

2012 National Postconsumer Plastic Bag & Film Recycling Report

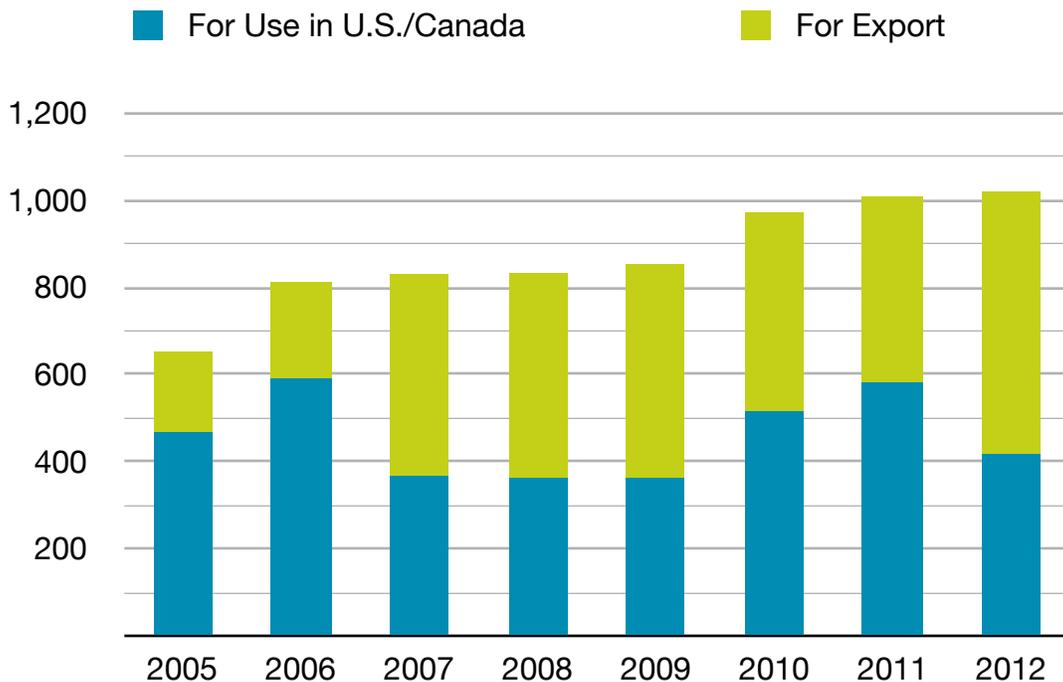
Prepared by Moore Recycling Associates Inc. for the
American Chemistry Council

March 2014

Introduction

The 2012 National Postconsumer¹ Plastic Bag and Film Recycling Report is the eighth annual report on the amount of plastic bags and film² recovered in the United States for recycling. Research for this report was conducted by Moore Recycling Associates Inc. for the Plastics Division of the American Chemistry Council (ACC).

U.S Postconsumer Film Acquired For Recycling (millions of pounds)



¹ The EPA defines “postconsumer” as a material or finished product that has served its intended use and has been diverted or recovered from waste destined for disposal, having completed its life as a consumer item. According to this definition, a business qualifies as a consumer of those goods. EPA’s definition of “postconsumer” is used throughout this report. Commercial materials are often recovered outside of curbside or dropoff collection programs and include items such as totes, pallets, crates, and other commercial packaging. (This report does not cover the recycling of *post-industrial* materials, which the EPA defines as materials, such as scrap and trimmings, that are generated in manufacturing and converting processes.)

² In this report plastic bags and film will generally be referred to as “film.” Film is thin, flexible sheets of plastic. The majority of plastic films are made from polyethylene resin including high density polyethylene (HDPE), low density polyethylene (LDPE), and linear low density polyethylene (LLDPE).

Executive Summary

A minimum of 1.02 billion pounds of postconsumer film (which includes plastic bags and product wrap) was acquired for recycling in 2012, an increase of 56 percent since 2005.

In order to accurately estimate the amount of bags and film recovered in 2012, both the domestic and export postconsumer film markets were surveyed. The information in this report is based on recovery data from 21 U.S. and Canadian processors and 39 exporters.

More than half of the film recovered in the United States in 2012 was sold to overseas markets, with U.S. and Canadian processors consuming approximately 41 percent of the material and the export market taking the remaining 59 percent. Composite lumber manufacturers consumed 38 percent of domestically-processed material, substantially less than in previous years. The film and sheet market consumed 21 percent of the domestically-processed material. The amount of recycled film going into the film and sheet market decreased by 7 percent in 2012.

