

2016 Post-Consumer Plastics Recycling in Canada



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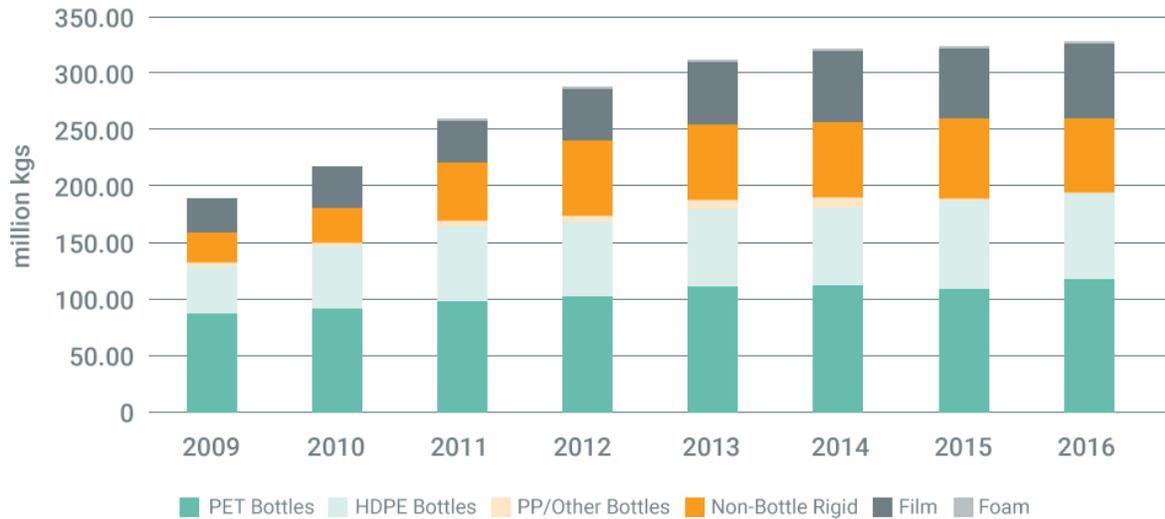


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This is the eighth annual report to document the amount of post-consumer plastic recovered in Canada for recycling. This report details how much Canadian post-consumer plastic was collected and reclaimed by U.S. or Canadian reclaimers and how much was sold to overseas markets. This study is conducted by More Recycling (MORE) and sponsored by the Canadian Plastic Industry Association (CPIA). It is made possible by the many businesses that cooperate by generously providing their data.

In 2016, a minimum of 325 million kilograms of Canadian post-consumer (including commercial) plastic material was collected for recycling.¹ This represents a 0.9 percent increase over 2015, primarily due to increases in Polyethylene Terephthalate (PET) Bottles, Polyethylene (PE) Clear Film and PE Agricultural Film.²

Figure 1. Canadian Post-Consumer Plastic Recycled (million kgs)



As was the case in 2015, most of the material collected in Canada for recycling remained in North America rather than moving to overseas markets. Eighty-four percent of the material reported was reclaimed in Canada or the U.S., and 12 percent was exported overseas. The destination of the remaining four percent is unknown.

¹ Throughout this report, the term “post-consumer” refers to plastics that have been 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, which the U.S. EPA defines as materials that are generated in manufacturing and conversion processes, such as scrap and trimmings.

² Polyethylene Terephthalate (PET), Polyethylene (PE), Polypropylene (PP)

Table 1. Summary of Canadian Post-Consumer Plastic Recycled in 2016³

	2016 Collection (million kgs)	Change In Collection 2015-2016 (million kgs)	2016 Material Processed in Canada	2016 Capacity ⁴ (million kgs)	2016 Utilization ⁵ of Capacity	North American End Markets
PET Bottles	119.1	9.0	134.5	NA	NA	fiber, food & beverage bottles, film & sheet, strapping, non-food bottles
HDPE Bottles	76.1	1.3	82.3	100	82%	bottles, pipe, film & sheet, automotive applications, lawn & garden products, lumber & decking
PP/Other Bottles	2.2	-1.1	NA	NA	NA	For PP: automotive applications, crates & buckets, caps & closures, lawn & garden products
Non-Bottle Rigid Plastics	63.8	-7.8	40.5	75	54%	automotive applications, crates & buckets, lawn & garden products, pipe, film & sheet, fence posts, consumer & household products
Film	63.3	4.1	22.2	48	46%	film & sheet, pipe, automotive applications, lawn & garden products, pallets, lumber & decking, crates & buckets
Foam	0.5	-2.5	NA	NA	NA	protective packaging, building products, picture frames

The PET and HDPE Bottle and Film categories increased while PP/Other Bottles, Non-Bottle Rigid and Foam categories decreased in 2016 compared to volumes reported in 2015. The amounts reported here are based on a voluntary survey and therefore represent the minimum that is known to have been recovered for recycling.

This report's findings are based on data from two surveys: 1) a post-consumer plastic recycling survey of export markets for all post-consumer plastic categories and all domestic markets (except for PET bottle reclaimers) conducted by MORE, and 2) a separate survey of PET bottle reclaimers conducted by the Association of Plastic Recyclers (APR) and the National Association for PET Container Resources (NAPCOR). Data gathered during the survey was cross-checked with data available from Canadian provinces and other recycling industry information.

