includes cups, trays, boxes, clamshells, tubs, pots, deli containers, carton, and blister), and all bulky rigid plastic (includes carts, crates, buckets, baskets, toys, and lawn furniture)
- **3-7 Bottles and Small Rigid Plastics (formerly Pre-picked Rigid Plastic: No Bulky)** - Non-bottle rigid containers (includes cups, trays, boxes, clamshells, tubs, pots, deli containers, cartons, and blister). PET and HPDE bottles removed, leaving 3-7 bottles
- **3-7 Bottles and All Other Rigid Plastics (formerly Pre-picked Rigid Plastic: With Bulky)** - Non-bottle rigid containers (includes cups, trays, boxes, clamshells, tubs, pots, deli containers,

⁷ Only the plastic portions of the mixed rigid bales are included in the volume; the waste is removed, unlike gross volumes that are used for most other recycled commodities.

⁸ *National Mixed Rigid Plastic Bale Composition Study*, Association of Plastic Recyclers (APR), July 2015

⁹ *National Mixed Rigid Plastic Bale Composition Study & Analysis of Non-Bottle Rigid Plastic Available for Recycling*, Association of Plastic Recyclers (APR), 2011

¹⁰ Mixed rigid bale commodity names above reflect the current revised commodity names agreed upon by APR and ISRI (Institute of Scrap Recycling Industries) in 2016.

cartons, and blister). Bulky rigid plastic (includes carts, crates, buckets, baskets, toys, and lawn furniture). PET and HPDE bottles removed, leaving 3-7 bottles

- **Mixed Bulky Rigid Plastics** (formerly Bulky Rigid Plastic) - Bulky rigid plastic (includes carts, crates, buckets, baskets, toys, and lawn furniture) predominantly PE and PP
- **Tubs and Lids** - Non-bottle household containers, including buckets, predominantly PP and PE, with no bulky items
- **Tubs and Lids: With Bulky** (formerly PE/PP Bottles, Containers, and Bulky (Olefin)) - Primarily PE and PP bottles, non-bottle containers and bulky items (includes carts, crates, buckets, and lawn furniture)
- **Mixed Clamshell** - A mixture of PET, PP, PS, and PVC clamshell-type containers
- **Other Mixed Rigid Plastic** - A “catch-all” category, defined on a case-by-case basis

Moore Recycling also asks for data in the following categories:

- **Post-Commercial Mixed Rigid Plastic** - A “catch-all” category for mixed resin rigid plastic that is generated from businesses, defined on a case-by-case basis
- **Mixed Electronic Scrap** - Primarily high impact polystyrene (HIPS), acrylonitrile butadiene styrene (ABS), polycarbonate (PC)
- **Categories for Non-Bottle Rigid Plastic Segregated By Resin** - A list of recovered products that are generated as segregated commodities or have been sorted into segregated categories and then sold. The list is based on categories respondents have offered in previous surveys (e.g. PET thermoforms, HDPE injection (drums-buckets-crates), PP hangers, PVC Flooring, and PC CDs). Moore Recycling also provides an “other” category for PET, HDPE, PP, PS, PVC, ABS, and PC.
- **Other Rigid Plastic** - A “catch-all” category for non-bottle rigid plastic segregated by resin that is different from the specific categories listed above

The APR and the National Association for PET Container Resources (NAPCOR) conduct a separate, but similar, survey of domestic PET reclaimers. Moore Recycling does not survey these reclaimers and receives the following domestic non-bottle rigid plastic data from APR/NAPCOR: strapping, thermoforms—both from PET bottle bales and purchased separately—and cap and label material obtained through the PET bottle reclamation process.

Data Gaps and Assumptions

Participation in the survey is voluntary and the reported data are based on responses received. Many companies have limited resources to put towards participation in the survey, and some companies may choose not to respond due to confidentiality policies. Therefore, as there is not 100 percent participation, the presented totals represent the minimum amount of plastic recovered for recycling and sold on the marketplace. Only data provided by North American reclaimers, predominantly U.S. and Canadian, but also exporters selling directly overseas, are

included in the reported totals, unless we determine that data are missing in areas where substantive information from other reliable resources is available. Data provided by brokers and MRFs are primarily used as a reference to better understand the flow of material, but Moore Recycling may include their data if enough information is provided that would enable us to attribute material sold to a non-responder.

