

Report on

Postconsumer PET Container Recycling Activity in 2012



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www.napcor.com



The Association of Postconsumer
Plastics Recyclers

www.plasticsrecycling.org

INTRODUCTION

2012 marks the eighteenth year that the National Association for PET Container Resources (NAPCOR) has issued this report in its current format, and the eighth year that NAPCOR and The Association of Postconsumer Plastics Recyclers (APR) have worked together to produce it.¹ This report would not be possible without the APR's support and the cooperation of its members. It is intended to provide the reader with a detailed overview of the recycling of injection stretch blow molded polyethylene terephthalate (PET) containers in the United States during 2012, and to a lesser degree, the recycling of PET thermoforms. Information contained in this report was obtained through surveys conducted by HDR Engineering, Inc. and Moore Recycling Associates, and from data generated internally by NAPCOR, L.O.M. Enterprises, and the International Bottled Water Association (IBWA). In order to present as accurate a picture of these activities as possible, additional data and information were obtained through discussions with individual collectors, intermediate processors, reclaimers, converters, brokers, exporters, resin producers, bottle manufacturers, public recycling officials, consultants, and key industry members.

PET BOTTLES AVAILABLE FOR COLLECTION

Sales were up in 2012 in several beverage categories, including bottled water; energy and sports drinks; and ready-to-drink tea and coffee drinks. In the market-dominant carbonated soft drinks (CSD) sector, both overall sales and PET resin use were flat to down. In total, the amount by weight of PET bottles and jars sold in the United States and available for recycling grew by 2% over 2011. Though NAPCOR reported in 2011 that the most significant impacts of PET packaging lightweighting had been experienced, lightweighting continued to have influence throughout 2012 across multiple categories, particularly bottled water, sports drinks, and food packaging. Down-sizing in single-serve bottle applications in categories such as CSD and isotonic, intended to provide additional consumer options, also affected PET resin usage.

NAPCOR determined that the total weight of PET bottles and jars available in the United States for recycling in 2012 was 5.586 billion pounds. This number reflects the total amount of PET bottle resin used by U.S. bottle manufacturers from U.S., foreign, and recycled sources, less scrap generated and not reused, exported bottles and pre-forms, and bottles less than eight ounces in size. We've used 5.586 billion pounds as the denominator in this report to determine both the recycling and utilization rates; it includes 326 MMLbs of postconsumer PET recyclate.

¹ This report will generally show data for the last 10 years. Earlier years' reports are available at www.napcor.com/PET/pet_reports.html.

POSTCONSUMER PET BOTTLE PURCHASES

The total amount, by weight, of postconsumer PET bottles collected for recycling and sold in the United States in 2012 was 1,718 million pounds. The breakdown of this total, by purchaser, is as follows:

1,135.4	Purchased by U.S. Reclaimers
547.0	Purchased by Export Markets
35.5	PET bottle component of mixed bales exported
1,717.9	Total Postconsumer Bottles (<i>MMlbs</i>)

This represents a 114 MMlb increase in total volume of bottles collected over 2011, resulting in an increase in the overall PET bottle recycling rate to 30.8%. Both positive and negative factors impacted collections in 2012. Contributing to the additional volumes were:

- An approximate 12.9 MMlb increase in CRV collections in California;
- A substantial increase in deposit material volumes reported, including in New York, which is feeling the full effect of the state’s recent deposit expansion to include water;
- New collection investments, mostly in single-stream or cart collection, which yielded new residential and commercial volumes.

This progress was countered by:

- Continued impact of lightweighting and reductions in single-serve container size;
- Most deposit program collections flat due to relatively stagnant CSD sales;
- Some residual curtailment or discontinuation of publicly initiated collection programs due to budget concerns still playing out in 2012.

