



**Association of Postconsumer
Plastic Recyclers**



2012 UNITED STATES NATIONAL POST- CONSUMER PLASTICS BOTTLE RECYCLING REPORT

INTRODUCTION

The 2012 edition of the United States National Post-Consumer Plastics Bottle Recycling Report is the 23rd annual report on plastic bottle recycling. This study is a cooperative effort between the Plastics Division of the American Chemistry Council (ACC) and the Association of Postconsumer Plastic Recyclers (APR), the goal of which is to quantify the amount of high density polyethylene (HDPE) and PP (PP) bottles collected for recycling, as well as the rate of recycling of those bottles. This study includes postconsumer recycling values and comments for polyethylene terephthalate (PET) developed by the National Association for PET Container Resources (NAPCOR) and the Association of Postconsumer Plastic Recyclers (APR). The reclaimer survey portion of the study was conducted by the Moore Recycling Associates, Inc.

HIGHLIGHTS/SUMMARY FOR 2012

Plastic Bottle Pounds Collected for Recycling in the United States

- The total pounds of plastic bottles collected for recycling reached a record high 2,785 million pounds.
- The total plastic bottle recycling collection rate was 30.5%, an increase of 1.6 percentage points over 2011.
- The total pounds of plastic bottles collected increased by 161 million pounds for 2012 over 2011 with increases for PET and HDPE and PP bottle resins.
- The annual increase in pounds of plastic bottles collected for recycling was 6.2%.
- The 5 year compounded annual growth rate for plastic bottle recycling was 3.6%.

- PET bottles collected increased by 113.9 million pounds for a total of 1,717.9 million pounds.
- HDPE bottles collected rose by 45.3 million pounds to 1,019.2 million pounds.
- The HDPE bottle recycling collection rate rose to 31.6% in 2012 compared to 29.9% in 2011.
- Exports of United States-collected HDPE bottle material rose to 201 million pounds, 19.7% of domestically collected material with approximately 69% of the exports leaving North America.
- Imports of postconsumer HDPE to the United States decreased by 35% to 33.1 million pounds, which combined with increased collection and increased exports resulted in slightly lower purchases for United States reclamation plants compared to 2011.
- PP bottle recycling collection totaled 47.0 million pounds, an increase of 7.2% over 2011 with 73% of the total processed domestically as deliberate PP material, as opposed to mixed material flake combined with HDPE. While the collection rate rose to 27.0% in 2012 compared to 20.8% in 2011, the rate change was due primarily to a smaller denominator in 2012 than in 2011.

Plastic Bottle Recycling Overview for 2012

2012 was a resumption year for postconsumer plastic bottle recycling growth, resulting in a significant increase in collection rate for recycling. The numerator of pounds of all bottles collected rose by 6.2%, beating the three year running average bottle collection growth rate of 4.9% per year. Lightweighting of PET and HDPE bottle continued as has been the case for several years. Some consumer products are being sold in smaller bottles with increased sales. The sales of PET for bottles increased while sales of HDPE for bottles sagged, suggesting a greater total number of PET bottles were available for recycling and a lesser total number of HDPE bottles were available for recycling. The total for all bottles in the marketplace increased by only 45 million pounds, or 0.5%, below the three year running average bottle marketplace growth rate of 1.0%.

Sales of virgin HDPE resin for bottles fell by 1.0% and sales of recycled HDPE resin for bottles stayed static. Sales of virgin PET resin for bottles rose by 1.6% and sales of recycled PET resin for bottles also rose.

2012 recycled HDPE bottle bale prices rose in the first half of the year compared to the latter half of 2011, then prices for both natural and pigmented HDPE fell in the second half of 2012. PET bottle bale prices eased down in the first half of 2012 compared to the latter half of 2011 and then PET postconsumer bale prices fell significantly in the second half of 2012.

Exports of postconsumer plastic bottle bales fell in 2012 compared to 2011 and reached the lowest percentage of total exports in four years, 28% overall. HDPE exports rose somewhat to a level more typical of several years ago. PET exports continued, fairly dramatically, a decrease in percentage of material collected, which started after the peak in

exports in 2008. The export of recycled PP bottles fell in 2012 to 13% of that collected as more material was processed domestically. An increased amount of PP bottle material was isolated as PP as opposed to being mixed with other resins.

The processing of recycled PET, sourced domestically or imported, increased substantially in 2012 vs. 2011. The processing of recycled HDPE, sourced domestically and imported, was stagnant in 2012 compared to 2011. The processing of recycled PP bottles, sourced domestically and imported, increased by 5 million pounds in 2012 versus 2011.