Except for the largest exporters, players in the export market come and go and may frequently change the materials purchased. This can make the export market difficult to track. Moore Recycling tracks exporters handling plastic through a number of industry resources, and most of the large exporters respond to the survey.

Again, since participation in the survey is voluntary, Moore Recycling sometimes receives responses from existing companies that did not previously respond. Increases in year-to-year recovery rates are often a combination of increased collection along with material that was recycled in previous years but not reported. When Moore Recycling can conclude the nature of an increase (or decrease), the reasoning is indicated; however, it can be difficult to make a solid determination in any given year, depending on the depth of information Moore Recycling receives from plastic handling companies for previous years and while taking into account the need to protect confidentiality.

Often, Moore Recycling must follow up with responders due to inconsistent placement of data in survey categories. Quality control is essential to determining if there has been an actual shift or just an entry error. Clarification is often needed to determine whether reported material can be counted as post-consumer commercial or if it is, in fact, industrial scrap. Mixed rigid bale commodities often require follow up and a data quality check due to the inconsistent terminology used in the marketplace to describe these commodities.

Post-commercial material, which is material from the commercial sector that has met its intended use, can be difficult to track because it is often purchased by companies that are also handling industrial scrap. The survey now specifically includes a detailed section on post-industrial plastic recycling to encourage responses from industrial/commercial scrap recyclers. Having an additional focus on post-industrial recycling enables us to engage these recyclers about handled post-commercial material that they may not realize is considered post-consumer.

As previously mentioned, Moore Recycling applied the bale composition results from the 2014/15 study¹¹ commissioned by the APR to the mixed rigid plastic bale volumes reported by responders to arrive at the non-bottle portion of these bales, separated by resin.

Based on separately available industry statistics for lead-acid battery and e-scrap recycling, it is likely that Moore Recycling did not receive survey responses from some key players in these sectors, and the total reported is likely less than the actual amount of plastic recycled from these two key recycling efforts.

¹¹ *National Mixed Rigid Plastic Bale Composition Study*, Association of Plastic Recyclers (APR), July 2015

Findings

Non-bottle Rigid Plastic Recycled

In 2015, the amount of non-bottle rigid plastic reported as recovered in the U.S. for domestic and overseas recycling decreased to 1.24 billion pounds, a decline of 3.5 percent from 2014, but still an increase of 280 percent since 2007. Approximately 67 percent of the 1.24 billion pounds was reclaimed in the U.S. or Canada in 2015, and the remainder was exported overseas. As previously noted, because participation in the survey is voluntary, the data in the report does not reflect 100 percent of the non-bottle rigid plastic that was acquired for recycling.

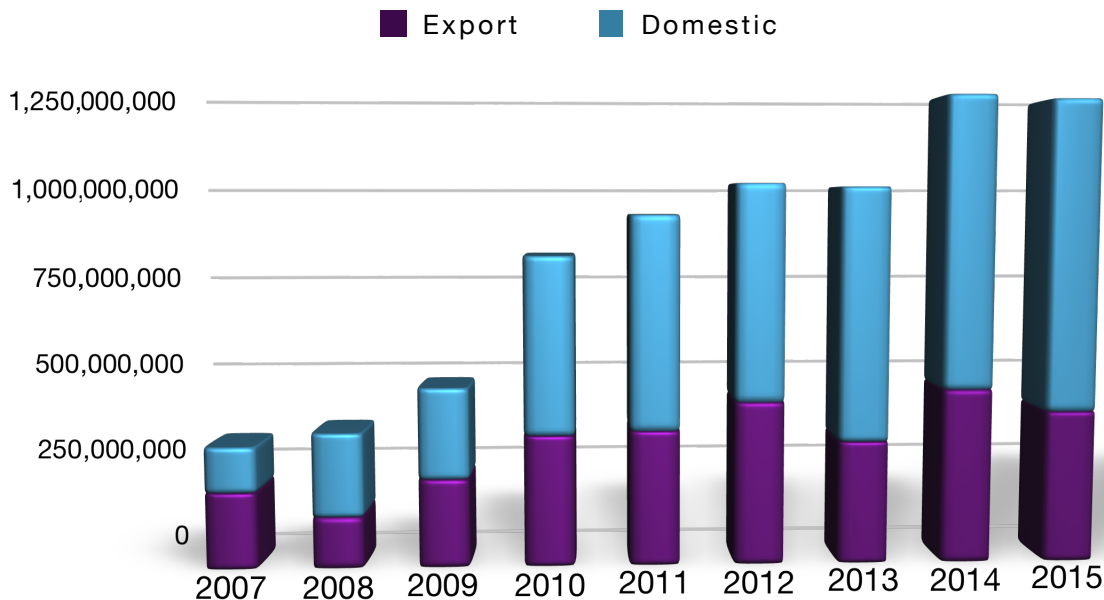
U.S. Post-Consumer Non-Bottle Rigid Plastic Recovered (pounds)

