



**Association of Postconsumer
Plastic Recyclers**



2011 UNITED STATES NATIONAL POST- CONSUMER PLASTICS BOTTLE RECYCLING REPORT

INTRODUCTION

The 2011 edition of the United States National Post-Consumer Plastics Bottle Recycling Report is the 22nd 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 polypropylene (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 2011

Plastic Bottle Pounds Collected for Recycling in the United States

- The total pounds of plastic bottles recycled reached a record high 2,624 million pounds.
- The total plastic bottle recycling collection rate was 28.9%, virtually the same as for 2010.
- The total pounds of plastic bottles collected increased by 45 million pounds for 2011 over 2010 with increases for PET and polypropylene bottle resins and a decrease for HDPE bottle resin.
- The annual increase in pounds of plastic bottles recycled was 1.7%.

- The 5 year compounded annual growth rate for plastic bottle recycling was 3.4%.
- PET bottles collected increased by 47 million pounds for a total of 1,604 million pounds.
- HDPE bottles collected fell by 10.2 million pounds to 973.9 million pounds.
- The HDPE bottle recycling collection rate held steady at 29.9% in 2011 compared to 29.9% in 2010.
- Exports of United States-collected HDPE bottle material fell to 171 million pounds, 17.6% of domestically collected material with approximately 72% of the exports leaving North America.
- Imports of postconsumer HDPE to the United States increased by 106% to 51.1 million pounds, which combined with decreased collection and decreased exports resulted in slightly higher production in United States reclamation plants compared to 2010.
- Polypropylene bottle recycling collection totaled 43.8 million pounds, an increase of 23.8% over 2010 with 64% of the total processed domestically as deliberate PP material, as opposed to mixed material flake combined with HDPE.

Plastic Bottle Recycling Overview for 2011

2011 was a stagnant year for postconsumer plastic bottle recycling, resulting in little change in collection recycling rate. As PET and HDPE bottles lightweighting continued, the sales of PET for bottles increased while sales for HDPE for bottles sagged, suggesting more total number of PET bottles and fewer total number of HDPE bottles.

Sales of virgin HDPE resin fell while sales of recycled HDPE resin for bottles increased.








2011 recycled HDPE bottle bale prices rose impressively in the first quarter and modestly in the second quarter. HDPE bottle prices fell in the third quarter, regaining some in the fourth quarter. PET bottle bale prices also rose in the first half of 2011, and then steadily weakened through the second half of the year.

Exports of both PET and HDPE recycled bottle bales decreased substantially with sales to Asia down. Reversing the experience of 2010, the export of recycled polypropylene bottles rose in 2011 to 21% of that collected and more material was recovered domestically as well. An increased amount of polypropylene bottle material was isolated as polypropylene as opposed to being mixed with other resins.

The processing of recycled PET, sourced domestically or imported, rose by 38 million pounds in 2011 vs. 2010. The processing of recycled HDPE, sourced domestically or imported, rose in 2011 by 42 million pounds compared to 2010. The processing of recycled polypropylene bottles, sourced domestically or imported, increased by 9 million pounds in 2011 versus 2010.

- Bottle resin use per capita continued to grow from the nadir of the recession, but did not recover to pre-recession levels.
- Bale prices for recycled bottles rose strongly through the first and second quarters and then fell through the rest of the year but stayed above the 2010 levels.
- 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 still impaired. 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 reduced exports of postconsumer bottle bales and increased imports of material, plastic bottle recycling continues to be an international business with USA reclaimers competing effectively.
- Active “all bottle” collection increased the percentage of LDPE and PVC bottles dramatically, 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% (96.1%) of the United States plastic bottle market and over 98% of the bottles recycled. The largest market share of the other resins used to make bottles is held by polypropylene at 2.3% of plastic bottles followed by PVC at 0.8% of plastic bottles. Some polypropylene bottles are included with pigmented HDPE bottles for recycling, about 11% of all polypropylene collected. For this report, an allowance based on buyer reports and bale audits has been included to account for those polypropylene bottles.

