



**Association of Postconsumer  
Plastic Recyclers**



# **2010 UNITED STATES NATIONAL POST- CONSUMER PLASTICS BOTTLE RECYCLING REPORT**

---

## **INTRODUCTION**

The 2010 edition of the United States National Post-Consumer Plastics Bottle Recycling Report is the 21<sup>st</sup> 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 recycled, as well as the rate of recycling. 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 2010**

### ***Plastic Bottle Pounds Collected for Recycling in the United States***

- The total pounds of plastic bottles recycled reached a record high 2,579 million pounds.
- The total plastic bottle recycling rate was 28.8%, up from 27.8% in 2010.
- The total pounds of plastic bottles collected increased by 123 million pounds for 2010 over 2009 with increases for PET, HDPE, and polypropylene bottle resins.
- The annual increase in pounds of plastic bottles recycled was 5.0%.
- The 20 year compounded annual growth rate for plastic bottle recycling was 9.2%.

- PET bottles collected increased by 113 million pounds for a total of 1,557 million pounds.
- HDPE bottles collected rose by 2.5 million pounds to 984.1 million pounds.
- The HDPE bottle recycling rate rose to 29.9% in 2010 from 29.2% in 2009 with a slight increase in amount collected for recycling and greater decrease in resin used for bottles.
- Exports of United States-collected HDPE bottle material fell to 197 million pounds, 20.0% of domestically collected material with approximately 78% of the exports leaving North America.
- Imports of postconsumer HDPE to the United States decreased by 38% to 24.8 million pounds, which with increased collection and decreased exports resulted in slightly higher production in and capacity utilization of United States reclamation plants compared to 2009.
- Polypropylene bottle recycling totaled 35.4 million pounds, an increase of 31% over 2009 with 67% of the total processed domestically as deliberate PP material, as opposed to mixed material flake combined with HDPE.








### ***Plastic Bottle Recycling Overview for 2010***

2010 was a year of continued recovery from the ‘perfect storms’ of 2008. While many PET water bottles became even lighter, growth was seen in all sectors of the PET bottle market. Sales of virgin HDPE resin increased as sales of recycled HDPE resin for bottles decreased with a net smaller base of potentially collectable HDPE bottle material to supply the recycling market. 2010 recycled bottle bale prices rose steadily into the second quarter for HDPE, fell in the spring, and regained some of the loss through the rest of the year. Recycled PET bales also rose through the first two quarters, adjusted downward, and recovered most of the loss by year’s end. Exports of both PET and HDPE recycled bottle bales decreased substantially. Continuing a trend from 2008, the export of recycled polypropylene bottles fell and more material was recovered domestically overall. 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 65 million pounds in 2010 vs. 2009. The processing of recycled HDPE, sourced domestically or imported, rose in 2010 by 24 million pounds compared to 2009. The processing of recycled polypropylene bottles increased by 11 million pounds in 2010 versus 2009.

- Bottle resin use continued to grow, but did not recover to 2007 levels.
- Bale prices for recycled bottles rose through the first and second quarters and then fell and slowly regained strength 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 still impaired.
- California Container Redemption Value redemption centers collected not only PET, but also HDPE, PP, PVC, LDPE bottles and Other bottles.

- Even with reduced exports of postconsumer bottle bales and reduced imports of material, plastic bottle recycling continues to be an international business.
- 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 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% (96.5%) of the United States plastic bottle market and about 99% of the bottles recycled. The largest market share of the other resins used to make bottles is held by polypropylene at 2.2% of plastic bottles followed by PVC at 0.8% of plastic bottles. Many polypropylene bottles are included with pigmented HDPE bottles for recycling, about 13% 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 3.5% 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 2010 Compared to Calendar Year 2009 Results [1,2,3,4,5,6,7]**  
(in millions of pounds per year)