- Bottle resin use per capita has remained stagnant for three years, rising very slightly from the low point of the recession. The growth seen before the recession has been replaced by less use and continual lightweighting.
- Bale prices for recycled bottles fluctuated up and down in the first half of 2012 and then fell through the rest of the year.
- Single stream collection of household recyclables continued to grow, generally resulting in higher overall household participation rates and more challenges from contaminated bales of bottles with bale yields as dismal as in recent years. Tension continued with the attraction of more available material from such collection and more challenging processing requirements.
- California Container Redemption Value redemption centers collected not only PET, but also HDPE, PP, PVC, LDPE bottles and Other bottles.
- With exports and imports of material, plastic bottle recycling continues to be an international business with U.S.-based reclaimers competing effectively.
- Active “all bottle” collection continued the collection of LDPE and PVC bottles, although the tonnage continues to be small. We see a small amount of “#7, Other”, bottles collected, but we do not have data for the denominators of those bottles. The LDPE and PVC bottles were exported as part of mixed bales.

The plastic bottle resins, as identified by their resin identification codes, are:



Polyethylene Terephthalate, PET



High Density Polyethylene, HDPE



Polyvinyl Chloride, PVC



Low Density Polyethylene, LDPE



Polypropylene, PP



Polystyrene, PS



Other

PET and HDPE bottles continue to comprise over 96% (96.4%) of the United States plastic bottle market with PP at 1.9% of plastic bottles produced followed by LDPE at 0.84% of plastic bottles. Together, PET and HDPE are over 98% of the bottles recycled. Some PP bottles are included with pigmented HDPE bottles for recycling, about 11% of all PP collected. An allowance, based on buyer reports and bale audits, has been included to account for those PP bottles in this report.

Although bottles made with the #3 through #7 resins are recyclable, and to varying degrees are recycled, the actual level of recycling is limited by the continuing challenge to reach a critical mass of readily recognizable bottles for economical collection and processing. However, it should be noted that bottles made from resins #3 through #7 make up only 3.6% of the plastic bottle market.

Finally, bottles coded with “#7, Other” are included in this report as a discrete category. Bottles coded #7 may include, among others, HDPE or PET or PP resins with barrier layer materials. These bottles are often recycled with the primary resins used in each container. Bottles coded #7 may also be made from resins other than those listed above. No information is available for the denominator for “#7, Other”.

Post-Consumer Plastic Bottle Recycling Collection Results

Table 1
Post-Consumer Plastics Bottles Recycled in
Calendar Year 2012 Compared to Calendar Year 2011 Results [1,2,3,4,5,6,7]
 (in millions of pounds per year)

	Calendar Year 2011			Calendar Year 2012		
Plastic Bottle Type	Plastic Recycled [2]	Resin Sales [3,4]	Recycling Rate	Plastic Recycled [2]	Resin Sales [3,4]	Recycling Rate
PET [4]	1604.0	5478	29.3%	1717.9	5586	30.8%
HDPE Natural	443.4	1550	28.6%	445.6	1560	28.6%
HDPE Pigmented	530.5	1711	31.0%	573.6	1669	34.4%
Total HDPE Bottles	973.9	3261	29.9%	1019.2	3229	31.6%
PVC [5]	1.2	72	1.6%	1.0	75	1.3%
LDPE [5]	1.0	73	1.3%	0.7	77	0.9%
PP [6]	43.8	210	20.8%	47.0	174	27.0%
Other [7]	2.9			4.3		
TOTAL BOTTLES	2624	9095	28.9%	2786	9140	30.5%

[1] These data provide a snapshot of plastic bottle recycling collection trends from the national perspective. The data are particularly useful in identifying national trends and highlighting changes that have occurred from year to year, and may be a useful tool for planning purposes. While national data may be useful as a comparison with local waste characterization and recycling data, significant differences will exist from locality to locality, and from state to state. If communities or states are making decisions where precise knowledge of the amount, composition and disposition of MSW is crucial, e.g., where a solid waste management facility is being designed, or for local or state regulatory enforcement, etc., then local characterization of the quantities of individual components generated, recycled and disposed is essential.

[2] Data are based on surveys performed by Moore Recycling Associates, Inc. and include bale composition data provided by Moore Recycling Associates, Inc. and others.

[3] Based on data provided by the American Chemistry Council’s Plastics Industry Producers Statistics Group. HDPE resin sales include both the virgin and recycled plastic pounds used to produce new bottles. Imports from non-ACC members are not included.

[4] Source: Report of Post Consumer PET Container Recycling Activity in 2012, National Association of PET Container Resources, Sonoma, California

[5] The majority of PVC and LDPE recycled were as part of commingled bottle and container bales.

[6] About 78% of PP bottles were deliberately recycled as PP bottles.

[7] Limited data for bottles of other resins are shown. Material sold as part of mixed export bale. No denominator values are available.