Although 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 3.9% 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 2011 Compared to Calendar Year 2010 Results [1,2,3,4,5,6,7]
 (in millions of pounds per year)

Plastic Bottle Type	Calendar Year 2010			Calendar Year 2011		
	Plastic Recycled [2]	Resin Sales [3,4]	Recycling Rate	Plastic Recycled [2]	Resin Sales [3,4]	Recycling Rate
PET [4]	1557	5350	29.1%	1604	5478	29.3%
HDPE Natural	434.1	1604	27.1%	443.4	1550	28.6%
HDPE Pigmented	550.0	1682	32.7%	530.5	1711	31.0%
Total HDPE Bottles	984.1	3286	29.9%	973.9	3261	29.9%
PVC [5]	1.4	68	2.0%	1.2	72	1.6%
LDPE [5]	1.0	56	1.9%	1.0	73	1.3%
PP [6]	35.4	193	18.3%	43.8	210	20.8%
Other [7]	3.4			2.9		
TOTAL BOTTLES	2579	8953	28.8%	2624	9095	28.9%

[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 are not included.

[4] Source: 2011 Report of Post Consumer PET Container Recycling Activity, 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 76% of polypropylene bottles were deliberately recycled as polypropylene bottles.

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

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

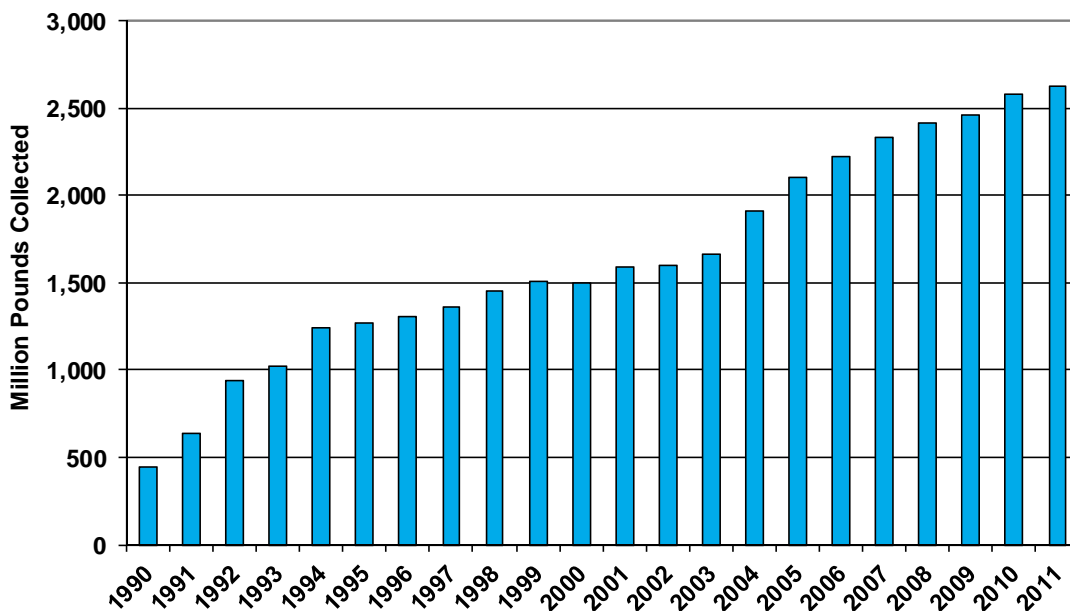
pigmented copolymer bottles. The recycled HDPE split between natural HDPE (presumed to all be homopolymer) and pigmented HDPE (usually presumed to be copolymer) was based on buyer estimates. The “Total HDPE Bottles” values above are probably more accurate numbers. In comparison with 2010, the 2011 HDPE denominator (bottles in the market place) decreased by 25 million pounds, or 0.7%. While still a decrease, the rate of loss was less than for 2010. The HDPE numerator (bottles recycled) decreased by 10.2 million pounds, or 1.0%. The collection rate for HDPE bottle recycling held steady in 2011 vs. 2010 at 29.9% for both years. Natural HDPE recycling, as defined, rose in 2011 while pigmented HDPE recycling decreased, reversing the experience of 2010. Overall, HDPE bottle recycling maintained the status quo while still feeling the effects of the recession.

About 1.8% of the total #2 through #7 bottles collected was part of commingled bottles bales which is down from the 2010 experience, showing greater capture of value in the sorting operations. About 0.3% of the total #2 through #7 bottles was from mixed rigids bales. And about 0.2% of the total #2 through #7 bottles was from bales characterized as “other bottle” and known to contain all possible bottles. For high density polyethylene bottles the contribution from commingled bottles bales and mixed rigids was again about 5% of the total HDPE bottles collected in 2011. For polypropylene bottles the contribution from commingled bottles bales and mixed rigids was about 13% 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 polypropylene bottles totaled 38.2 million pounds, a 30% increase over 2010. The deliberately isolated polypropylene bottles for domestic recycling as polypropylene increased from 23.6 million pounds in 2010 to 27.8 million pounds in 2011.