Plastic Bottle Type	Calendar Year 2009			Calendar Year 2010		
	Plastic Recycled [2]	Resin Sales [3,4]	Recycling Rate	Plastic Recycled [2]	Resin Sales [3,4]	Recycling Rate
PET [4]	1444	5149	28.0%	1557	5350	29.1%
HDPE Natural	457.0	1613	28.3%	434.1	1604	27.1%
HDPE Pigmented	524.6	1752	29.9%	550.0	1682	32.7%
<b>Total HDPE Bottles</b>	<b>981.6</b>	<b>3365</b>	<b>29.2%</b>	<b>984.1</b>	<b>3286</b>	<b>29.9%</b>
PVC [5]	2.0	66	3.0%	1.4	68	2.0%
LDPE [5]	1.4	72	2.0%	1.0	56	1.9%
PP [6]	27.0	192	14.1%	35.4	193	18.3%
Other [7]	1.0			3.4		
<b>TOTAL BOTTLES</b>	<b>2456</b>	<b>8844</b>	<b>27.8%</b>	<b>2579</b>	<b>8953</b>	<b>28.8%</b>

[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: 2010 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 3/4 of polypropylene bottles were deliberately recycled as polypropylene bottles, about 1/7 were included in commingled and mixed plastic bales, and about 1/6 were included with colored HDPE

[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 2009, the 2010 HDPE denominator (bottles in the market place) decreased by 79 million pounds, or 2.4%. The HDPE numerator (bottles recycled) increased by 2.5 million pounds, or 0.3%. Natural HDPE recycling, as defined, fell in 2010 while pigmented HDPE recycling increased.

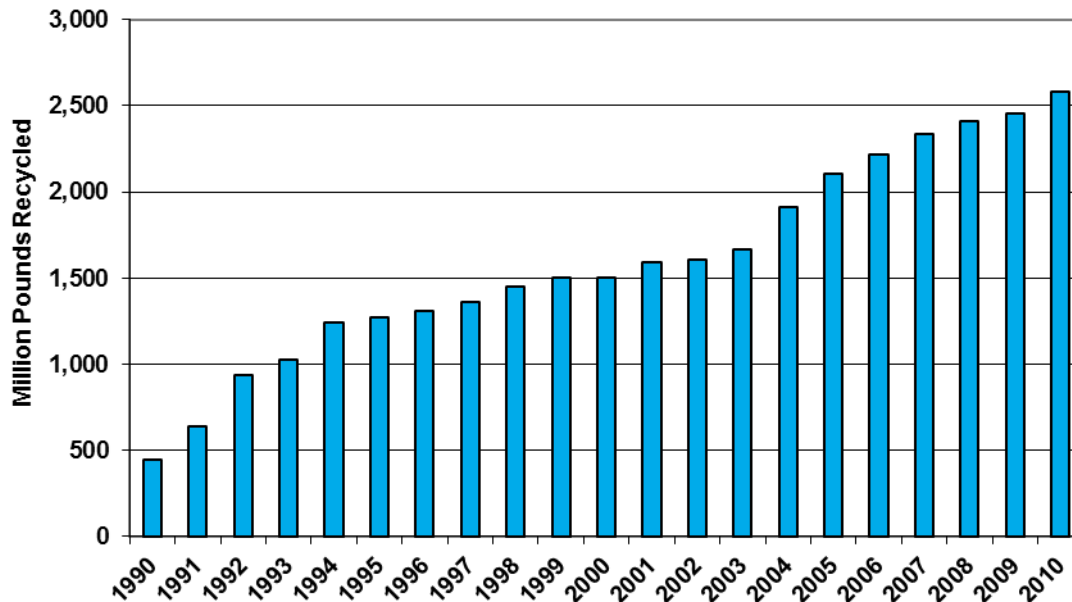
About 6.7% of the total #2 through #7 bottles collected was part of commingled bottles bales.

About 1.4% of the total #2 through #7 bottles was from mixed rigids bales. And about 0.5% 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 5.5% of the total HDPE bottles collected in 2010. 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 96% of the total. For LDPE bottles the contribution from commingled bottles bales and mixed rigids was about 99% of the total.

Domestic processing of postconsumer polypropylene bottles totaled 29.5 million pounds, a 62% increase over 2009. The deliberately isolated polypropylene bottles for domestic recycling as polypropylene increased from 12.8 million pounds in 2009 to 23.6 million pounds in 2010.