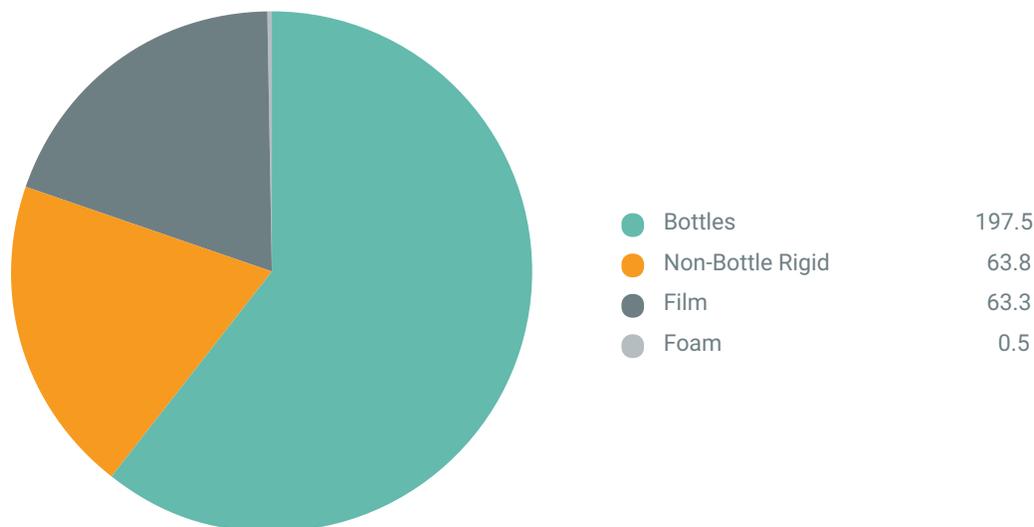
³ 2016 Material Processed in Canada can include imports from the U.S., Mexico, and outside of North America. In 2016, the vast majority of imported material came from the U.S.

⁴ Capacity for processing bottles often overlaps with capacity to process non-bottle rigid plastic and/or film. Thus, adding the capacities reported here for bottle, non-bottle rigid, and film could result in some double counting.

⁵ Utilization is determined by dividing the estimated capacity by the sum of the reported purchases of material from Canada, the U.S., Mexico, and outside North America by Canadian reclaimers.

Plastic bottles continued to comprise the majority of the recycled plastic collected. PET bottles remained the highest volume plastic product segregated by resin, also showing the largest increase, up nine million kilograms in 2016, after a slight decrease from 2014 to 2015. Colored HDPE bottles continued to be the second largest category segregated by resin, though the category showed negligible change from 2015 to 2016. Other categories that saw increases in 2016 compared to 2015 include Film and HDPE Natural Bottles, with a 4.1 and 1.4-million kilogram increase, respectively.

Figure 2. Canadian Plastic Recycled by Major Category in 2016 (million kgs)

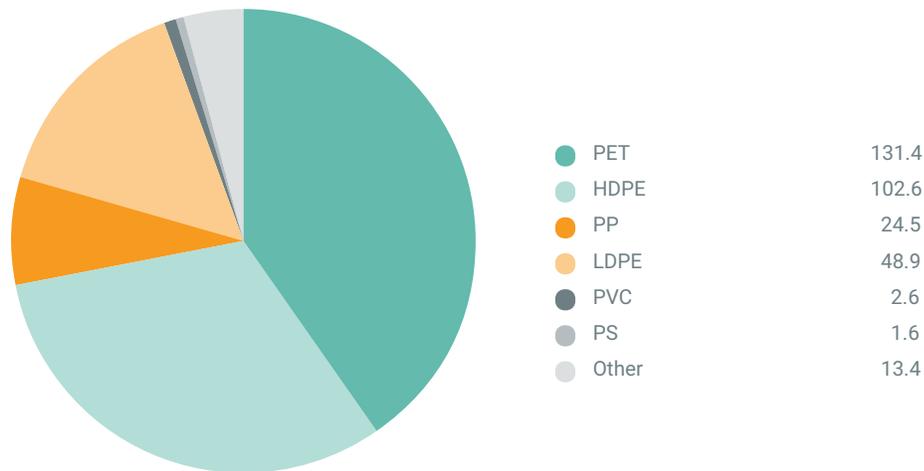


By category, non-bottle rigid plastic recycling decreased by nearly 7.8 million kilograms in 2016, as compared to 2015. A decrease in mixed rigid bales, primarily from residential recycling, made up the majority of the decline.

In the film category, PE Clear Film had the largest increase in 2016 compared to 2015, with PE Mixed Color Film showing the largest decrease. This is the opposite of what happened from 2014 to 2015 where PE Mixed Color increased and PE Clear Film decreased. In addition to the PE Mixed Color Film decrease in 2016, MRF Curbside Film, PE Retail Bag and Film and Other Film also had small decreases, whereas PE Agricultural Film collected volumes increased. In total, the Film category was up by 4.1 kilograms, or seven percent, from 2015 to 2016.

The majority of the foam reported was foam polystyrene (PS), which was predominantly from protective packaging for durable products, but also from food packaging, e.g., meat trays, clamshells, and coffee cups. This is a relatively small category, but it was down significantly in 2016 versus 2015.

FIGURE 3. Canadian Post-Consumer Plastic Recycled by Resin in 2016 (million kgs)



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

When evaluating plastic recycling by resin, PET and HDPE comprised the majority of post-consumer plastic recycled in Canada. The majority of the PET was from bottles—91 percent, up from 88 percent in 2015—with the remaining nine percent made up of non-bottle rigid PET. For HDPE, bottles comprised 74 percent of the volume reported, an increase of one percentage point over 2015, with non-bottle rigid and film remaining relatively steady at 15 and 11 percent, respectively. The third largest resin source collected for recycling was LDPE, 99 percent of which was film. For PP, 93 percent of collection was made up of non-bottle rigid material; the remaining seven percent was bottles.

MORE conducts the Canadian survey simultaneously with the annual U.S. Plastic Recycling Survey. The survey gathers data on all Canadian- and U.S.-sourced plastic, except plastic purchased by PET bottle reclaimers in Canada or the U.S.; as previously mentioned, those data are provided by a study conducted through the APR and NAPCOR. Data on recovered post-consumer plastic are collected through a voluntary, annual plastic recycling survey that gathers data on bottles, non-bottle rigid, film and other plastics. For this report, the survey includes data on residential and commercially generated recycled plastic. Residentially generated commodities are both mixed resin rigid plastic (including bottles) and non-bottle rigid material further segregated by resin. Commercial material includes products that have met their intended use, such as packaging for transport— pallets, crates, totes, stretch wrap—and material collected through special programs by the commercial sector, such as battery casings.

THE FOLLOWING STEPS ARE TAKEN TO PREPARE THE REPORT

- MORE continually updates its markets database to include current exporters, reclaimers, and other handlers of plastic scrap;
- MORE conducts an electronic survey of market participants in plastic recycling to collect data; and
- MORE 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.