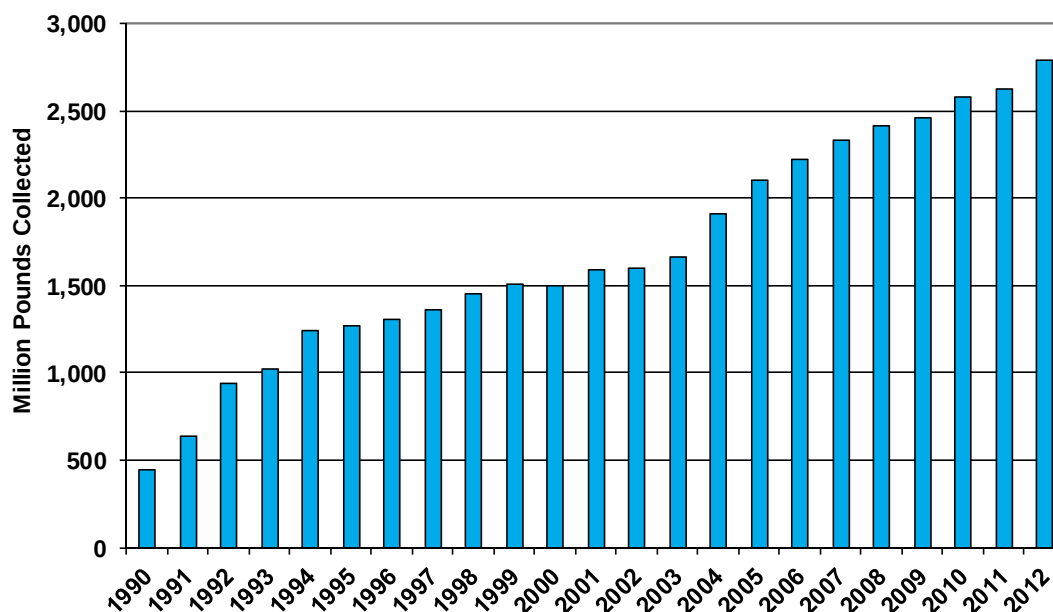
The 2012 PET bottle denominator increased by 108 million pounds to 5,586 million pounds. The 2012 PET bottle numerator, not including thermoforms, grew by 113.9 million pounds to 1,717.9 million pounds collected. Many natural homopolymer HDPE milk bottles continue to be pigmented, the usual visual indicator of the use of copolymer, and those bottles become included in the usually pigmented copolymer bottles. The recycled HDPE split between natural HDPE (presumed to all be homopolymer) and pigmented HDPE (usually presumed to be copolymer) was based on buyer estimates. The “Total HDPE Bottles” values above are probably more accurate numbers. In comparison with 2011, the 2012 HDPE denominator (bottles in the market place) decreased by 33 million pounds, or 1.0%. The rate of loss was greater than for 2011 when a loss of 0.7% was seen. The HDPE numerator (bottles collected for recycling) increased by 45.3 million pounds, or 4.6%. The collection rate for HDPE bottle recycling rose in 2012 vs. 2011 from 29.9% to 31.6%. Natural HDPE recycling, as defined, held steady in 2012 vs. 2011 while pigmented HDPE recycling increased. Overall, HDPE bottle recycling saw an increase in pounds recycled as the available pounds to be recycled fell, resulting in the substantial increase in collection rate for recycling.

About 0.9% of the total #2 through #7 bottles collected was part of commingled bottles bales, which is down from 2011, showing greater capture of value in the sorting operations. About 0.5% of the total #2 through #7 bottles was from mixed rigids bales. None of the total #2 through #7 bottles was from bales characterized as “other bottle” and known to possibly contain all possible bottles. For high density polyethylene bottles the contribution from commingled bottles bales and mixed rigids was about 3% of the total HDPE bottles collected in 2012. For PP bottles the contribution from commingled bottles bales and mixed rigids was about 11% of the total. For PVC bottles the contribution from commingled bottles bales and mixed rigids was about 100% of the total. For LDPE bottles the contribution from commingled bottles bales and mixed rigids was about 100% of the total.

Domestic processing of postconsumer PP bottles totaled 43.5 million pounds, a 14% increase over 2011. The deliberately isolated PP bottles for domestic recycling as PP increased from 27.7 million pounds in 2011 to 34.5 million pounds in 2012. As was the case for HDPE, PP recycling collection saw a slight increase in tons collected, but a decrease in tons of PP used for bottles, resulting in an increase in the collection rate for recycling.

PP from injection molded closures was recycled, but that amount is not part of this report on bottles. For information on PP from injection molded closures, please refer to Moore Recycling’s Non-Bottle Rigid Plastic Recycling Annual Reports.

Figure 1
Growth in Post-Consumer Plastic Bottle Recycling



**SOURCE: NAPCOR, all years, for PET. For other bottle resins,
R.W. Beck, Inc., 1990-2006; Moore Recycling Associates, Inc., 2007-2013**

The growth in total pounds of postconsumer bottles collected for recycling continued in 2012. A total of 2,785 million pounds of #1 through #6 plastic bottles are reported as collected for recycling. The change from 2011 was an increase of 161 million pounds of recycled bottles, or an increase of 6.2%. This happened in the face of both increases and decreases in the use of plastics to make bottles, lighter bottles, and the continued low growth economy.