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**



The growth in total pounds of postconsumer bottles collected for recycling continued in 2010. A total of 2,579 million pounds of #1 through #6 plastic bottles are reported as

collected for recycling. The change from 2009 was an increase of 123 million pounds of recycled bottles, or an increase of 5.0%. This happened in the face of slight overall increase in the use of plastics to make bottles and the continued low growth economy.

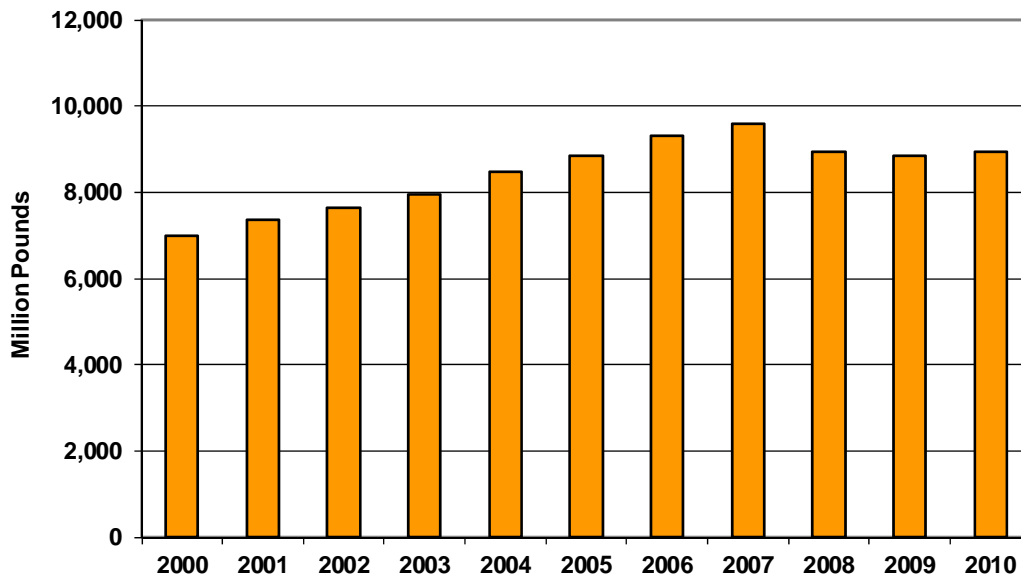
### **Bottle Resin Sales**

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. 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 109 million pounds, or an increase in bottle production of 1.2%, stopping the decline started in 2008. Use of HDPE to make bottles decreased by 79 million pounds, or -2.4%. Use of PET to make bottles increased by 201 million pounds, or 3.9%. Over three years the total resin used to make bottles has been steady.

**Figure 2  
Resin Used for Plastic Bottles in USA**

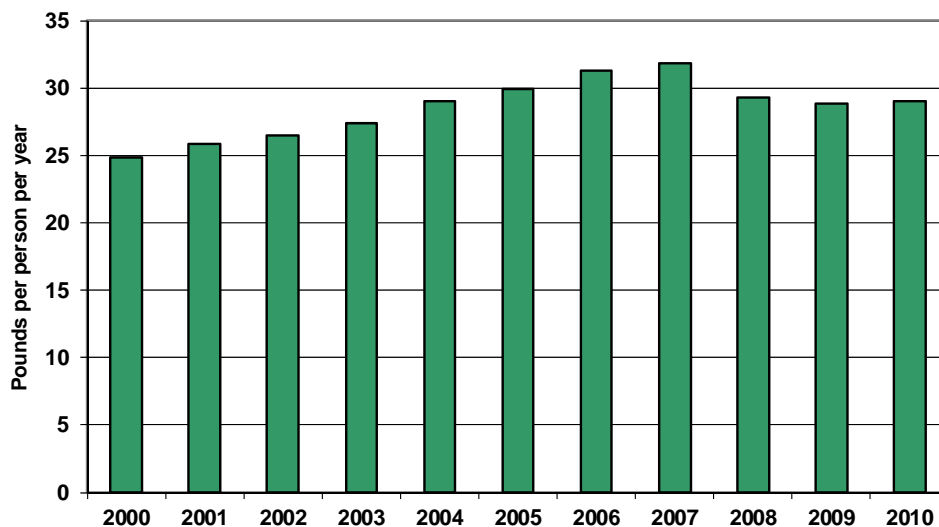


**SOURCE: National Post-Consumer Plastic Bottle Report, 2001-2010**

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. The United States per capita consumption of bottle resins, virgin and recycle sourced, in 2010 continued to match the consumption rate of 2004 and be less than before the 2008 recession.