United States reclaimers increased their purchases by 219 MMlbs from 2011, an increase of more than 23%, accounting for 66% of all U.S. bottles collected. Canadian reclaimers remained constant with 54 MMlbs of U.S bales purchased, slightly down from 55 MMlbs in 2011. Export purchases of PET bottle bales, predominantly by Chinese buyers, dropped by 105 MMlbs. Combined with bottles purchased in mixed bales, exports to the Far East totaled 528 MMlbs, or 31% of the PET bottles collected. This is the lowest volume of material exported since 2005 – and as a relative percentage of total collected, the lowest since 2001 – reflecting increased investment in domestic reclamation capacity.

United States reclaimers continued to supplement their domestic purchases by importing 114 MMlbs of postconsumer bottles, predominantly from Canada, Mexico and Central and South America. Domestic reclaimers also reported buying 23.9 MMlbs of alternative feedstock, which included postconsumer thermoforms, pre-consumer

bottles, postconsumer strapping, and other unprocessed industrial scrap. In total, U.S. reclaimers purchased 1,273 MMlbs of scrap material, an increase of 205 MMlbs over 2011.

POSTCONSUMER BOTTLES Gross Weight Purchases (MMlbs)	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
A. Purchased by U.S. Reclaimers	522	520	631	681	619	641	615	642	776	916	1,135
B. Purchased by Exporters *	275	321	372	489	653	755	836	802	781	688	582
C. Total U.S. Material Recycled (A+B)	797	841	1,003	1,170	1,272	1,396	1,451	1,444	1,557	1,604	1,718
D. Postconsumer Bottle Imports	57	62	106	109	97	100	98	98	89	106	114
E. Total Postconsumer Bottles used by U.S. Reclaimers (A+D)	579	582	737	790	716	741	713	740	865	1,022	1,249

* As of 2005, this number includes the amount of PET sold in mixed bottle bale shipments.

2012 GROSS RECYCLING RATE

$$\frac{\text{Total U.S. Bottles Collected and Sold for Recycling} = 1,718 \text{ MMlbs}}{\text{Total U.S. Bottles Available for Recycling} = 5,586 \text{ MMlbs}} = 30.8\%$$

Year	Total U.S. Bottles Collected (MMlbs)	Bottles on U.S. Shelves (MMlbs)	Gross Recycling Rate
2002	797	4,007	19.9%
2003	841	4,292	19.6%
2004	1,003	4,637	21.6%
2005	1,170	5,075	23.1%
2006	1,272	5,424	23.5%
2007	1,396	5,683	24.6%
2008	1,451	5,366	27.0%
2009	1,444	5,149	28.0%
2010	1,557	5,350	29.1%
2011	1,604	5,478	29.3%
2012	1,718	5,586	30.8%

PET BOTTLE BALE MARKETS

Falling prices for virgin PET and inconsistent demand and pricing for RPET flake and pellet led to a tumultuous year in recycled PET bale markets. Despite the market fluctuations, domestic reclaimers were still able to effectively compete with export markets, keeping more recycled PET bottles in the US for processing and end use.

The nearly record bale prices paid by reclaimers in 2011 were sustained only through the early part of 2012. By mid-year, bale prices had dropped significantly – in some cases to half what they were in late 2011/early 2012. By the end of the year, prices had stabilized at historically typical levels (\$.15 to \$.20 per pound on the East Coast). The mid-year price correction also brought an end to an unusual run of bale prices higher on the East Coast than the West. By mid-summer, West Coast bales were again commanding a slight premium over East.

Concern over poor bale quality and low yields escalated during 2012 as the amount of unusable material (e.g., non-PET, PET with full-wrap shrink labels, etc.) continued to grow. This was particularly distressing to reclaimers during the periods of bale price run-ups early in the year.

Good-quality dirty granulate material and deposit bales continued to be in high demand and short supply. This dynamic led to a higher than usual price premium, at some points greater than \$.10 per pound.