Year	Exported	Purchased for use in US or Canada		Total
		volume	percent	
2007	204,040,000	121,400,000	37%	325,440,000
2008	137,133,000	223,643,000	62%	360,776,000
2009	236,105,000	243,115,000	51%	479,220,000
2010	350,870,000	475,783,000	58%	826,653,000
2011	361,527,000	572,400,000	61%	933,927,000
2012	437,207,000	579,451,000	57%	1,016,658,422
2013	328,974,000	678,738,000	67%	1,007,712,000
2014	467,778,000	816,481,000	64%	1,284,259,000
2015	407,069,000	832,371,549	67%	1,239,440,000

In 2015, non-bottle rigid plastic recovery decreased by 45 million pounds from 2014 values. Domestic buyers purchased fewer mixed resin rigid bales but more non-bottle rigid plastic segregated by resin¹². Exporters reported less segregated non-bottle plastic as well as less mixed rigid plastic in 2015, but due to the significant decrease in domestic purchases, export buyers purchased 64 percent of mixed resin rigid bales, up from 60 percent in 2014. Challenging market conditions and competition from virgin resin put pressure on domestic reclaimers of mixed resin material, resulting in changes in the bale types and a drop in value.

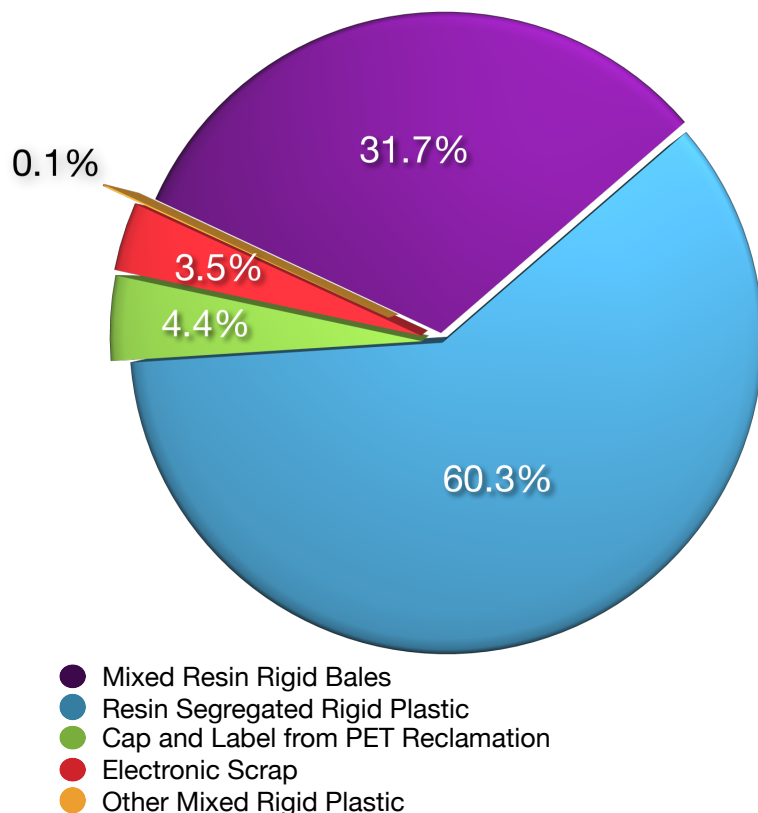
¹² Non-Bottle Rigid Plastic Segregated By Resin includes mixed bottle, containers, and bulky material segregated by resin. The volume of these types of bales was higher this year due to material reported as PP bottles in previous years that were actually PP mixed rigid bales.