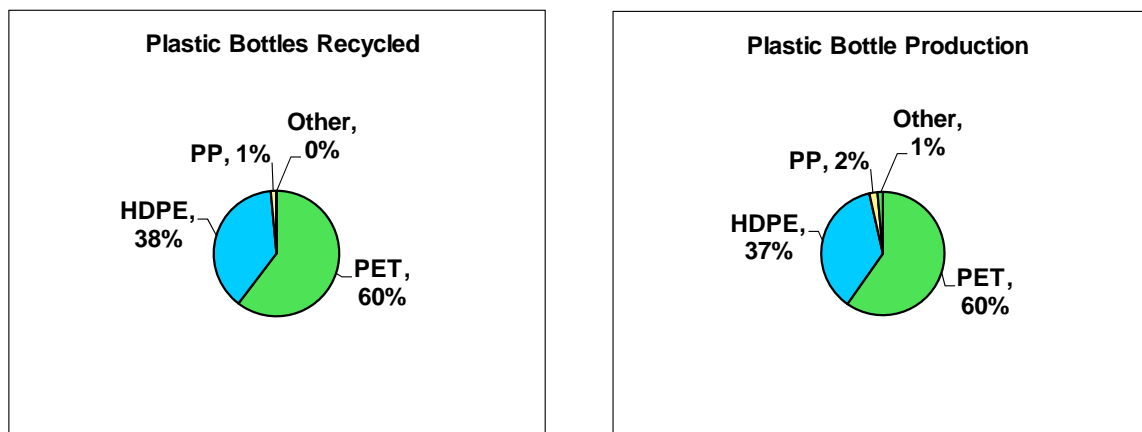
**Figure 3**  
**USA Per Capita Consumption of Plastic Bottles**



**SOURCE: National Post-Consumer Plastic Bottle Report, 2001-2010; US Census**

PET and HDPE continued to dominate as selected resins to produce plastic bottles: 96.5% 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 98.5% and polypropylene being 1.4%.

**Figure 4**  
**2010 Plastic Bottles Recycled and Plastic Bottle Production by Resin**



Source: Moore Recycling Associates, Inc. 2010  
 NAPCOR, 2010

### ***Barriers to Increased Plastic Bottle Recycling***

As noted for 2005 through 2009, 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 increased for HDPE. For PET with an increasing variety of packaging applications, the quality of bales continued to slip. Bottles produced contrary to APR's Design for Recyclability Guidelines create economic and technical barriers to plastic bottle recycling.

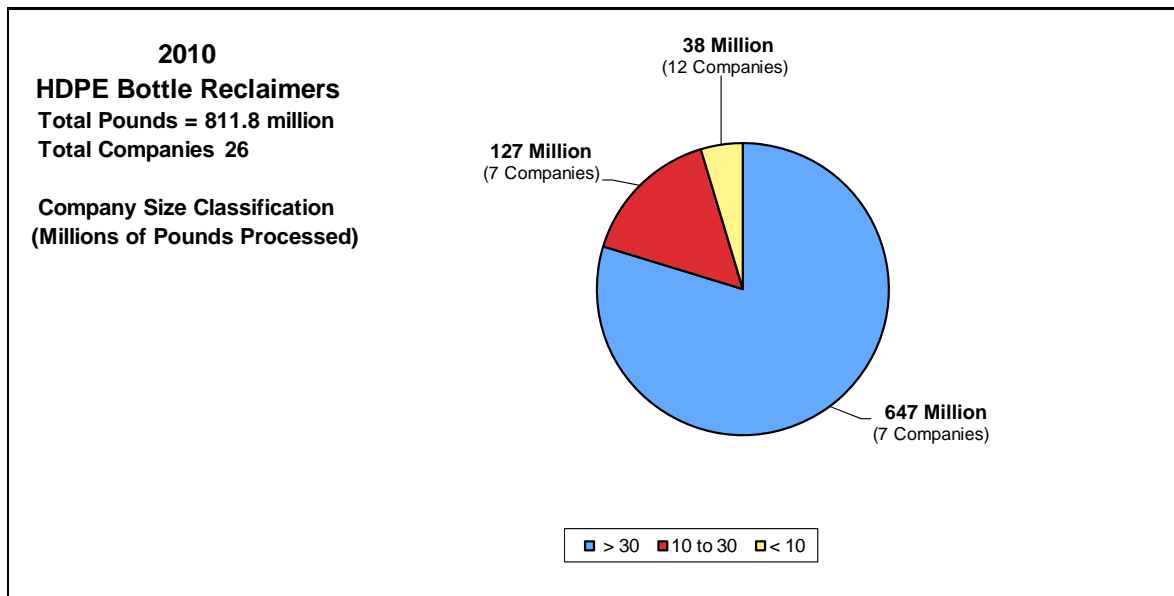
### **HDPE Reclamation Industry Update**