EAST COAST, NON-DEPOSIT PET BOTTLE BALE PRICES

(Picked Up, Truckload Quantities, Seller’s Dock)

2012	LOW	HIGH
JANUARY	\$0.18 / pound	\$0.27 / pound
FEBRUARY	0.23	0.32
MARCH	0.25	0.34
APRIL	0.27	0.33
MAY	0.23	0.30
JUNE	0.15	0.22
JULY	0.14	0.19
AUGUST	0.15	0.21
SEPTEMBER	0.18	0.23
OCTOBER	0.14	0.20
NOVEMBER	0.15	0.20
DECEMBER	0.16	0.22

RECLAMATION CAPACITY

A reclamation plant is defined as an operation that can take dirty postconsumer plastic packaging and process it into a clean flake suitable for remanufacture. At the beginning of 2012, there were 23 U.S. PET reclamation plants in operation, with a combined capacity of 1.755 billion pounds, gross weight input. By year's end, there were 27 plants operating in the U.S. with a total annual capacity of 2.025 billion pounds. These plants employ a wide range of technologies, with 14 of the 27 able to produce Food and Drug Administration (FDA) Letter of No Objection (LNO) direct-contact recycle suitable for food and beverages.

The plant utilization rate for U.S. reclaimers at year end 2012, based on the use of all feedstock, was approximately 63% for the year, down slightly from last year's 67%. This takes into account plants that were semi-operational, those that were shut down, and new plants that were operational for any portion of the year.

Recycled PET (RPET) Production Summary (MMlbs)	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
A. RPET Produced by U.S. Reclaimers from U.S. Bottles	401	412	505	558	523	496	477	477	558	590	785
B. RPET Produced by U.S. Reclaimers from Imported Bottles	46	49	83	85	69	82	87	84	71	77	84
C. Total RPET Production U.S. Reclaimers (A+B)	447	461	588	643	592	578	564	561	629	667	869
D. Clean Flake Equivalent from U.S. Bottles Exported	212	255	298	401	529	583	647	601	557	462	396
E. Total Clean Flake from U.S. Bottles (A+D)	613	667	803	959	1,052	1,079	1,124	1,078	1,115	1,052	1,181