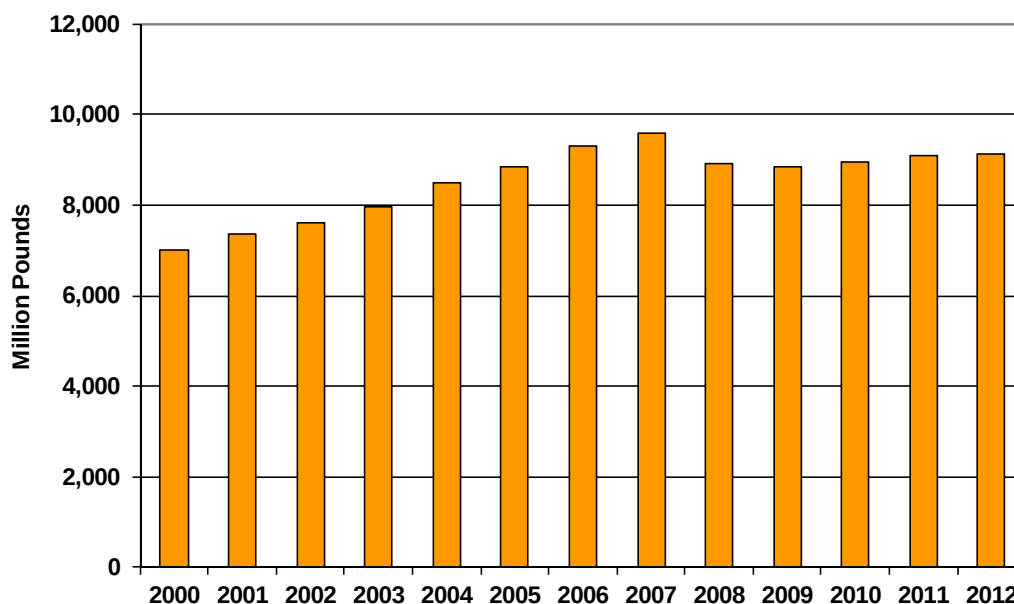
Bottle Resin Sales

The denominator used to calculate the recycling rate is composed of both virgin resin and recycled resin used for bottle making.

Plastic bottle light-weighting continues for all bottle resins. Many HDPE bottle applications are using product concentrates, which means an increasing number of smaller bottles, or fewer bottles made for the total number of uses, such as laundry loads. Light-weighting helps companies to meet economic and sustainability goals and is a relentless force in bottle making. While lighter bottles are more economically sustainable, recycling is denominated by weight.

The change in total resins used to make bottles was an increase of 46 million pounds, or an increase in bottle production of 0.5%. Use of HDPE to make bottles decreased by 33 million pounds, or -1.0%. Use of PET to make bottles increased by 108 million pounds, or 2.0%. A slight gain is seen over the last few years for all resins used to make bottles, but not yet to the level of 2007.