The total amount of postconsumer film collected for recycling in 2012 increased one percent over 2011, but the two largest categories—Commercial Clear Film and Mixed Film—saw lower total recoveries. At an estimated 471 million pounds recovered, Commercial Clear Film, nevertheless, continued to make up the largest category of film collected for recycling. The next largest category of recovered film, which is Mixed Film and includes retail collected bags and wraps, had 181 million pounds recovered. An estimated 141 million pounds of postconsumer bags and packaging wrap were collected for recycling, representing a 7 percent decrease from 2011.³ Commercial Mixed Color, Curbside, Agricultural, and Other categories of film all experienced growth in 2012. (See page 4 for film category descriptions.)

Scrap value for postconsumer film increased after the first quarter of 2012 and then remained steady through the end of the year. Export buyers generally offered slightly more competitive pricing than domestic buyers in 2012, particularly those exporting from the West Coast and for commercial film.

Methodology

Data on recovered postconsumer plastic is collected during the Postconsumer Plastic Recycling Survey, which also gathers data on plastic bottles and non-bottle rigid plastics.

To prepare the report:

- Moore Recycling continually updates its markets database to include current exporters and reclaimers of plastic scrap;
- Moore conducts an electronic survey of market participants in plastic recycling to collect data; and

³ The estimate is calculated using the total reported for Curbside Film plus a percentage of Mixed Film.

- Moore provides a verification step for survey-collected data, checking the accuracy of the data through follow-up calls and conversations with industry contacts, as well as by conducting reviews of other sources of recycling industry information.

Markets Database

Moore Recycling continually updates an in-house database of plastic exporters, processors, reclaimers and key brokers. Through work with ACC, the Association of Postconsumer Plastic Recyclers (APR), the Plastic Recycling Corporation of California (PRCC) and the National Association of PET Container Resources (NAPCOR), and web sites PlasticsMarkets.org and PlasticFilmRecycling.org, Moore Recycling Associates regularly receives requests from new contacts for material and markets. Moore Recycling also identifies potential buyers through published market databases and conversations with suppliers, such as materials recovery facilities (MRFs) and key reclaimers.

Data Collection and Analysis⁴

Moore Recycling uses a custom-designed web-based survey system to gather data. Although the overall methodology has not changed since the first report, Moore Recycling continually seeks ways to improve the completeness and timeliness of survey responses. For example, beginning in 2011, we have asked survey participants to differentiate between clear and mixed pigmented film within the Commercial Film category.

An email with a unique link and message is sent to each contact. After an adequate amount of response time has passed, Moore Recycling staff send follow-up emails and make telephone calls to retrieve data. This follow-up process can take weeks or months depending on responses.

Data is entered in the online survey tool, either directly by the company being surveyed, or by Moore Recycling staff when the survey is completed over the phone, or by email or fax. As it is received, the data is reviewed for accuracy and follow-up calls are made as needed. After data collection is complete, the data is compiled and categorized based on the detail reported. The final data totals are reviewed, analyzed, and then reported with as much detail as possible without compromising confidentiality. The analysis involves comparison of year-to-year totals, material categories, and buying trends among export and domestic buyers, to determine trends or anomalies that may require further vetting of data.

⁴ Moore Recycling conducts the survey and maintains confidentiality of individual responses.

Film Categories

The 2012 survey used the following material categories:

- Commercial Clear Film - Clear, clean PE (polyethylene) film, including stretch wrap and poly bags
- Commercial Mixed Color Film - Mixed color PE film, including stretch wrap; no postconsumer bags
- Mixed Film - Mixed color, clean PE film, including stretch wrap and retail collected postconsumer bags, sacks, and wraps
- Curbside Film - Mixed PE film generated at MRFs
- Dirty Ag Film - From the ground; up to 50% contamination
- Clean Ag Film - Dry and from uses that do not touch the ground; up to 10% contamination
- Other Film - A catchall for film that does not fit in any of the categories above; mostly non-PE films such as polyvinyl chloride (PVC) and polypropylene (PP).

Findings

Volume

In 2012, the amount of plastic bags and film reported as recovered in the U.S. for domestic and overseas recycling was 1.02 billion pounds. Approximately 41 percent was reclaimed in the United States or Canada, and the remainder was exported overseas, primarily to China. The amount of material reported as purchased by domestic processors went down 16 percent. Because participation in the survey is voluntary, the data in the report does not reflect 100 percent of the film acquired for recycling. At least 3 reclaimers that may have processed postconsumer film and 3 large exporters did not participate in 2012.