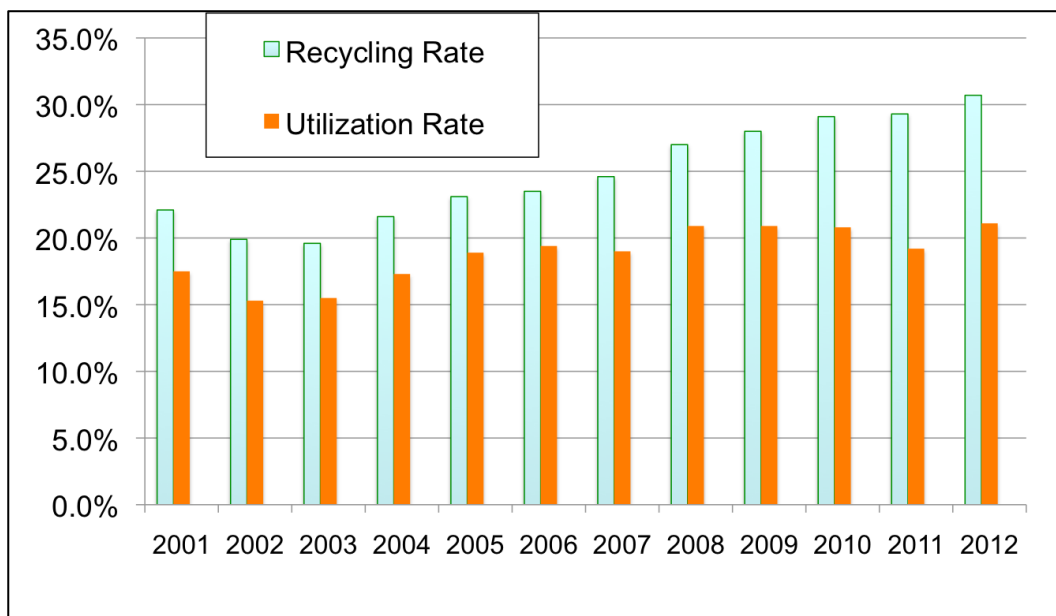
PET UTILIZATION RATE



The PET utilization rate is determined by adding the amount of clean flake produced by U.S. reclaimers to the amount of clean flake expected to be produced from exported bottles, both Canadian and all other (assuming U.S. yield losses as detailed below); the sum is expressed as a percentage of total U.S. bottles available for recycling.

United States reclaimers reported average yield losses ranging from 25% for deposit bottles to 35% for curbside material and 29% for California CRV. After applying the yield losses to the various fractions purchased, it was determined that the clean flake equivalent of the 582 MMlbs of postconsumer PET bottles shipped export to all locations was 396 MMlbs. As calculated above, the resulting PET utilization rate was 21.1%, a slight rebound from 2011, but still far below the recycling rate, illustrating continuing low bale yields as previously mentioned.

PET Recycling & PET Utilization Rates Compared



What industry experts characterized as crisis-level contamination in 2011 continued in 2012, adding significant cost for reclaimers and impacting the quality of the recycled PET flake they produced. In practice, PET bale yield losses are greater than just the sum of the non-PET fractions because every step taken to remove contamination—during material sorting, washing, and processing—also leads to some loss of valuable, usable PET material.

While the slight increase in the PET utilization rate may be viewed as a positive indicator, it is attributable not to better bale quality, but to greater volumes of baled PET material being pre-processed and sold to reclaimers as “dirty flake.” When this occurs, some of the yield loss is experienced before the reclaimer accepts the material and is therefore not reflected in the data collected in this report.

PET Utilization Rate

Year	Clean Flake Equivalent (MMlbs)	Bottles on U.S. Shelves (MMlbs)	Utilization Rates
2001	660	3,768	17.5%
2002	613	4,007	15.3%
2003	667	4,292	15.5%
2004	803	4,637	17.3%
2005	959	5,075	18.9%
2006	1,052	5,424	19.4%
2007	1,079	5,683	19.0%
2008	1,124	5,366	20.9%
2009	1,078	5,149	20.9%
2010	1,115	5,350	20.8%
2011	1,052	5,478	19.2%
2012	1,181	5,586	21.1%

2012 RPET MARKET

Use of RPET in the primary end-market conversion categories in the U.S. and Canada increased dramatically in 2012, up by 26% over 2011, with converter consumption totaling 1,312 MMlbs across all product categories (see Table, page 9).² United States and Canadian reclaimers also sold 74.5 MMlbs of PET byproducts to secondary markets. This is the highest converter consumption figure to date and

² Since the 2009 report, the RPET end-use data in the table on page 9 has reflected RPET consumption by converters in both the U.S. and Canada.

represents a marked increase in this multi-year upward trend. U.S. and Canadian reclaimers supplied about 1,083 MMlbs of flake and pellet produced from all sources of feedstock. The remaining 229 MMlbs was either: PET byproducts; material provided by U.S. RPET “upgraders” (companies that purchase dirty PET flake, have it toll washed, then pelletize or solid-state it for resale); or PET imported from reclaimers in countries such as France, Italy, India, Israel, Taiwan, China, Mexico, Brazil, Peru and others in Central and South America.

Growth in fiber application end uses stands out in 2012, with an increase over 2011 of more than 28%, or 114 MMlbs. PET staple fiber applications rebounded in no small part due to the use of RPET; RPET use was also evident in bulk continuous filament (BCF) production.

Another notable trend is the strong and consistent year-over-year growth in the Sheet & Film and Food & Beverage Bottles categories as the preference for and manufacture of recycled content packaging continues. Sheet & Film uses alone increased by approximately 50 percent.