DATA COLLECTION AND ANALYSIS

MORE continually updates a proprietary database of plastic exporters, processors, reclaimers, and key brokers to ensure that the survey reaches the key plastic scrap buyers from North America.⁶

MORE uses a custom-designed web-based survey system to gather data. Although the overall methodology has not changed since the first report, MORE continually seeks ways to improve the completeness and timeliness of the survey responses. For example, in 2016, MORE improved the organization of the survey category layout to more clearly ask for non-bottle rigid generated from residential recycling in a separate section from commercially sourced and collected material, whereas previous years' surveys had separated the categories by mixed material versus segregated by resin. MORE is involved in the plastic recycling industry's work to harmonize commodity categories and the terminology used by the industry. Updates to categories are reflected in MORE's survey, this report, and in the other tools and resources that MORE manages. This is critical in order to

⁶ Through MORE's project work in the industry and websites that it manages—PlasticsMarkets.org, RecycleMorePlastic.org, and PlasticFilmRecycling.org— MORE regularly receives requests from new contacts for information on material and markets. MORE also identifies potential buyers through published market databases and conversations with suppliers, such as material recovery facilities (MRFs) and key reclaimers.

report on the key materials, to avoid misunderstanding, and to further support harmonization of terminology used in the industry.⁷ The **model bale specifications**, maintained by the Association of Plastic Recyclers (APR), are a key resource in this process.⁸

The survey is distributed by sending an email with a unique link to each survey contact, including both U.S. and Canadian reclaimers, export buyers for all post-consumer plastic, as well as some key players within the value chain, such as MRFs, brokers, and end users. After an appropriate amount of response time has passed, MORE employees send follow-up emails and make telephone calls to retrieve data. Data are entered into the online survey tool, either directly by the company surveyed, or by MORE 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, MORE compiles the data and categorizes them based on the detail reported.⁹

The residential commodity categories may be a mixture of resins, or some combination of bottles, containers, bulky items, and other non-bottle rigid plastic. Some are further segregated by resin and others are intentionally a combination of both resin and product type.

Where the commodities are a mix of resins and bottle and non-bottle material, the non-bottle rigid plastic portion 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 2014/2015 mixed rigid bale composition study.¹⁰ The 2015 report also used the 2014/2015 study data whereas previous reports dating back to 2011 used the 2011 composition study.¹¹

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 U.S. and Canadian buyers. This quality control, which often requires follow-up with survey responders, is essential to determining if there has been an actual shift or just an entry error. Clarification may also be needed to determine whether reported material can be counted as post-consumer commercial or if it is, in fact, industrial scrap. 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.

⁷ The Plastic Recycling Terms and Tools resource is 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>.

⁸ Bale specifications maintained by the Association of Plastic Recyclers (APR) are in alignment with the Recycling Terms and Tools, <https://www.plasticsrecycling.org/resources/model-bale-specs>

⁹ MORE conducts the survey and takes steps to maintain the confidentiality of individual responses; including procedures designed so that no individual company data are released, nor are any specific data that do not include at least three companies reporting.

¹⁰ National Mixed Rigid Plastic Bale Composition Study, Association of Plastic Recyclers (APR), July 2015.

¹¹ Mixed Rigid Plastic Bale Composition Study & Analysis of Non-Bottle Rigid Plastic Available for Recycling, Association of Plastic Recyclers (APR), 2011.

SURVEY CATEGORIES

The MORE survey requested data for PET bottle exports and for reclamation and export of the following:

- **HDPE bottles** (natural, colored, mixed)
- **PP and other bottles**
- **Commingled bottles**
- **Plastic collected from residential recycling, both mixed resin rigid bales and plastic further segregated by resin** (detailed below)
- **Categories for commercial generated/collected non-bottle rigid plastic segregated by resin** (detailed below)
- **Mixed electronic scrap** - Primarily high impact polystyrene (HIPS), acrylonitrile butadiene styrene (ABS), polycarbonate (PC).
- **Film** (detailed below)
- **Foam** - Foam PS (including expanded polystyrene blocks and shapes and foodservice foam PS), EPP (Expanded Polypropylene), EPE (Expanded Polyethylene), Flexible Polyurethane, Rigid Polyurethane, and Other Foam

The 2016 survey included the following rigid plastic categories:¹²

Mixed Resin Rigid Plastic from Residential Collection¹³

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

¹² Recycled plastic commodity names reflect the current revised commodity names agreed upon by APR and ISRI (Institute of Scrap Recycling Industries) in 2016.

¹³ Only the plastic portions of the mixed rigid bales are included in the volume; the waste is removed, unlike gross volumes, which are used for most other recycled commodities.

- **Mixed Bulky Rigid Plastics** (formerly *Bulky Rigid Plastic*) - Bulky rigid plastic (includes carts, crates, buckets, baskets, toys, and lawn furniture); predominantly PE and PP.
- **Mixed Clamshell** - A mixture of PET, PP, PS, and PVC clamshell-type containers.
- **Other Mixed Bottle and Non-bottle Rigid Plastic** - A “catch-all” category, defined on a case-by-case basis.

Plastic Further Segregated by Resin from Residential Collection

- **PET Thermoforms** – PET containers and lids, clamshells and other thermoformed packaging.
- **HDPE Colored Bottles with Containers** - Primarily HDPE bottles, with some HDPE or PP house hold containers; no bulky items.
- **PP Small Rigid Plastics** (formerly *PP Bottles and Containers*) - Primarily PP 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).
- **Tubs and Lids** - Non-bottle household containers, predominantly PP and PE, with no bulky items, although may include buckets.
- **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).
- **HDPE Injection Bulky Rigid Plastics** - HDPE bulky rigid plastics (includes buckets, totes, crates, lawn furniture, carts, storage bins); may include some bulky PP and LDPE.

Categories for Commercial Generated/Collected Non-Bottle Rigid Plastic Segregated by Resin

- **A list of major categories of non-bottle rigid plastic from commercial sources** - Commodities generated through the usual course of business or through special collection programs (e.g., PP battery casings). The list is based on categories that respondents have offered in previous surveys, e.g., HDPE injection (drums, buckets, crates), PP hangers, PVC Flooring, and PC CDs. MORE also provides resin-specific commercial “other” category for PET, HDPE, PP, PS, and PVC.
- **Other Non-Bottle Rigid Plastic** - A “catch-all” category for non-bottle rigid plastic segregated by resin that is different from the specific resin categories listed above.
- **Other 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.