Polypropylene from injection molded closures was recycled, but that amount is not part of this report on bottles. For information on polypropylene 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., 2007-2011**

The growth in total pounds of postconsumer bottles collected for recycling continued in 2011. A total of 2,624 million pounds of #1 through #6 plastic bottles are reported as collected for recycling. The change from 2010 was an increase of 45 million pounds of recycled bottles, or an increase of 1.7%. 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.

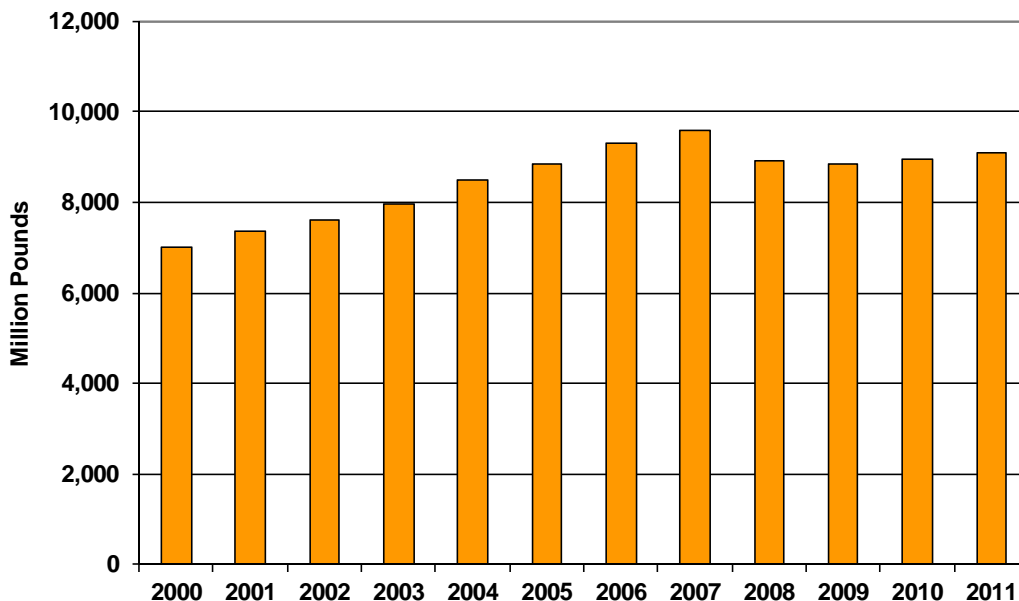
Bottle Resin Sales

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 meets 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 resin used to make bottles was an increase of 142 million pounds, or an increase in bottle production of 1.6%. Use of HDPE to make bottles decreased by 25 million pounds, or -0.7%. Use of PET to make bottles increased by 128 million pounds, or 2.4%. A slight gain is seen over the last few years, but not yet to the level of 2007.

Figure 2
Resin Used for Plastic Bottles in USA

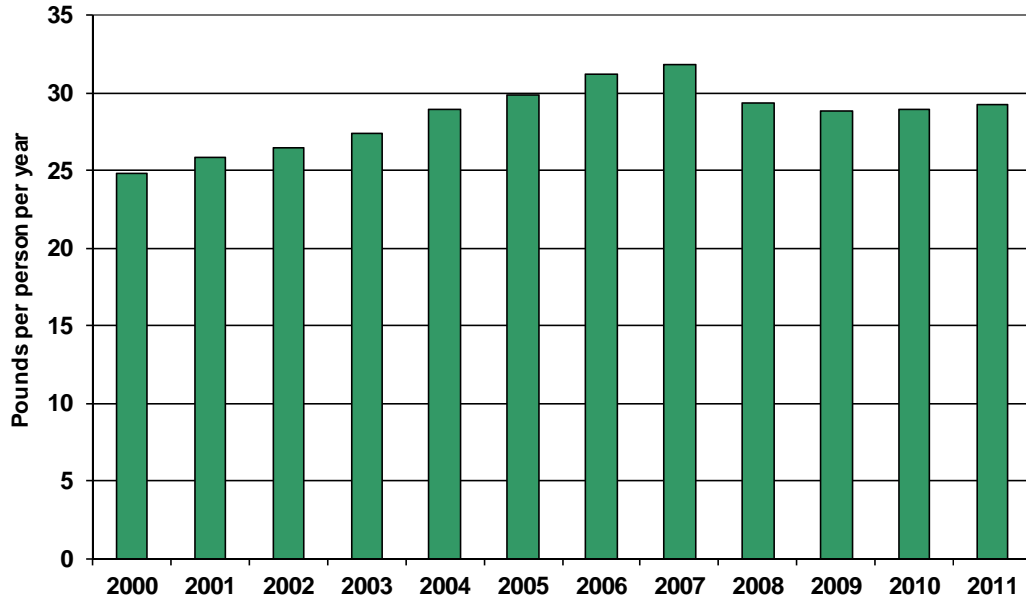


SOURCE: National Post-Consumer Plastic Bottle Report, 2001-2011

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.