Once again in 2012, the “Engineered Resins” category was folded into “Other,” as there was insufficient survey response in this category to meet standard confidentiality guidelines. Although nylon-based compounds have dominated the market of late, Engineered Resins remains a potential growth market, particularly for green and colored RPET. Canadian RPET end-use markets continued to improve, as they have over the last two years, with particular growth in fiber and packaging applications.

RPET Product Categories
RPET used (MMlbs)

Product Category	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Fiber	344	296	479	463	422	383	391	344	381	398	512
Sheet & Film	18	32	58	71	74	128	153	159	195	202	307
Strapping	83	77	116	131	132	144	137	114	127	120	136
Engineered Resin	10	10	12	8	9	11	7	10	9	See Other	See Other
Food & Beverage Bottles	86	106	126	115	139	136	141	203	216	242	276
Non-Food Bottles	43	24	63	63	49	60	55	65	58	57	50
Other	4	7	24	13	30	38	31	42	16	21	31
TOTAL CONVERTER CONSUMPTION	588	552	878	864	855	900	915	937	1,002	1,040	1,312

2012 YEAR-END SUMMARY

Several factors were influential in shaping the postconsumer PET recycling industry in 2012; some are new developments, others continue trends identified in the 2011 report.

Fiber Resurgence: The use of RPET in fiber continues to grow as additional investments fuel more domestic fiber manufacturing capacity and the economics favor the use of RPET. Thought to be in decline a few years back, 2012 fiber category numbers indicate otherwise, with growth in staple fiber applications and bulk continuous filament (BCF).

Lightweighting: While observers expected the impacts of packaging lightweighting to taper off in 2012, they continued into this year. Collectors, intermediate processors, and reclaimers all felt the impact of lightweighting, having to handle more containers to obtain the same weight, incurring increased costs, and meeting the logistical challenges inherent in moving lighter packages throughout various sorting and processing systems. The lighter weights further support PET's credentials as the environmentally preferred package, and while challenges persisted in 2012, they are expected to resolve in the long term.

Reclamation Capacity: North American reclamation assets are arguably the most sophisticated in the world, both in what they can handle and in the quality of RPET they produce. Investment in those assets continued in 2012, to the tune of an estimated \$75 million. The U.S. now has capacity to process significantly more postconsumer PET packaging, both bottles and thermoforms, than is actually collected. That means that in 2013, even if no PET bales are exported, demand by domestic PET reclaimers for recycled material will outstrip supply of collected PET. Absent additional collection efforts or new streams of material, competition for the limited supply will drive prices to unsustainable levels and threaten the viability of the reclamation infrastructure.

Contamination: The poor quality of PET bales from curbside collection programs was another continuing challenge to the reclamation infrastructure. The rising curbside contamination in these bales—with average yields reported at 65% in 2012 and many even lower—correlates to the increase in single-stream and all-rigid-plastics collection programs. Unfortunately, market forces did not drive suppliers to resolve bale quality issues. Because supply for PET material was tight, it was difficult for reclaimers to enforce bale quality standards. In effect, they have accepted lower quality material to ensure adequate supply.

A second source of contamination results from brand owners introducing PET packages into the marketplace that do not conform to "Design For Recycling" principles and guidelines. These range from modifications to the PET resin to improve package performance, to the adjunct components of a package, including labels, inks, adhesives

and closures. Full-wrap shrink labels continue to cause significant disruption, as mentioned in the 2011 Report.

NAPCOR urges brand owners to use The Association of Postconsumer Plastics Recyclers (APR) Design for Recyclability™ Guidelines to determine whether their PET packaging will move efficiently through the recycling system.³ Quite simply, the current contamination levels are not economically sustainable. Reversing the trend will require a strong, coordinated effort on the part of all stakeholders.