Film Categories

The 2016 survey used the following material categories:

- **PE Clear Film** (formerly Commercial Clear Film) - Clear, clean polyethylene (PE) film from commercial sources, including stretch wrap and poly bags.
- **PE Mixed Color Film** (formerly Commercial Mixed Color Film) - Mixed color PE film from commercial sources, including stretch wrap; no post-consumer bags.
- **PE Retail Bag and Film** (formerly Mixed Film) - Mixed color, clean PE film, including stretch wrap and retail collected post-consumer bags, sacks, and wraps.
- **MRF Curbside Film** (formerly Curbside Film) - Post-consumer PE Mixed film collected curbside and sorted at a MRF.
- **PE Agricultural Film** (formerly Agricultural Film) - Includes clean and dirty agricultural film. Dirty agricultural film has been in contact with the ground and may include up to 50 percent contamination (e.g., mulch film). Clean agricultural film has been used in applications that do not involve contact with the ground and may include up to 10 percent contamination (e.g., greenhouse film).
- **Other Film** - A “catch-all” for film that does not fit in any of the categories above; includes PE film not described above, as well as non-PE film such as polypropylene (PP) and polyvinyl chloride (PVC).

The APR and NAPCOR gather data from PET reclaimers through an annual survey. MORE does not survey PET reclaimers and instead receives data on domestic processing of PET bottles along with the following non-bottle rigid plastic data from the APR/NAPCOR: strapping, thermoforms—both from PET bottle bales and purchased separately—and cap and label material from the PET bottle reclamation process.

Reclay Steward Edge (RSE) also assisted MORE in obtaining non-bottle rigid plastic recycling data, with a focus on closed loop recyclers, to further capture the quantities recycled in this area. The data acquired by RSE contributed to the revised 2015 data and the 2016 totals included in this report.

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 and 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. Only U.S. and Canadian reclaimers currently respond to the survey. When reclaimers do not report a capacity total to MORE the totals reported as acquired material is used to estimate capacity. Also, when there are too few reclaimers or responses, capacity is reported as N/A for not available to protect the participating companies' confidentiality.

Data provided by brokers and MRFs are primarily used as a reference to better understand the flow of material, but MORE may include their data if enough information is provided to enable attribution of material sold to a reclaimer or exporter survey non-responder.

MORE cross-checked the 2016 data with the latest available provincial collection estimates and also referenced Statistics Canada's estimated national totals. If there were large gaps between the survey responses and other industry data, we conducted additional research to ensure that the results represent a reasonable accounting of post-consumer plastic collected in Canada for recycling. For example, as was the case in previous years, the 2016 survey responses from exporters and reclaimers reflected a lower total for curbside film than what the provinces report as recovered in their most recent data. The provincial film collection totals are used in this report. Any domestic or export volumes, not corroborated by MORE survey data, are attributed to "unknown" market destinations.

Again, since participation in the survey is voluntary, MORE 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 MORE 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 MORE receives from plastic handling companies for previous years and while taking into account the need to protect confidentiality.

MORE tracks exporters' purchasing of plastic through a number of industry resources. Except for the largest exporters, players in the export market come and go, and may change the type or mix of materials that they purchase. When final efforts to track down survey non-responders was underway in mid- to late 2017, there were growing concerns about when China's policy restricting the import of scrap materials would take effect. As a result, exporters were, in some cases, less responsive to calls about their buying history or follow-up survey inquiries.

In addition to the potential impact of non-responders, changes in how responders report pounds in the survey categories has an impact on the totals reported year over year. 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. There is also some play between responders reporting pounds in PE Retail Bag and Film and PE Mixed Color. Also, responders tend to lump a mixture of film categories in Other Film rather than break out their purchased volumes into the individual PE film categories. It is possible that we are either missing a significant amount of commercial film that is being recycled, or material that could be collected and marketed as PE Clear Film is being processed by MRFs and counted as MRF Curbside Film, given its contamination level.

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 the post-commercial material that they handle, material that they may not realize is considered post-consumer.

As previously mentioned, MORE applied the bale composition results from the 2014/2015 study commissioned by the APR to the mixed rigid plastic bale quantities reported by responders to arrive at the bottle and non-bottle portion of these bales, separated by resin.¹⁴ Only the plastic portions of the mixed rigid bales are included in the quantity totals; the waste is removed, unlike gross quantities that are used for most other recycled commodities.

Based on separately available industry statistics for lead-acid battery and e-scrap recycling, it is likely that MORE 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.

¹⁴ National Mixed Rigid Plastic Bale Composition Study, Association of Plastic Recyclers (APR), July 2015.

In 2016, a minimum of 325 million kilograms of post-consumer plastic were collected for recycling in Canada, a 0.9 percent increase over the amount collected for recycling in 2015. Eighty-four percent of this plastic was reported as recycled in the U.S. and Canada, which is a 19-million kilogram increase in the amount of plastic recycled in 2015, and took the percentage of material staying on shore back up to 2013 levels. Exports were down at 12 percent, compared to 17 percent in 2015, with four percent of collected materials sold to unknown destinations, as was also the case in 2015.

Table 2. Canadian Post-Consumer Plastic Recycled by Major Category (million kgs)

Year	Bottles	Non-Bottle Rigid	Film	Foam	Total
2009	132.8	28.1	27.1	NA	188.1
2010	150.4	29.9	36.8	NA	217.2
2011	169.3	50.9	37.1	0.8 ¹⁵	258.1
2012	174.7	65.5	43.7	1.0	285.0
2013	189.5	66.3	54.0	2.7	311.5
2014	189.3	66.8	61.8	2.9	320.7
2015	188.3	71.6	59.2	3.0	322.0
2016	197.5	63.8	63.3	0.5	325.0

¹⁵ In 2009 and 2010, foam plastic was included in the PS reported as non-bottle rigid plastic. Since 2011, foam collection data has been presented separately in its own section.