Figure 3 shows the United States per capita consumption for plastic bottles. The per capita consumption of bottle resins, virgin and recycle sourced, in 2011 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.

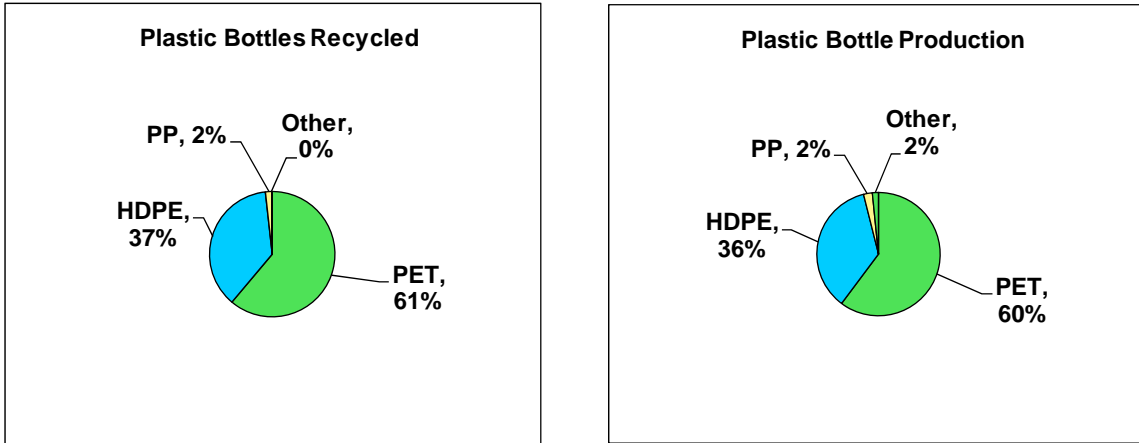
Figure 3
USA Per Capita Consumption of Plastic Bottles



SOURCE: National Post-Consumer Plastic Bottle Report, 2001-2011; US Census

PET and HDPE continued to dominate as selected resins to produce plastic bottles: 96.1% 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 98.2% and polypropylene being 1.7%.

Figure 4
2011 Plastic Bottles Recycled and Plastic Bottle Production by Resin



Source: Moore Recycling Associates, Inc. 2011
 NAPCOR, 2011

Barriers to Increased Plastic Bottle Recycling

As noted for 2005 through 2010, 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 improvement in single stream collection of recyclables at household residences and the increased care to collect more than bottles and reduced export material, the quality of available postconsumer bottle material fell slightly for HDPE. For PET with an increasing variety of packaging applications, the quality of bales continued to slip. Bottles produced contrary to the APR Design for Recyclability™ Guidelines create economic and technical barriers to plastic bottle recycling.

HDPE Reclamation Industry Update

- The number of HDPE reclaimers held steady in 2011 as compared to 2010 with 26 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 rose by 32 million pounds to 843 million pounds. The increase in pounds processed came from increases for domestically sourced bales and increased imports.
- The largest companies, processing over 30 million pounds annually, processed 79% of the HDPE processed and totaled six in number.
- The mid-sized companies were increased by one in number and amount processed in 2011 increased compared to 2010. Small companies held steady in number and the amount processed compared to 2010.