Figure 2
Resin Used for Plastic Bottles in USA

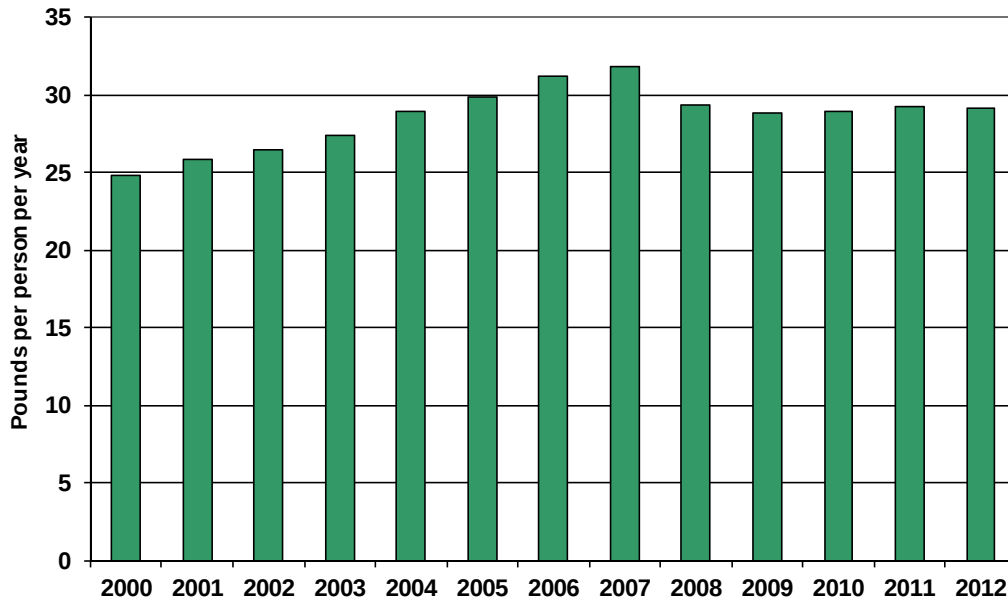


SOURCE: National Post-Consumer Plastic Bottle Report, 2001-2012

It is vital for the growth of plastic bottle recycling that bottles be present in the marketplace and consumers place bottles in the proper pathways for recycling to happen. The pounds of material in bottles used by consumers shown in Figure 2 include recycled content. Without available pounds of feed material, plastics recycling may grow in recycling rate, but not in the tons needed for a robust industry. Inability to secure wanted feedstocks has increased reclaimer interest in other resins and non-bottles.

Figure 3 shows the United States per capita consumption for plastic bottles. The per capita consumption of bottle resins, virgin and recycle sourced, in 2012 continued to match the consumption rate of 2004 and be less than before the 2008 recession. This chart shows that use of plastic bottles for more applications is offset by the continuing lightweighting and use of concentrates.

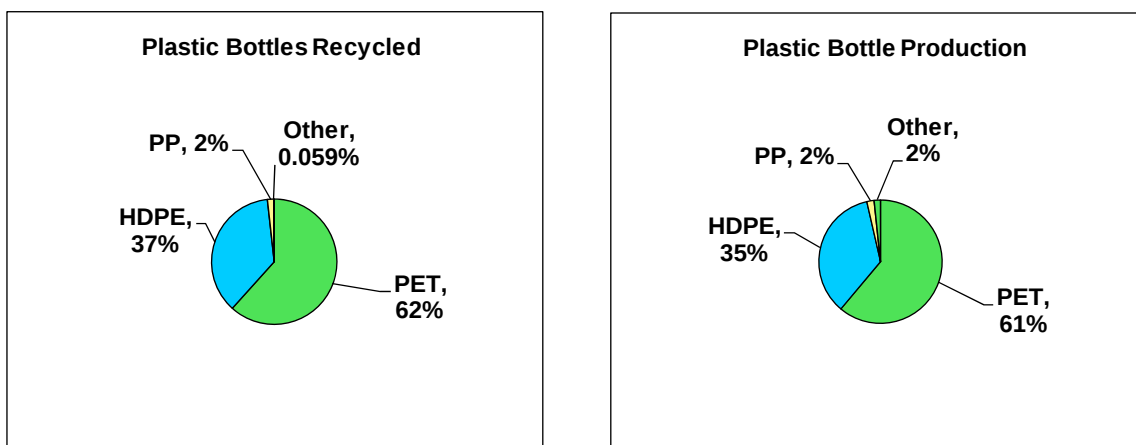
Figure 3
USA Per Capita Consumption of Plastic Bottles



SOURCE: National Post-Consumer Plastic Bottle Report, 2001-2012; US Census

PET and HDPE continued to dominate as selected resins to produce plastic bottles: 96.4% by weight of produced bottles were made of PET or HDPE. PET and HDPE bottles also continued to dominate the bottles collected for recycling, collectively being 98.3% and PP being 1.7%.

Figure 4
2012 Plastic Bottles Recycled and Plastic Bottle Production by Resin



Source: Moore Recycling Associates, Inc. 2012
 NAPCOR, 2012

Barriers to Increased Plastic Bottle Recycling

As noted for 2005 through 2011, too many consumers continue to be unaware of the significant usefulness, demand, and value of recycled plastic HDPE and PET. Data and experience show that plastic bottle recycling can be increased through sustained local education campaigns. Municipalities also need to understand that they too can benefit from the prices being paid for bales of bottles, including revenue sharing to fund educational programs and other costs of collection.

Another barrier to increased recycling is lack of sufficient access to recycling collection opportunities for products used away from home. Consumers continue to want additional opportunities to be able to recycle at public venues, offices, recreational sites, schools, and retail establishments.

With three driving influences, the increase in single stream collection of recyclables at household residences and the increased interest to collect more than bottles, and reduced export material, the quality of available postconsumer bottle material to U.S. reclaimers fell slightly for HDPE. For PET with an increasing variety of packaging applications, the quality of bales continued to slip. Use of the APR Design™ for recyclability guidelines can help reduce economic and technical barriers to plastic bottle recycling.

HDPE Reclamation Industry Update

- The number of HDPE reclaimers slipped in 2012 as compared to 2011 with 22 companies active at year's end. The number of smaller companies may vary year-to-year as industrial scrap companies change their business plans and start-ups and acquisitions continue.
- The amount of HDPE processed by United States HDPE reclaimers fell by 3 million pounds to 851 million pounds. The difference from 2011 is not significantly

different. While HDPE recycled bottle collection increased compared to 2011, exports also increased and imports decreased for nearly no change in the amount of HDPE bottles processed.