Figure 4. Canadian Post-Consumer Plastic Recycled by Major Category (million kgs)



Plastic Bottles exhibited the largest quantity increase by major category, followed by Film which exhibited the largest percent increase. The modest net increase in total kilograms collected for recycling in 2016 was largely the result of increases in PET bottles and PE films collections offset by decreases in collection of PP/Other Bottles, Non-bottle Rigid Plastic and Foam. Non-Bottle Rigid exhibited an overall decrease, due in large part to decreases in 3-7 Bottles and Small Rigid Plastics reported as recycled in 2016.

Table 3. Canadian Post-Consumer Plastic Recycled (million of kgs)

Year	Exported Outside North America	Purchased for processing in Canada	Purchased for processing in US	Unknown destination	Total
2009	22.2	NA ¹⁶	NA	8.8	188.1
2010	34.7	149.2	27.9	5.3	217.2
2011	33.9	165.8	51.7	6.7	258.1
2012	41.1	193.6	43.8	6.4	285.0
2013	46.0	212.6	49.6	3.3	311.5
2014	54.1	209.0	42.3	15.3	320.7
2015	54.2	213.4	41.1	13.3	322.0
2016	38.0	216.4	57.2	13.3	325.0

The majority of recycled plastic remains in North America, with Canadian and U.S. reclaimers purchasing 84 percent of Canadian-sourced material, a five percent increase over 2015. Post-consumer recycled plastic leaving Canada, either purchased by US reclaimers or exported overseas, resulted in nearly 95 million kilograms of post-consumer plastic being recycled outside of Canada in 2016; this represented 29 percent of total collection, a slight decrease from 2015. This small net change was due to export decreases, given that U.S. companies purchased approximately 57.2 million kilograms (18 percent) of post-consumer plastic from Canada for processing in the U.S., up from 13 percent in 2015. Overall, purchases by Canadian reclaimers of Canadian generated plastic increased by 3.1 million kilograms—two percent over 2015—to 216.4 million kilograms or 67 percent of Canadian-sourced recycled plastic. In addition, Canadian reclaimers purchased 65 million kilograms of U.S.-sourced plastic in 2016, a 20-million kilogram decrease of their 2015 U.S. purchases. The material without a known market destination makes up four percent of the total plastic recycled and is comprised solely of MRF Curbside Film. MRF Curbside Film is a relatively small collection category, with the 13.3 million kilograms going to unknown destinations representing sixty-four percent of the total MRF Curbside Film recovered in 2016. Given the limited Canadian and U.S. capacity for this category, it is likely that this material was exported.

¹⁶ In 2009, 157 million kilograms of Canadian post-consumer plastic was reclaimed by Canada and the U.S. combined.

Bottles are collected in Canada through municipal curbside programs, as well as at depots and retail drop-off locations as part of beverage deposit systems that are mandated in most provinces. Each province accepts different types of beverage containers as part of its program, and each has a unique collection system. Collection efforts in Canada resulted in 197.5 million kilograms of post-consumer bottles being sold into the marketplace for recycling in 2016. Bottles make up 61 percent of plastic collected for recycling in Canada and represents an overall increase in the Bottle category of five percent compared to 2015.

Figure 5: Canadian Bottles Recycled by Resin in 2016

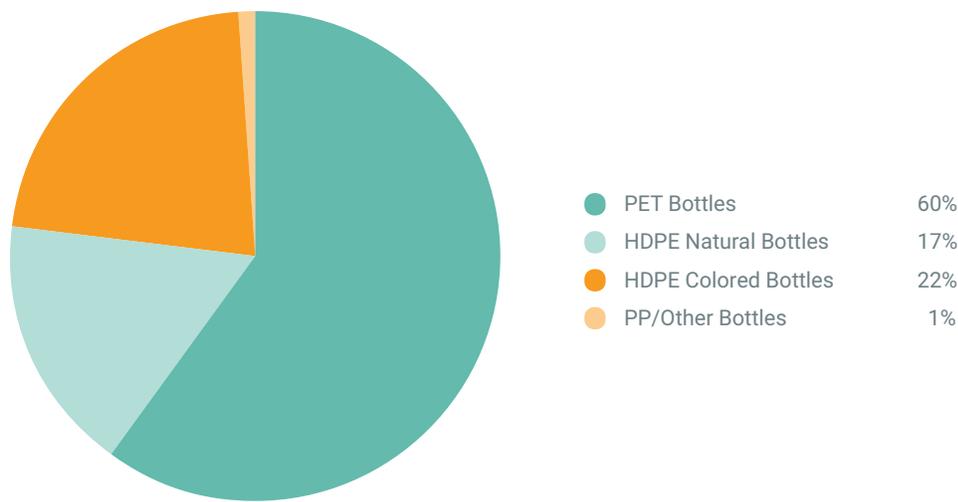


Table 4. Canadian Bottles Recycled by Resin (million of kgs)

Year	PET Bottles	HDPE Natural Bottles	HDPE Colored Bottles	PP Bottles ¹⁷	Other Bottles
2009	88.1	13.3	27.7	3.5	0.3
2010	93.9	18.8	34.8	2.7	0.3
2011	98.1	20.3	46.3	4.5	0.2
2012	103.4	21.9	44.4	4.5	0.5
2013	112.8	24.2	42.5	7.3	1.7
2014	113.1	25.0	44.1	6.6	0.6
2015	110.2	31.4	43.3	2.7	0.6
2016	119.1	32.9	43.2	1.8	0.5

¹⁷ Prior to 2015, PP material that was reported as bottle when it was actually a mix of bottle and non-bottle rigid PP. 2015-2016 reflects the correct allocation of bottle and non-bottle rigid plastic for PP.

PET BOTTLES

In 2016, approximately 119.1 million kilograms of Canadian-sourced post-consumer PET bottles were reclaimed in Canada and the U.S., and only 0.4 million kilograms—0.4 percent of the PET bottles collected in Canada—were exported overseas. The PET bottles exported were from both PET bottle bales as well mixed rigid bales. Compared to 2015, Canadian reclaimers purchased 15.2 million kilograms more Canadian-sourced PET bottles and 3.6 million kilograms less U.S.-sourced material. U.S. purchases of Canadian material remained about the same as 2015.