Figure 5
Size Comparison of Domestic Reclaimers of HDPE Bottles

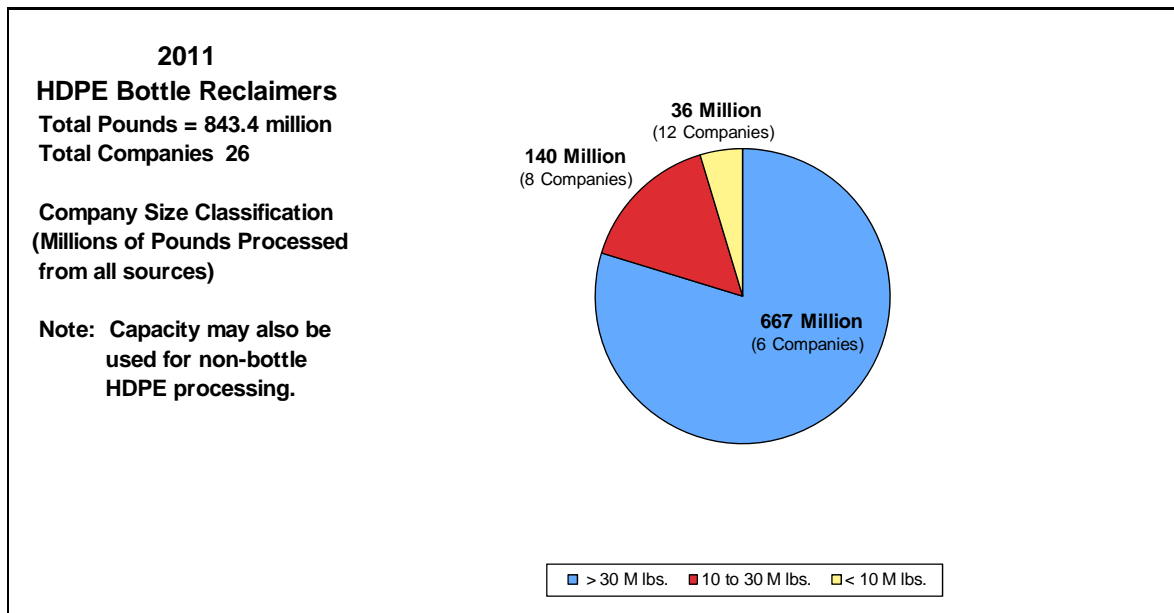
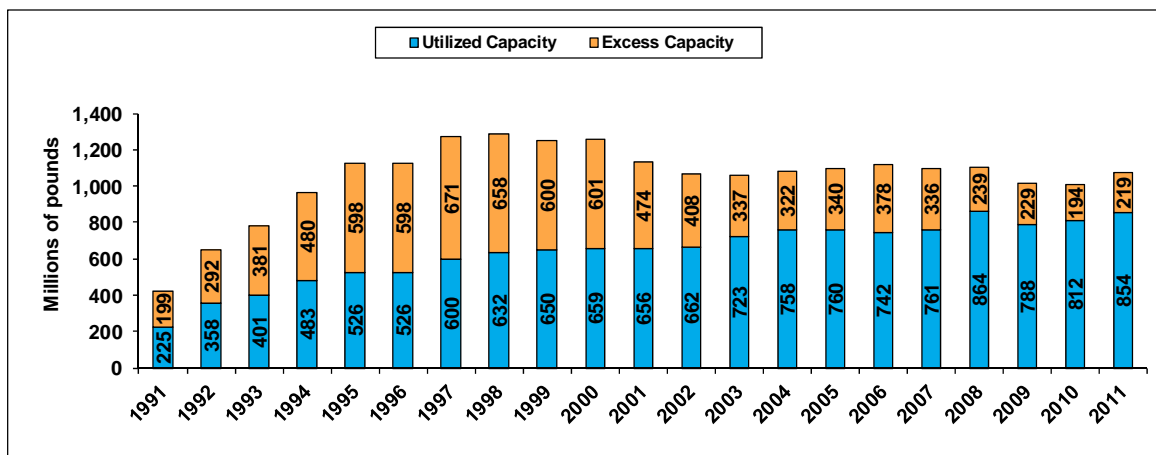


Figure 6
HDPE Bottle Wash Capacity in the U.S.



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, slipped to 80% for 2011 as compared to 81% in 2010. The total utilized capacity rose in 2011 to 854 million pounds compared to 812 million pounds in 2010. The overall industry capacity, as calculated, increased to 1,072 million pounds of HDPE postconsumer reclamation capacity. Some capacity could be used for non-bottle HDPE container reclamation.

Export and Import Markets

Postconsumer bottles are a valuable commodity and are traded globally. Buying of United States postconsumer bottles for export continued in 2011. Postconsumer plastic was exported out of the United States as bales of PET, polypropylene, and HDPE bottles; bales of commingled bottles and containers; mixed rigid container bales; and unwashed flake material. A total of 34% of collected plastic bottle material of all types was exported.