- The largest companies, processing over 30 million pounds annually, processed 84% of the HDPE processed and totaled eight in number.
- The mid-sized companies were decreased by three in number and amount processed in 2012 compared to 2011. Small companies decreased in number, but held steady in the amount processed compared to 2011. One 2011 reclaimer was shuttered in 2012.

Figure 5
Size Comparison of Domestic Reclaimers of HDPE Bottles

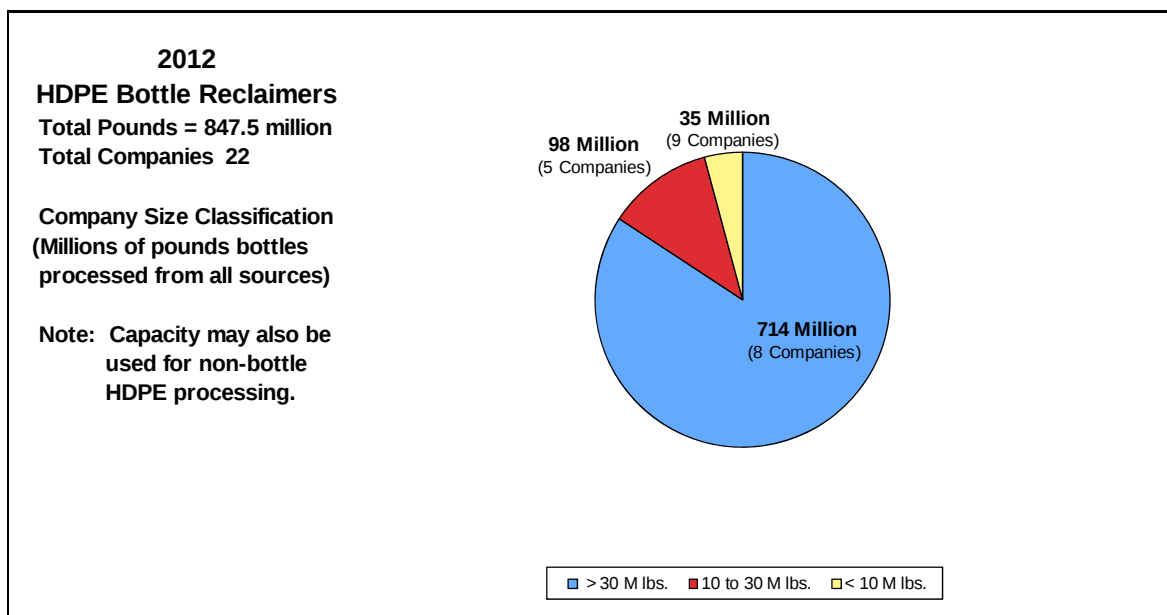
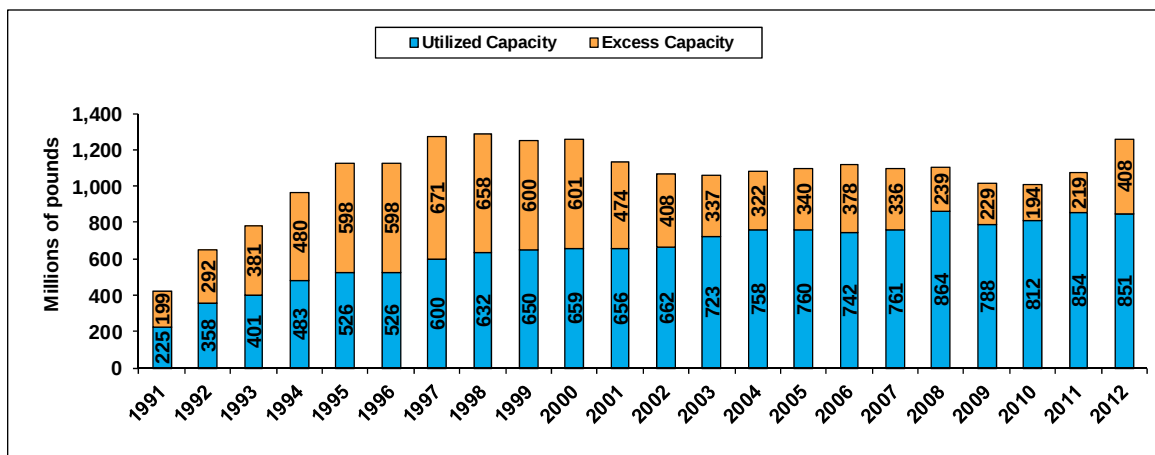


Figure 6
HDPE Bottle Wash Capacity in the U.S.



The figures shown above are estimates and should not be used for business planning purposes. Utilized capacity includes postconsumer material quantities processed domestically only. Capacity is based on 24 hours per day and 365 days per year.