- The number of HDPE reclaimers decreased in 2010 as compared to 2009 with 26 companies active at year's end. One company ceased operations. The number of smaller companies may vary year-to-year as industrial scrap companies change their business plans and start-ups and acquisitions continue.

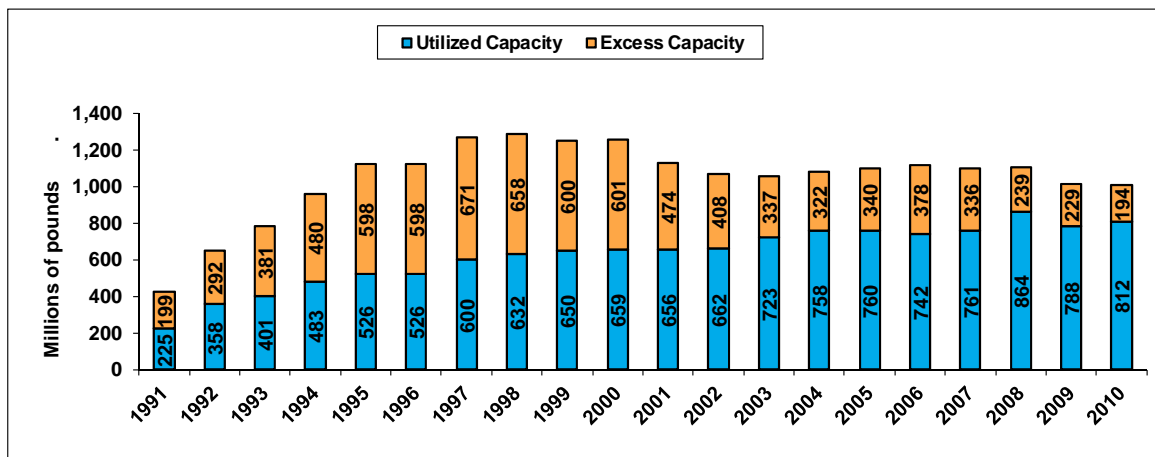


- The amount of HDPE processed by United States HDPE reclaimers rose by 24.2 million pounds to 811.8 million pounds. The increase in pounds processed came from increases for domestically sourced bales increased in spite of increased exports and decreased imports.
- The largest companies, processing over 30 million pounds annually, processed 80% of the HDPE processed and totaled seven in number.
- The mid-sized companies were dropped by one in number and amount processed in 2010 was nearly the same as compared to 2009. Small companies increased in number but decreased the amount processed compared to 2009.

**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 rose to 81% for 2010 as compared to 77% in 2009. The total utilized capacity rose in 2010 to 812 million pounds compared to 788 million pounds in 2009. The overall industry capacity, as calculated, decreased slightly to 1,006 million pounds of HDPE postconsumer reclamation capacity.

### ***Export and Import Markets***

Postconsumer bottles are a valuable commodity and are traded globally. Buying of United States postconsumer bottles for export continued in 2010. 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.

For United States-collected HDPE bottle material, 197 million pounds were exported; representing 20.0% of the total bottle material collected domestically, a decrease of 37 million pounds vs. 2009. Of those exported pounds, 22% went to Canada. The trade in bales is not one-sided. United States reclaimers imported 25 million pounds in 2010, down from 40 million pounds of postconsumer HDPE bales imported in 2009. 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.