Capacity and End Uses

There were five PET reclaimers operating in Canada in 2016. The PET bottle collection volume and domestic reclamation capacity continue to be close to equilibrium, although the capacity does exceed the PET collection volumes in Canada. In its *Report on Post-Consumer PET Container Recycling Activity in 2016*, NAPCOR reported that fiber remains the dominant North American end use for recycled PET (rPET) bottles. Food and beverage bottles were the second most common end use of rPET in 2016, with Sheet and Film plastic coming in close behind. Strapping, non-food bottles, and other products also use recycled PET. The report states that the use of Canadian rPET in food & beverage bottles, non-food bottles, strapping and fiber end products increased overall in 2016.¹⁸

HDPE BOTTLES

An estimated 76 million kilograms of post-consumer HDPE bottles were recycled in 2016, a 1.3-million kilogram increase from 2015 values. This increase was due to increased domestic recycling of natural HDPE bottles in 2016. Although recycling of Colored HDPE continued to comprise the largest percentage of total HDPE bottles recovered for recycling in Canada, at 57 percent (43 million kilograms), this category remained flat from 2015 to 2016. Minimal HDPE bottle material was reported as having been shipped overseas in 2016.

Of the 76 million kilograms of HDPE bottles recovered in Canada for recycling, 54 million kilograms were sold to Canadian reclaimers, a decrease from the 61 million kilograms processed in Canada in 2015. Canadian reclaimers also purchased 28 million kilograms of HDPE bottles from the U.S. for processing in Canada, while U.S. reclaimers purchased 21.6 million kilograms of Canadian-sourced HDPE bottles. This marks the largest quantity of Canadian HDPE bottles purchased by U.S. reclaimers in the history of the survey and is a significant increase over 2015.

Capacity and End Uses

MORE estimates that the 2016 Canadian HDPE bottle reclamation capacity is 100 million kilograms. One company was shuttered in 2016, but additional capacity from other companies made up for this resulting in a small impact to total capacity. The utilization rate was calculated to be 82 percent for 2016, down from 92 percent in 2015, due to increased purchases by U.S. buyers and a decrease in purchases of U.S. material by Canadian buyers. Canadian and U.S.

¹⁸ *Report on Post-consumer PET Container Recycling Activity in 2016*, NAPCOR & APR

reclaimers continue to report new bottles as the primary end use for reclaimed natural bottles, followed by pipe, lumber and decking applications. Pipe continues to be the largest end use for colored HDPE bottles in the U.S. and Canada. In 2016, significant volumes of colored HDPE bottles also went to production of: automotive components, new bottles, lawn and garden products, lumber and decking, and film and sheet.

PP AND OTHER BOTTLES

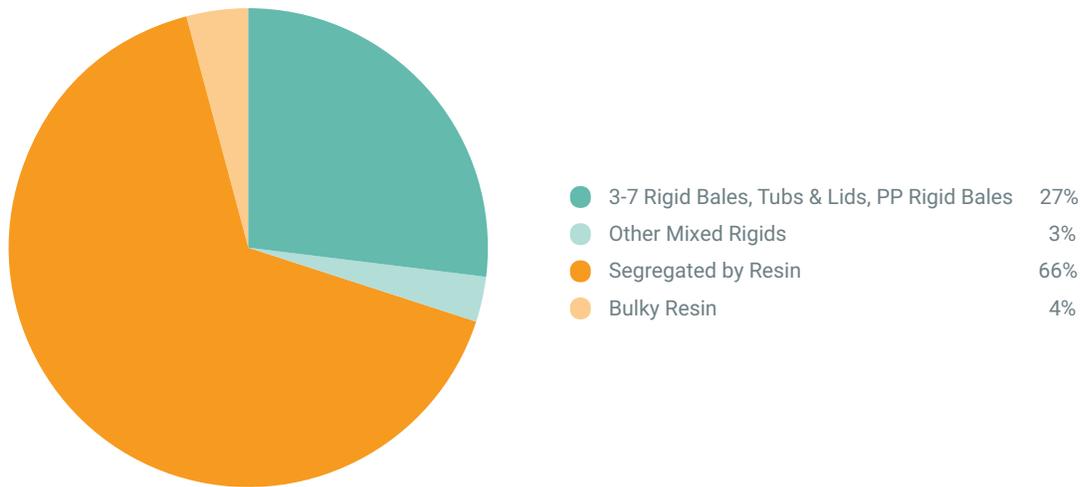
A minimum of 1.8 million kilograms of post-consumer PP bottles were reported as recycled in 2016, which is down from the 2.7 million kilograms reported in 2015. LDPE, PVC, and other bottles comprised 0.5 million kilograms of the total material in this report, which is similar to the total reported in 2015. The Canadian reclaimers that handle mixed resin bales can handle non-olefin (PVC or Other #7) minority resin bottles in one of several ways: either disposing of them, selling them (if a domestic or export market is available) or, in some cases, providing the material to waste-to-energy facilities. The survey asked reclaimers that reported mixed rigid bales whether they utilized all of the material or disposed of, sold, or otherwise provided any portion of it to another reclaimer, exporter, broker, or intermediate processor. No bottle material was reported as disposed of or sold.

Capacity and End Uses

Due to limited data sources, information on PP reclamation capacity is not available. Recycled PP bottles are used to manufacture automotive components, crates and buckets, caps and closures, or items such as lawn and garden furniture.

In 2016, almost 64 million kilograms of non-bottle rigid plastic were reported as reclaimed or exported. This represents a decrease of nearly 11 percent from the quantity reported for 2015.