The capacity utilization is shown for the given conditions of hours worked. The capacity utilization, as calculated, slumped to 68% for 2012 as compared to 80% in 2011. Production capacity was added for some reclaimers and diminished for others while the pounds of HDPE bottles processed did not increase. The HDPE reclaimers did, though, use assets to process non-bottle HDPE containers and PP. The total utilized capacity was static in 2012 at 851 million pounds compared to 854 million pounds in 2011. The overall industry capacity, as calculated, increased to 1,259 million pounds of HDPE postconsumer reclamation capacity.

As reported, PET reclamation capacity utilization was about 63% based on estimated capacity of 27 US reclaimers at the end of 2012.

Export and Import Markets

Postconsumer bottles are a valuable commodity and are traded globally. Buying of United States postconsumer bottles for export continued in 2012. Postconsumer plastic was exported out of the United States as bales of PET, PP, and HDPE bottles; bales of commingled bottles and containers; mixed rigid container bales; and unwashed flake material. A total of 28% of collected plastic bottle material of all types was exported in 2012 compared to an updated 33% in 2011.

For United States-collected HDPE bottle material, 201 million pounds were exported; representing 19.7% of the total bottle material collected domestically, an increase of 30 million pounds vs. 2011. Of those exported pounds, 31% went to Canada. The trade in bales is not one-sided. United States HDPE reclaimers imported 33 million pounds in

2012, down from 51 million pounds of postconsumer HDPE bales imported in 2011. The imported pounds of PCR are not included in the totals of pounds collected in the United States and are not part of the totals on Table 1.

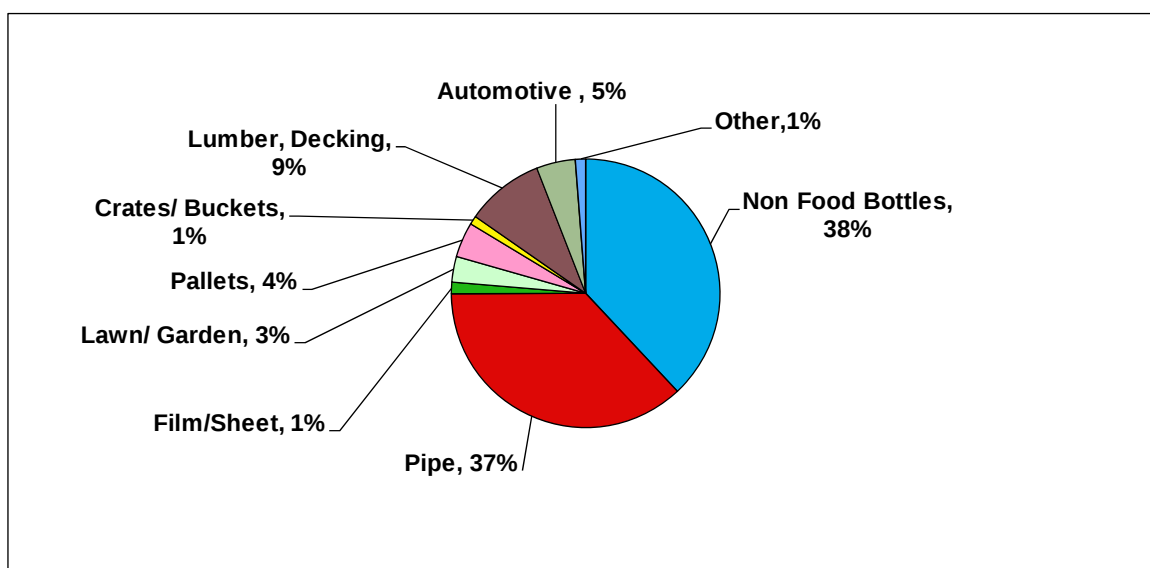
2012 PET exports totaled 33.9% of the total PET bottles collected with most going to China. This percentage is significantly less than the experience in 2011, when 42.9% of the collected PET was exported. The exports for PP bottles fell in 2012 vs. 2011, 6.1 vs. 9.2 million pounds, most as part of mixed resin or commingled bales or mixed flake. The PP exports fell from 21% in 2011 to 13% in 2012 for the bottles. 79% of PVC bottles were exported, a total of 0.7 million pounds. 83% of LDPE bottles were exported, a total of 0.6 million pounds.

End Use Markets for Recycled Plastics

Per a survey of postconsumer reclaimers:

- Natural HDPE postconsumer recycled resin's primary markets continued to be for non-food application bottles, such as for detergent, motor oil, household cleaners, etc.
- Pigmented HDPE postconsumer recycled resin's markets continued to be pipe and plastic lumber, decking, railroad ties, and non-food application bottles.
- Plastic lumber continued to consume a broad range of materials including recycled HDPE, LDPE, mixed rigid containers, and wide-spec virgin resin.
- PET postconsumer resin retained its traditional markets for fiber, film and sheet, and food bottles. Use into fiber, sheet & film, and food bottles rose significantly in 2012.
- PP postconsumer bottles in 2012 were used for pallets, buckets, and crates.