2010 PET exports totaled 50.2% of the total PET bottles collected with most going to China. This percentage is less than the experience in 2009. The exports for polypropylene bottles dropped in 2010 vs. 2009, 6.3 vs. 9.3 million pounds, most as part of mixed resin or commingled bales or mixed flake. Because so much polypropylene was domestically

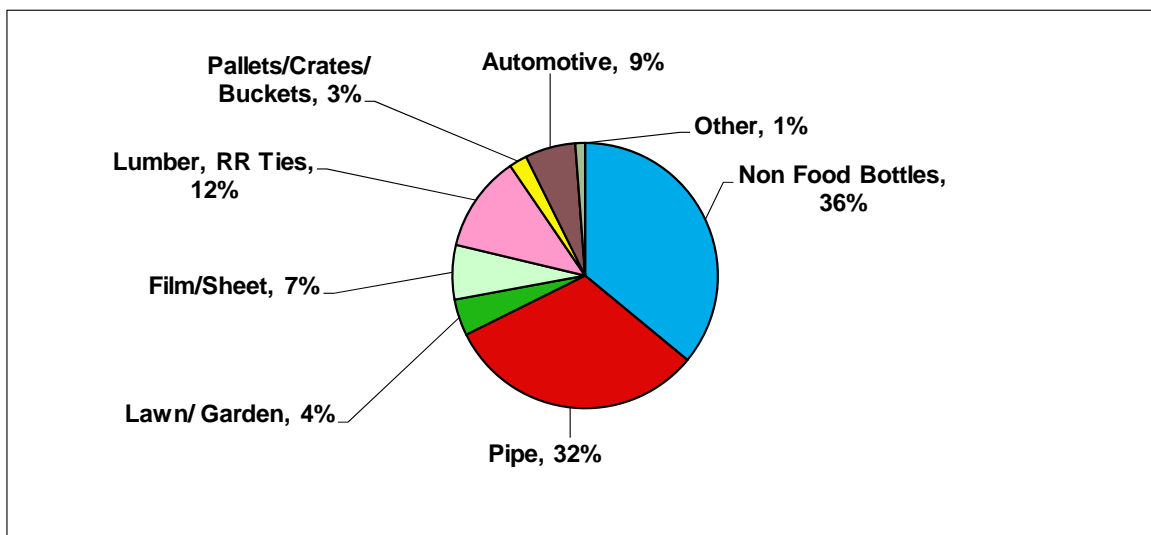
processed, the exports fell from 34% in 2009 to 18% in 2010 for the bottles. 82% of PVC bottles were exported, a total of 1.1 million pounds. 86% of LDPE bottles were exported, a total of 0.9 million pounds.

### **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 and for films.
- Pigmented HDPE postconsumer recycled resin's markets continued to be pipe and lawn and garden products 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 film and sheet. Use into food bottles consumed 21.6% of the reprocessed PET.
- Polypropylene postconsumer bottles were used for lawn and garden applications and for pallets, buckets, and crates.

**Figure 7**  
**Domestic Recycled HDPE Bottle End Use**  
**2010**



The market share for pipe applications continued to rise, reaching 32% vs. 25% in 2009. The pounds used for pipe reached its highest level yet. The market shares for lawn/garden and for film/sheet sagged. The market share for lumber and railroad ties rose back to historic norms. The market share for automotive uses held steady. The market share for non-food bottles fell to 36% compared to 45% in 2009. Market shares are as reported by survey of reclaimers.

The yield of post consumer bottles to clean product ranged, depending on raw material and end use, from mid-60 percent to upper 80 percent. The average yield of bales to clean HDPE pellets in 2010 was 82%, comparing to 78% in 2009. For PET the bale yields varied from 68 to 76%, 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.

### ***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](http://www.allplasticbottles.org). A database for the recycling of clean plastic film and grocery/retail bags is provided at [www.plasticbagrecycling.org](http://www.plasticbagrecycling.org).

APR offers resources at its website, [www.plasticsrecycling.org](http://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 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](http://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](http://www.NAPCOR.com).

### **Legal Notice**

The 2010 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.