Figure 6: Canadian Non-Bottle Rigid Plastic Recycled by Source

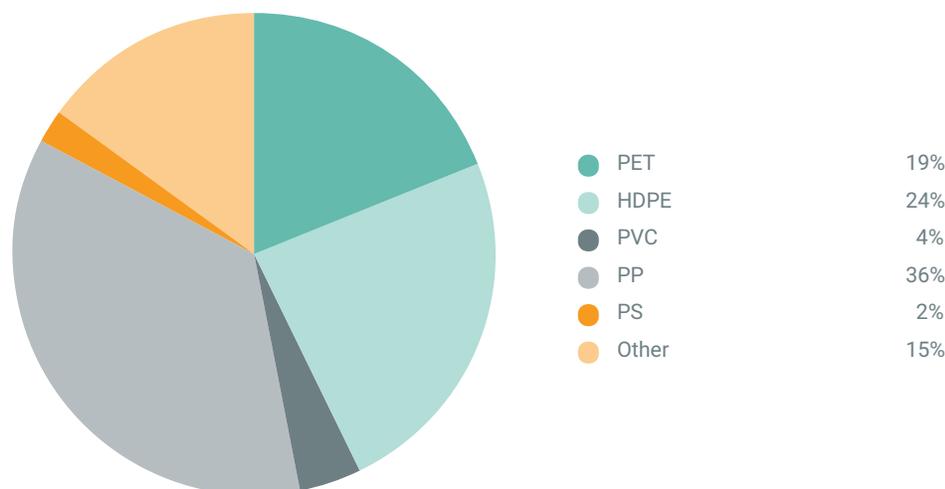


"3-7 Rigid Bales" and "PP Rigid Bales" combine the "Small Rigid Plastic" and "All Other Rigid Plastic" categories of each. "Other Mixed Rigid" includes data provided as "Post-Commercial Mixed Rigid," "Other Mixed Rigid Plastic" and any mixed rigid bale categories, with less than 800 thousand kilograms reported.

Non-bottle rigid plastic, segregated by resin, from both residential and commercial streams, comprised 66 percent of the non-bottle rigid material reported. Mixed rigid plastic, again from residential and commercial sources comprised the other 34 percent. Residential-generated non-bottle rigid plastic made up 44 percent of the non-bottle rigid plastic reported. The 3-7 Bottles and Small /All Other Rigid Plastic bales made up 57 percent of all of the mixed rigid material, including E-scrap and Other Mixed reported for 2016.

For 2016, 76 percent of all non-bottle rigid plastic was reported as purchased by domestic markets, either Canadian or U.S. reclaimers, a five percentage point increase over 2015. U.S. reclaimers purchased 11.9 million kilograms of Canadian sourced non-bottle rigid plastic material, which is a combination of mixed rigid bales and resin-segregated material, continuing the trend of gradual increases since 2014. The overseas export market purchased 15 million kilograms, 11 million kilograms or 73 percent of which was mixed rigid material from residential or commercial sources.

Figure 7: Canadian Non-Bottle Rigid Plastics Recycled by Resin in 2016



Consistent with previous years, PP and HDPE comprise the majority of the non-bottle rigid plastic recovered in Canada, making up 60 percent of the total. PET is the next largest at 19 percent of the non-bottle reported. The PET non-bottle material, e.g., clamshells and other non-bottle packaging, comes from both PET bottle bales and mixed rigid bales that were reported. The “Other” category comprised just 15 percent of total collection, which is just above what it was in 2015. “Other” consists of other mixed rigid plastic material that was reported without the detail needed to break it down by resin; it also includes the other resins from mixed rigid bales.

Table 5. Canadian Non-Bottle Rigid Plastic Recycled By Resin (million of kgs)¹⁹

	2009	2010	2011	2012	2013	2014	2015	2016
PET	.5	1.7	5.1	5.7	12.9	12.7	14.9	12.2
HDPE	10.8	0.3	12.8	22.1	21.9	17.7	16.7	15.1
PVC	0.9	1.4	0.3	1.3	1.4	0.7	0.6	2.5
LDPE	0.4	0.3	0.2	0.5	0.5	0.3	0.3	0.3
PP	10.8	6.9	21.8	23.2	24.8	25.3	27.7	22.7
PS	0.9	1.2	0.3	0.8	0.9	1.3	1.3	1.2
Other	1.9	8.2	10.5	11.8	3.9	8.9	10.1	9.8

¹⁹ Data from the report 2014/2015 National Mixed Rigid Plastic Bale Composition Study performed by MORE for APR were applied to arrive at the resin quantities for 2016. The 2015 report was the first year to use the 2014/2015 study data whereas previous years used data from the 2010/2011 National Mixed Rigid Plastic Bale Composition Study.

Polypropylene non-bottle had the highest decrease among the non-bottle categories, dropping by approximately five million kilograms from 2015 to 2016, followed by PET and HDPE, respectively. The PVC non-bottle collections reported increased over 2015, with the remaining categories staying relatively flat. Just over five million kilograms of the non-bottle rigid fraction of the mixed rigid bales reported by domestic reclaimers are non-olefin, non-bottle rigid plastic (PET, PS, PVC, and Other). The survey asked reclaimers reporting mixed rigid bales whether they utilized all of the material or disposed of, sold, or otherwise provided any portion of it to another reclaimer, exporter, broker, or intermediate processor. Those that responded to this question said that they utilized all of the material they purchased from U.S. and Canadian sources.

Capacity and End Uses

A conservative estimate for non-bottle rigid plastic reclamation capacity is 75 million kilograms for 2016, representing a 15-million kilogram decrease compared to 2015. The capacity change from 2015 to 2016 is, in part, due to one reclaimer going out of business in 2016, but this was somewhat offset by additional capacity reported by new survey responders. It should be noted that this capacity does not include all commercial/industrial scrap grinding and compounding capacity. While Canadian purchases of non-bottle rigid plastic decreased overall, so did processing capacity, resulting in a 2016 utilization capacity of 54 percent, a drop of seven percent.

Recycled non-bottle rigid plastic is commonly used in automotive components, crates, buckets, lawn and garden products, and pipe, as well as in film and sheet manufacturing. Other uses include various consumer and household products, lumber and decking, and fence posts.

In 2016, a minimum of 63.3 million kilograms of post-consumer film and bags (including film collected from the commercial sector) were collected for recycling, representing an increase of almost seven percent compared to 2015. PE Clear Film continued to make up the largest portion of film recycled in Canada at 39 percent and exhibited an increase of 3.8 million kilograms in 2016 over 2015. MRF Curbside Film made up the second largest portion at 32 percent with a slight decrease in 2016. PE Mixed Color Film exhibited the largest decrease, with 2.2 million kilograms less recycled in 2016 compared to 2015. PE Agricultural Film, representing 13 percent of total film recycled in 2016, had the other significant increase and was up nearly three million kilograms as compared to 2015. PE Retail Bag and Film and Other Film categories are the smallest categories and remained relatively flat from 2015 to 2016.