Purchases of U.S. Recovered Non-Bottle Rigid Plastic (pounds)

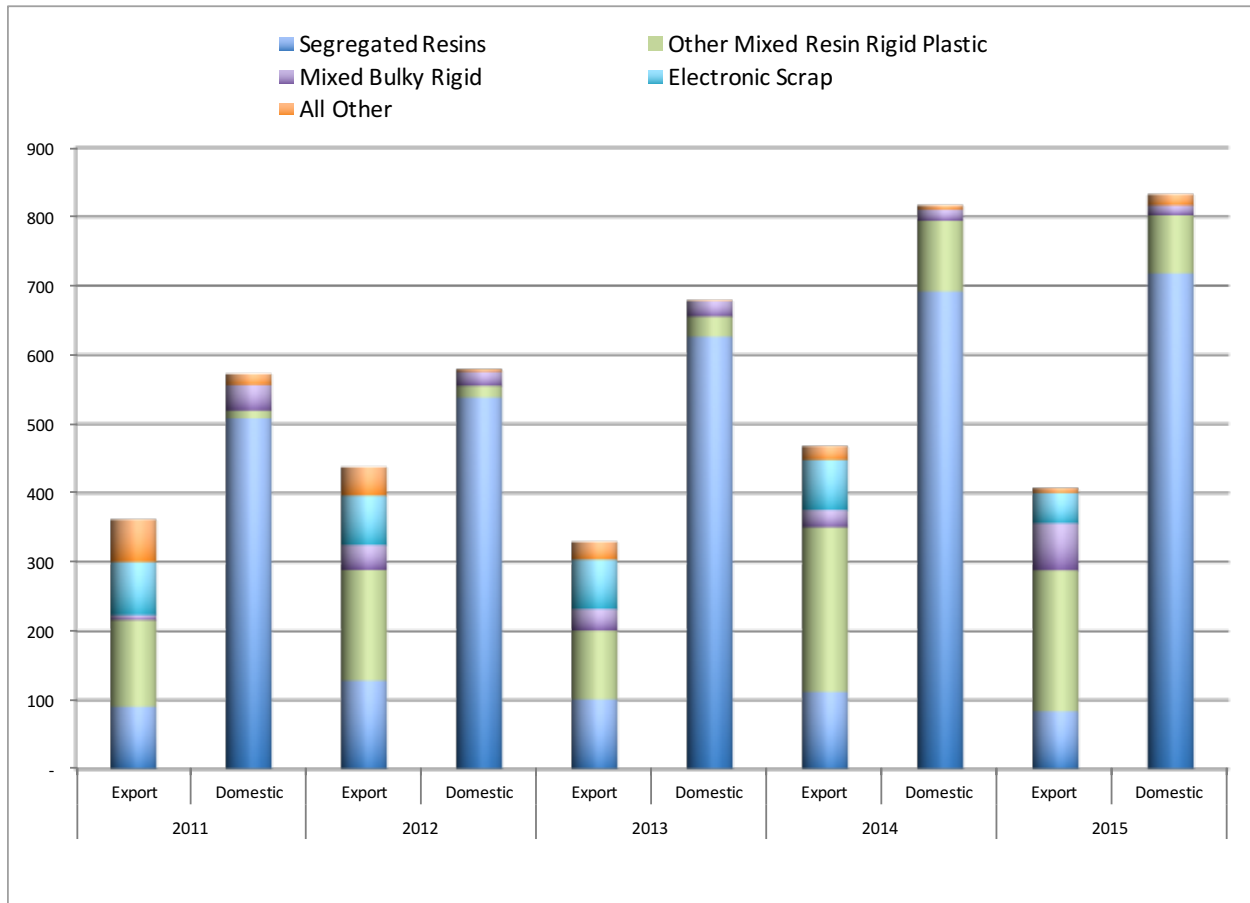


Overall, the breakdown of the material sources remained the same from 2014 to 2015. Material reported as segregated resins (e.g., HDPE injection: drums, buckets, and crates; PP Battery Casings; PET Thermoforms) made up 60.3 percent of the total plastic reported as recycled, up two percent compared to 2014. The non-bottle rigid plastic portion of mixed resin rigid bales—predominantly from municipal programs—comprised 31.7 percent of the volume reported (unchanged compared to 2014).