Figure 7
Domestic Recycled HDPE Bottle End Use
2012



There was little change in the recycled postconsumer HDPE end use markets in 2012 vs. 2011, but the use into bottles is still the major use. Pipe applications usage showed a gain compared to 2011. The pounds used for pipe reached its highest level yet. The tons of postconsumer HDPE for lawn/garden and for film/sheet and automotive dropped. The tons for lumber and railroad ties held the same as for 2011, but tonnage is still less than before the 2008 recession. End use markets and usage of material in those markets are as reported by a survey of reclaimers.

The reported yield of post-consumer HDPE bottles to clean product ranged, depending on raw material and end use, from low-70 percent to mid-90 percent. The average of reported yield values of bales to clean HDPE pellets in 2012 was 81.3%, comparing to 79.5% in 2011 and 81.0% long term. Many reclaimers are reporting that they implemented a Zero Waste program, leading to increased use of purchased materials and higher reported yields. For PET the bale yields varied from mid- 60's to mid-70's percentage, depending on source of bottles. The yield situation is different for recycling HDPE and PET bottles. For PET bottles the labels are not recovered as PET while for HDPE bottles labels may be recovered as HDPE. The presence of contamination in bales of HDPE bottles and PET bottles presented an ongoing challenge to reclaimers.

Economic Impact

The estimated value of purchased bales of postconsumer bottles of PET and HDPE in 2012 was \$670 million dollars.

Additional Information

ACC's Plastics Division represents the leading U.S. manufacturers of plastic resins. ACC offers resources to communities that wish to increase postconsumer plastic collection, including some targeted specifically at bottles and rigid plastics, as well as others focusing on plastic films, bags and wraps, and applications such as mattresses that are outside the scope of this Report. Details on the highly successful All Plastic Bottle collection programs can be found at www.allplasticbottles.org. A database for the recycling of clean plastic film and grocery/retail bags is provided at www.plasticfilmrecycling.org. Additional resources on plastic recycling can be found at www.recycleyourplastics.org.

APR offers resources at its website, www.plasticsrecycling.org, including lists of buyers and sellers of recycled plastic, market development workshop information, the Kids Zone for educating and involving children in plastics recycling, and technical resource documents to aid in designing recyclable packaging. APR announces at its website upcoming webinars and workshops to help local recycling coordinators achieve better plastic recycling results. The APR Design™ for recyclability guidelines, offered by APR for over 15 years, help packaging designers avoid poor materials selections that reduce the recyclability of plastic packages. The guideline document is available at <http://plasticsrecycling.org/technical-resources/design-for-recyclability-guidelines>.

Moore Recycling Associates Inc., supported by ACC, APR, J store front, and Resource Recycling, manages www.plasticmarkets.org, a database of buyers and sellers of recycled

plastic, open to all market participants. The website also provides other useful information, such as historical scrap prices and guidance for handling and bailing guidelines.

The Association of Postconsumer Plastic Recyclers, with support provided from the plastics industry through the American Chemistry Council, conducted programs for municipal recycling coordinators to educate them on the existing markets for baled bottles, the strong demand for goods, quality considerations, and suggestions for householder education.

NAPCOR provides additional information about PET at its website, www.NAPCOR.com.

Legal Notice

The 2012 United States National Post Consumer Plastics Bottle Recycling Report has been prepared to provide helpful ideas and information for parties interested in recycling plastics. Facilities developing a recycling process and all entities involved in the chain of collection, processing, distribution, and sale of recycled products have an independent obligation to ascertain that their plans, actions, and practices meet all relevant laws and represent sound business practices for their particular operations. Facilities may vary their approach with respect to particular operations, products, or locations based on specific factual circumstances, the practicality and effectiveness of particular actions and economic and technological feasibilities. This report is not designed or intended to define or create legal rights or obligations. Although the information contained in this document has been produced and processed from sources believed to be reliable, no warranty expressed or implied is made regarding the accuracy, adequacy, completeness, legality, reliability or usefulness of any information, and this information is provided on an "as is" basis. **NO WARRANTIES ARE GIVEN; ALL IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE ARE EXPRESSLY EXCLUDED.** Neither ACC nor APR assumes any liability of any kind whatsoever resulting from the use of or reliance upon any information, conclusions, or options contained herein.

The Association of Postconsumer Plastic Recyclers and the Plastics Division of the American Chemistry Council produced this report.

The United States National Post-Consumer Plastics Bottle Recycling Report is published by the Association of Postconsumer Plastic Recyclers and the Plastics Division of the American Chemistry Council.