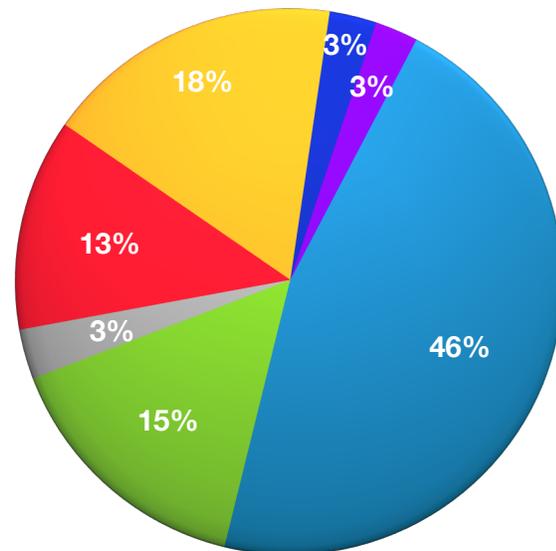
U.S. Postconsumer Film Acquired For Recycling (pounds)

Year	Exported	Purchased for use in US or Canada	TOTAL
2005	183,701,000	468,776,000	652,477,000
2006	221,082,000	590,928,000	812,010,000
2007	462,611,000	367,569,000	830,180,000
2008	469,968,000	362,426,000	832,394,000
2009	490,718,000	363,659,000	854,377,000
2010	455,984,000	515,823,000	971,807,000
2011	426,738,000	583,023,000	1,009,761,000
2012	601,890,000	418,641,000	1,020,531,000

Recovered film enters the market in various categories, and often includes a combination of baled HDPE, LDPE, and LLDPE resins. Stretch film is either collected alone and marketed as Commercial Clear Film, or mixed with other polyethylene film—including postconsumer bags and wraps—and marketed as Mixed Film. Stretch film represents a significant majority of the postconsumer film recovered.

Percentage of Recycled Film by Category

- Commercial Clear
- Commercial Mixed Color
- Clean Ag
- Dirty Ag
- Mixed (Includes Retail Collection)
- Curbside
- Other



The Commercial Mixed Color, Curbside, Agricultural, and Other categories all experienced growth in 2012. More than half of the Commercial Mixed Color Film acquired in 2012 was purchased by export buyers. The amount of Commercial Mixed Color Film purchased by domestic reclaimers decreased 35 percent. Similarly, purchases of Curbside Film increased for the export market and decreased domestically, following the trend seen in 2011. Fewer buyers reported Curbside Film in 2012 compared to 2011. Two exporters reporting purchases of Curbside Film in 2011 reported none in 2012. Both export and domestic buyers increased their purchases of Agricultural Film and Other Film (other resins, including PVC and PP).

The total amount of Commercial Clear Film acquired for recycling decreased in 2012 compared to 2011. Export buyers purchased more, but domestic reclaimers purchased 52 percent less. The amount of Mixed Film (including postconsumer bags) also decreased, with domestic reclaimers purchasing 28 percent less than they did in 2011. Six domestic companies reported lower overall totals in 2012 compared to 2011.

Plastic bags are most often commingled with stretch film wrap and other retailer-generated scrap film for efficient collection at retail locations; “bag only” bales are fairly rare. To determine the total amount of recovered bags, a percentage of the Mixed Film bale is added to the total for Curbside Film, which consists primarily of bags.

Historically, the percentage used to calculate the total amount of bags recovered was generated from the average of all the percentages reported by reclaimers. This year, a national bale audit conducted in the retail sector provided a more accurate percentage of bags in Mixed Film bales. Retail bags (grocery or carryout) make up approximately 20 percent of these bales, with the remainder comprising 42 percent consumer-returned packaging wrap and other bags, 32 percent stretch wrap, less than 2 percent non-film polyethylene, and 4 percent non-polyethylene.⁵

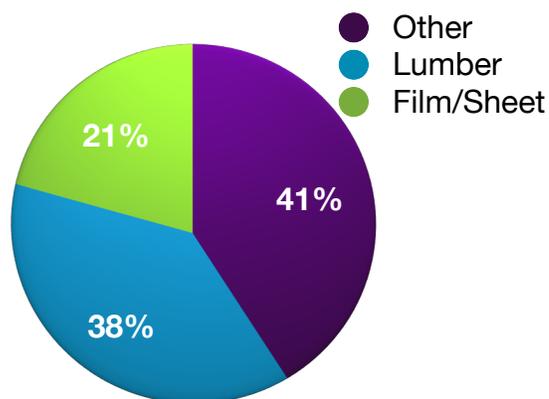
An estimated 141 million pounds of consumer-returned bags and wraps were acquired for recycling, a 7 percent decrease from 2011.⁶ Approximately 65 million pounds of retail bags (not including other sacks and packaging) were acquired for recycling. Since the Curbside Film total increased, the drop in the estimated total for bags and wraps is due to the drop in Mixed Film reported. Based on bale audits and comments from domestic reclaimers, the makeup of the Mixed Film bale is changing: percentages are lower for carryout bags and higher for consumer-returned film packaging (e.g., wraps and non-retail carryout bags).