Sources of U.S. Non-Bottle Rigid Plastic, 2015



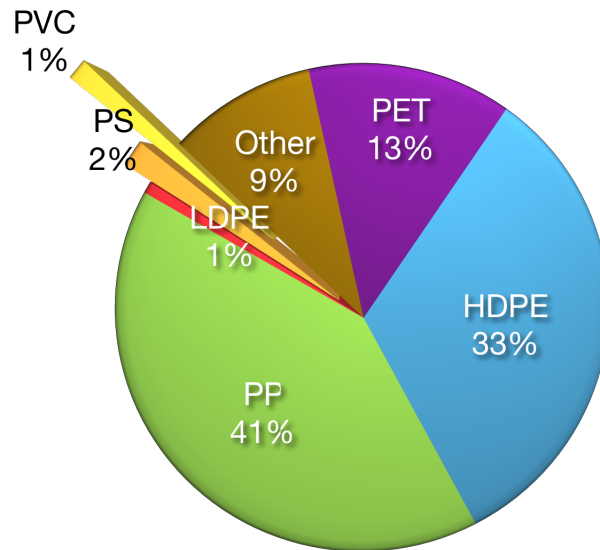
U.S. Non-Bottle Rigid Plastic Recovered by Source (millions of pounds)



Resin-segregated plastic reclaimed in the U.S. or Canada increased in 2015 to 718 million pounds, maintaining a strong market share at 90 percent of the total resin segregated plastic reported, which is up by four percent from 2014. Domestic buyers purchased 36 percent of mixed resin rigid bales reported, which is down four percent compared to 2014. This reverses the trend of the previous few years, wherein there were increased domestic purchases of mixed resin rigid bales, and we expect the reversal to continue to be shown in 2016. As noted, this change was due to competition from virgin resin, which challenged reclaimers, especially with material that requires substantial sorting and handling.

U.S. Post-Consumer Non-Bottle Rigid Plastic Recovered in 2015 by Resin

RESIN	POUNDS
PET	159,730,000
HDPE	405,258,000
PP	511,054,000
LDPE	9,109,000
PS	20,987,000
PVC	16,666,000
Other Mixed/ Unknown	116,581,786



As in previous years, polypropylene comprised the largest proportion of the non-bottle rigid plastic recycled, followed by HDPE. PP and HDPE together comprise the majority of the non-bottle rigid plastic in mixed resin rigid bales, and the majority of reported segregated resin material. PP and PET exhibited a marked increase in 2015 compared to 2014. HDPE and Other exhibited significant decreases overall in 2015. The largest decrease in mixed rigid resin bales were the mixed resin rigid categories with bulky rigid as a component. The 2015 decrease in HDPE recycling can be largely attributed to the decrease in the mixed resin rigid categories with bulky rigid. Although Mixed Bulky Rigid Plastics bales increased in 2015 the increase was not enough to make up for the decrease in the other mixed resin rigid bales containing bulky rigid plastic or the decrease in export of segregated HDPE rigid plastic. The increased volume of PP is due to the increase in other mixed resin rigid bale categories (3-7 Bottles and Small Rigid Plastics and Tubs and Lids), as well as PP mixed rigid bales, included in the totals for segregated resins. The increase in PET was due to material reported as segregated resin, and a large portion of the decrease in Other was due to the reduced volume of plastic from e-scrap reported. LDPE and PS decreased mostly due to the volume and type of mixed resin rigid bales reported this year. PVC maintained its volume, with a small decrease from mixed material reporting, but an increase in PVC segregated resin.

Domestic Capacity and End Markets

Based on survey responses, as of 2015, there was approximately one billion pounds per year of non-bottle rigid plastic reclamation capacity in the U.S., which includes washing or processing unwashed material directly into regrind, pellets, or end products. The non-bottle capacity was estimated based on 39 companies. There was at least an additional 150 million pounds of non-bottle reclamation capacity in Canada that draws on U.S. and Canadian material. It is important to acknowledge that there was significant grind capacity, in both the U.S. and Canada, for plastic scrap that is clean enough to be used unwashed; not all of it is 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.