FIGURE 8: Canadian Film Recycled by Source in 2016

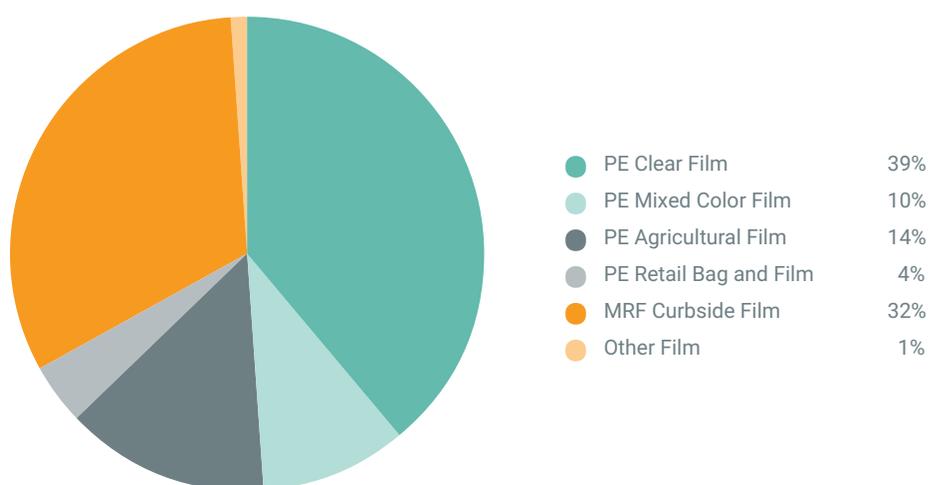


Table 6: Canadian Film Recycled By Source (million kgs)²⁰

Year	PE Clear Film	PE Mixed Color Film	MRF Curbside Film	PE Retail Bag and Film	PE Ag Film	Other Film
2009	6.9	6.4	12.2	NA	1.7	.04
2010	13.5	7.1	12.4	NA	1.0	2.9
2011	13.8	3.3	13.2	1.0	5.6	0.2
2012	15.7	5.5	14.4	3.1	4.3	0.8
2013	23.8	4.1	16.7	4.2	4.3	1.0
2014	25.7	4.9	22.4	3.0	5.7	0.2
2015	20.7	8.5	21.0	2.7	5.5	0.7
2016	24.6	6.3	20.5	2.7	8.5	0.7

²⁰ Beginning with the 2011 survey, Mixed Film was divided into PE Mixed Color Film (no post-consumer bags) and PE Retail Bag and Film (includes post-consumer bags, sacks and wraps). The amount of PE Mixed Color Film reported above for 2010 and 2009 was previously reported under Mixed Film and may include some post-consumer bags.

The reported data indicates that a minimum of 44 percent of recovered post-consumer film was processed by Canadian or U.S. reclaimers, which is a seven percentage point increase over 2015. U.S. reclaimers' purchases of film plastic recovered in Canada increased 10 percent compared to 2015, marking the largest amount purchased by U.S. companies since 2011. Canadian reclaimers' purchases of U.S. material remained unchanged from 2015 to 2016. Some reclaimers reported better quality film coming out of Canada than from the U.S.

The export market has historically been a major buyer of film coming out of the U.S. and Canada. In 2016, a minimum of 35 percent of the recovered film was exported overseas, down from 41 percent in 2015, and slightly up from 34 percent in 2014. The largest categories exported in 2016 were PE Clear Film and PE Mixed Color Film, with totals exported, by weight, similar to those of 2015. The largest film categories exported by percentage are PE Mixed Color Film at 89 percent, followed by PE Retail Bag and Film at 55 percent. As previously mentioned, given that few reclaimers in Canada can process the MRF Curbside Film, it is likely that a fair amount of this material—that with no reported market destination—went to export markets. Only 33 percent of the collected PE Clear Film and 36 percent of PE Agricultural Film was reported as exported.

Capacity and End Uses

For 2016, MORE estimates that the film reclamation capacity in Canada was 48 million kilograms, which is a slight increase from 2015 values. Overall capacity utilization was 46 percent, up from 44 percent in 2015, due to increases in film purchases outpacing capacity growth. Most of the capacity in Canada is for clean, clear commercial film, with less available for post-consumer retail or curbside film. Fewer than five U.S. and Canadian companies were able to process curbside film in 2016. The major end use for recycled film in Canada was new film and sheet, with pipe the next most common market. This is unlike the U.S., where the lumber and decking market continued to be the largest consumer. Additional end uses reported in 2016 for Canada and the U.S. were automotive components, crate and buckets, and lawn and garden products.

Sources of recycled Foam PS included commercial generators, depot operations (both municipal and private), and curbside collection programs. In 2016, 0.5 million kilograms was reported as recycled, which is a significant drop for this category. The majority of what was reported was foam polystyrene (Foam PS), predominantly from protective packaging, which is made from expanded polystyrene (EPS). There are still a number of companies that do not respond to the survey, and we received even fewer responses for 2016 compared to previous years, thus the total collected may be under-reported.

Capacity and End Uses

Foam PS is recycled into fire protection products, crown moldings, and decorative frames for mirrors, pictures, and wall hangings. Due to the limited number of reclaimers responding about the domestic reclamation of Foam PS, no additional information is available.

CONCLUSIONS



Post-consumer plastic collected in Canada for recycling increased almost one percent overall to a total of 325 million kilograms, reflecting an increase in bottle and film recycling and a decrease in non-bottle rigid and foam recycling as reported. Year over year, the data continues to show that the vast majority of material collected for recycling in Canada has stayed in Canada for reclamation and remanufacture. Support of sustainability and recycling goals in Canada has led to domestic markets for most plastic scrap types and a low dependence on the export market.

The Canadian Plastics Industry Association (CPIA) provides resources to communities, businesses, and consumers to assist in increasing awareness and education about the recycling of plastic packaging and diversion from Canadian landfills. For information about plastics recycling, visit www.plastics.ca. For information on markets for post-consumer plastic, visit www.PlasticsMarkets.org and www.PlasticFilmRecycling.org.

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