Thermoformed Packaging Recycling: PET thermoformed packaging continued to move through the recycling system in both the US and Canada in 2012 (see addendum, page 12). Since 2009, NAPCOR has made the removal of obstacles to PET thermoform recycling a top priority, not only as a reflection of proper stewardship for PET's fastest-growing packaging segment, but as a way of increasing feedstock opportunities for reclaimers, and ultimately ensuring more RPET flake and pellet supply to the end-use market. These efforts are now bearing fruit, as many reclaimers are allowing some level of thermoforms mixed in with the bottles. In the short term, increasing the collection of PET thermoforms is the best hope for addressing the key issue of insufficient supply.

³ Available at <http://www.plasticsrecycling.org/technical-resources/apr-design-for-recyclability-guidelines>.

Addendum: PET Thermoform Recycling

NAPCOR's goal is to make recycling PET thermoforms as easy and accessible as recycling PET bottles, without causing harm to existing PET bottle reclamation assets. Building on work that began in 2009, in 2012 NAPCOR continued to collaborate with retailers, brand owners, public program operators, intermediate processors, reclaimers, and end users to work through key challenges and expand domestic recovery of this valuable, sustainable material.

In 2012, the US and Canada recycled 47.8 MMlbs of PET thermoforms. Domestic reclaimers report purchasing and using 28.9 MMlbs of PET thermoforms, while NAPCOR data indicates that an additional 18.9 MMlbs of PET thermoforms collected in the US were reclaimed by off-shore markets. This is a modest increase over the 2011 reported recovery of 45 MMlbs; 24.9 MMlbs of which was reclaimed domestically while 20.1 MMlbs were exported.

The data demonstrates that the domestic market is building, but not as aggressively as some market watchers had anticipated. While growth in PET thermoform recycling is expected to continue, some technical and design for recyclability issues remain. At a time when high yield loss is a significant challenge for reclaimers, contamination from the "look-alike" packaging that can accompany PET thermoforms (e.g., OPS, PVC, PETG, PLA), pressure-sensitive labels, aggressive adhesives used on thermoforms, and other factors are putting a damper on market growth. In addition, because thermoform packaging does not travel through sorting and reclamation lines in the same way that bottles do, its presence may necessitate adjustments to line flow and other process components.

Nonetheless, certain PET reclaimers are well positioned to handle the challenges of processing PET thermoforms and are aggressively pursuing that supply. Reports indicate that some reclaimers are accepting PET bottle bales with as much as 30 percent PET thermoforms, and some are accepting dedicated PET thermoform bales. As such, clean, high-quality PET bales—whether PET bottles mixed with a specified percentage of PET thermoforms, or PET thermoforms only—command good value in domestic markets. At the same time, other reclaimers are more cautious about the effect PET thermoforms will have on their processes and yield rates.

Recycling collection programs and MRFs interested in marketing PET thermoforms should talk to their buyers about market opportunities. As they move to implement PET thermoform recycling, it is critical that collectors and processors implement best practices to minimize contamination and maximize quality.

In 2012, NAPCOR worked closely with PET thermoform collection programs in Montgomery County, MD; Omaha, NE; and Elk and Lebanon counties in PA, the recipients of grants to demonstrate education, collection and sorting strategies for PET

thermoforms. These two-year grants, possible through the financial support of SPI: The Plastics Industry Trade Association (SPI) and individual NAPCOR members Placon Corporation, Plastic Ingenuity, Inc. and Solo Cup, are critical to developing models in intermediate processing alternatives and consumer education, and will accelerate the recycling of the PET thermoformed package in the U.S.

NAPCOR would again like to acknowledge the support of its PET thermoform recycling efforts by Stewardship Ontario, Waste Diversion Ontario, The Association of Postconsumer Plastics Recyclers, the Canadian Plastic Industry Association, the Retail Council of Canada, PacNEXT, the Tag & Label Manufacturing Institute, and SPI, without whose collective assistance the progress achieved to date would not have been possible.