For United States-collected HDPE bottle material, 171 million pounds were exported; representing 17.6% of the total bottle material collected domestically, a decrease of 26 million pounds vs. 2010. Of those exported pounds, 28% went to Canada. The trade in bales is not one-sided. United States reclaimers imported 51 million pounds in 2011, up from 25 million pounds of postconsumer HDPE bales imported in 2010. 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.

2011 PET exports totaled 42.9% of the total PET bottles collected with most going to China. This percentage is significantly less than the experience in 2010, when 50.2% of the collected PET was exported. The exports for polypropylene bottles rose in 2011 vs.

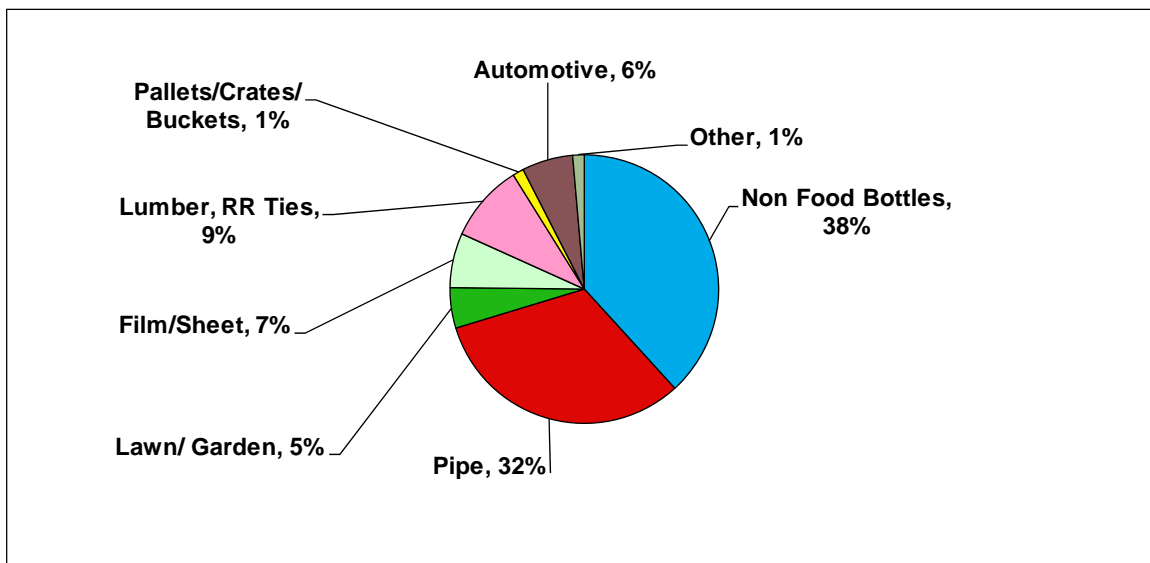
2010, 9.2 vs. 6.3 million pounds, most as part of mixed resin or commingled bales or mixed flake. The polypropylene exports rose from 18% in 2010 to 21% in 2011 for the bottles. 97% of PVC bottles were exported, a total of 1.1 million pounds. 94% of LDPE bottles were exported, a total of 0.9 million pounds.

End Use Markets for Recycled Plastics

Per survey of HDPE 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 with an increase in pounds used for fiber, film and sheet, and food bottles. Use into food bottles consumed 23.3% of the reprocessed PET.
- Polypropylene postconsumer bottles were used for automotive, bottles, and for pallets, buckets, and crates.

Figure 7
Domestic Recycled HDPE Bottle End Use
2011



The market share for non-food bottles gained in 2011, but was still below pre-recession values. The pounds going to bottles were also below pre-recession levels. Pipe applications market share held steady at 32%. The pounds used for pipe reached its highest level yet. The market shares for lawn/garden and for film/sheet and automotive

held steady. The market share and tons for lumber and railroad ties fell. Market shares are as reported by survey of reclaimers.

The reported yield of post-consumer bottles to clean product ranged, depending on raw material and end use, from low-70 percent to mid-80 percent. The average of reported yield values of bales to clean HDPE pellets in 2011 was 79.5%, comparing to 82% in 2010. For PET the bale yields varied from 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 2011 was \$782 million dollars.

Additional Information

ACC offers resources to communities that wish to increase postconsumer plastic collection. 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.plasticbagrecycling.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 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 scrap prices and 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 2011 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. ***ACC and APR do not make any warranty or representation, either express or implied, with respect to the accuracy or completeness of the information contained in this report;*** nor do ACC and APR assume 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.