Most of the U.S. reclamation capacity is for relatively clean—and often larger—PE and PP items, because it can be handled more cost effectively than small items and often does not require washing. Many buyers are seeking clean PE and PP-based bulky rigid materials, such as buckets, crates, battery casings, storage bins, and hangers.

Very few reclaimers reported their end-market information in the 2015 survey, but based on previous year's reporting, the primary domestic end uses for non-bottle rigid plastics are automotive products, crates, buckets, pipe, lawn and garden products, and other relatively thick-walled injection products. A small portion of the non-bottle rigid plastic recovered is used in composite products, such as lumber, and other extruded products. Furthermore, many companies blend or compound these materials and sell them to manufacturers that make a wide variety of products, including tanks, drums, and carts.

Discussion

The remaining sections of this Report present Discussion and Recommendations that reflect Moore Recycling's expertise and industry knowledge.

Moore Recycling tracks the non-bottle rigid plastic recycling market throughout the calendar year. Demand for and value of plastic scrap were volatile in 2015. Low oil prices provided lower virgin resin prices created stronger competition for post-consumer resin in 2015. High-grade material (clean, single resin) fared better than mixed material because—unlike contaminated or mixed resin material—it requires very little processing, thus it is less costly to reclaim. Unlike 2014, demand for mixed resin rigid bales wavered in 2015 from both export and domestic markets with a more dramatic decrease from domestic. Mixed resin rigid bale buyers sought composition changes, encouraging a higher percentage of PP and PE fractions and increasing demand for more bulky rigid only bales rather than smaller rigid material mixed in with the bulky rigid. The focus on bale quality—in both mixed and single resin bales—that began after the green fence continued into 2015.

MRFs have a limited capacity to sort specific resins beyond PET and HDPE, as indicated by the prevalence of mixed resin rigid bales. Furthermore, most domestic reclaimers are not structured to handle mixed resin material. Therefore, continued growth in the collection of plastic beyond PET and HDPE bottles is dependent on a healthy sorting and reclaiming infrastructure for non-bottle rigid plastic. The growth of domestic secondary sorting facilities (i.e. Plastic Recovery Facilities (PRFs) and secondary MRFs) and a healthy demand for end-use products, with the capacity to utilize fairly wide-specification material, are key to the future growth of non-bottle rigid plastic recycling.

Recommendations

Market Development

As sorting infrastructure grows, market demand for the resins found in the mixed bales is essential. Research is needed to identify existing and potential buyers for the recycled resins that are now being created in greater amounts; in particular, this demand is vital as communities continue to expand recycling beyond bottles. The success of an expanded plastic recycling system depends on buyers for the collected material. Consumer products companies that want their plastic products and packaging recycled must play a strong role in creating demand for products that contain their recycled materials. Given the competitiveness of virgin resin, they may not be able to cost-effectively use post-consumer resin (PCR) in very narrow-specification products and packaging, but companies should work with reclaimers to identify other products with potential to use post-consumer recycled content, such as pallets, buckets, pipe, and crates.

Invest in Infrastructure: Sorting, Reclamation, and End Markets

Potential investors in recycling infrastructure need to know that they will have a reliable supply, viable technology, and demand for the end product. If the plastic recycling industry wishes to foster such investment, funders need independent documentation of the potential supply: from raw material to post-consumer resin. Public research and development of potential technology and potential end markets is needed to determine the viability of investments in sortation and reclamation infrastructure; this is especially true for the minority of resins found in mixed bales. Lastly, to expand the infrastructure, waste generators must be willing to create quality bales and to enter into bankable supply agreements with reclaimers.

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 others in increasing awareness and education about the recycling of plastic bottles, containers, plastic bags, and film. Moore Recycling is a recognized expert in the field of plastics recycling and has been conducting recycling studies for over 27 years. This work has been conducted and evaluated in an objective manner by persons qualified to do so, using procedures generally accepted in the profession. For information about recycling non-bottle rigid plastics, visit www.AmericanChemistry.com/Plastics. Also, visit www.PlasticsMarkets.org, which is maintained by Moore Recycling Associates, for information about additional markets and handling guidelines. This report and others on plastic recycling can be found at www.MooreRecycling.com/m_02_00.html.

Disclaimer

The 2015 National Report on Post-Consumer Non-Bottle Rigid Plastics Recycling was 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

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