Domestic Capacity and End Markets

In the U.S. there is approximately 824 million pounds⁷ per year of plastic film reclamation capacity, which includes washing or processing unwashed material directly into pellet or an end product. Utilization rates—even more challenging to estimate than capacity—were around 50 percent in 2012, which is down 28 percent from 2011.

Most of the U.S. film processing capacity is for clean, clear polyethylene. End uses for Commercial Film are more varied, and processing obstacles fewer, than for other categories. The primary domestic end uses for plastic film are composite lumber, film and sheet, pipe, automotive products, lawn and garden products, crates, buckets, and pallets.

2012 U.S. Reclaimed End Uses



⁵ The Bale Audit Study is ongoing and being conducted by members of the Flexible Film Recycling Group, which represents more than half of the domestic processing capacity for postconsumer film. In 2011, the percentage of Mixed Film bales used to determine the total for bags and wraps was 54 percent.

⁶ Based on the Bale Audit Study, the percentage of Mixed Film used to determine the total for bags and wraps was 62 percent in 2012.

⁷ Capacity for processing postconsumer film often overlaps with capacity to process postindustrial film and in some cases bottles and non-bottle rigid plastics. The annual United States National Postconsumer Plastic Bottle Recycling Report and the annual National Postconsumer Non-bottle Rigid Plastic Recycling Report likely report some capacity that is also reported here. Thus, adding the non-bottle rigid, bottle and film capacities from this report and the others could result in some double counting.

The composite lumber industry continues to lead the U.S. market for Mixed Film but no longer dominates it, as it did in previous years. The amount of film going into composite lumber decreased nearly 46 percent in 2012. The amount of domestically reclaimed film going into film and sheet decreased 7 percent from 2011 for a total of 93.6 million pounds. Forty-one percent of the recovered film reported went into Other (miscellaneous) applications, such as garden products, crates, buckets, pallets, and piping. Because not all processors were able (or willing) to report their postconsumer resin end markets, some of the material reported as Other may actually have gone into Film/Sheet or Lumber.⁸

The survey asked responders to make a historical characterization of supply and demand, 2012 compared to previous years. Although the reported 2012 volumes do not reflect their responses, exporters reported less demand from China and more difficulty exporting material, mostly in reference to film other than Commercial Clear Film. The Green Fence (discussed in more depth below) did not come into play until early 2013, but it was mentioned in these responses and likely influenced comments about 2012. Domestic reclaimers reported continuing tight supply for good quality material. Four reclaimers reported plans for expanding their capacity, while two reported declining demand for their products.

Note: *The remaining sections of this Report present Discussion and recommendations reflecting Moore Recycling's expertise and industry knowledge.*

Discussion

Supply and Demand

There was a dramatic drop in purchasing by domestic reclaimers, particularly in Commercial Clear Film and Mixed Film. One reason for the drop is a shift towards “just-in-time” inventory. Companies may have been using up stored inventory as they move towards storing only what is slated for immediate use.

Other reasons for decreased purchasing by domestic companies include lower demand for their end products and challenges in processing. That said, several processors underwent expansion and met challenges in processing material of highly variable quality. Some have moved away from purchasing the lower quality material. While the lower grades are cheaper, costs for processing them into end products often exceed those for virgin resin.

The amount of Commercial Clear Film acquired for recycling dropped in 2012. This may have been due to reduced supply resulting from continued consolidation in warehousing and a shift in where pallets are prepared for shipment to the store. As retailers place more focus on volume discounts and consolidating shipments to stores, the process of breaking down full pallets and building mixed pallets has shifted from manufacturers to retailer distribution centers (DCs). Thus, film collection is increasing from retailer supply chains and decreasing from manufacturer supply

⁸ To protect the confidentiality of respondents, only end uses reported by more than 3 companies are listed.

chains. The result is fewer Commercial Clear Film bales being generated from pure (clear) stretch wrap (i.e., pallet wrap) and more Commercial Mixed Color Film available, because the stretch wrap from pallet unwrapping that occurs at the retailer DCs or stores, is combined with other mixed commercial film material.

The volume of Mixed Film reported also dropped in 2012. Based on bale audits performed on Mixed Film bales by domestic reclaimers the bales contain fewer retail carry out bags, particularly in California. Bale audits also indicate a shift towards more collection of other plastic film packaging. Based on pounds reported and bale audit data, there are fewer carry out bags collected for recycling compared to previous years.

The spread between export and domestic pricing varies dramatically depending on the region and the commodity, but it appears to be shrinking. For example, in the Eastern U.S., domestic prices offered for Mixed Film were consistently higher than those of export buyers. In the Western U.S., exporters generally offered higher prices than domestic buyers in 2011 and 2012, but, as noted above, the gap is closing; the average domestic price was higher in 2012 than in 2011, and the average export price was slightly lower. We expect this trend to continue with China's enforcement of import restrictions on scrap materials.

Moore Recycling tracks the scrap plastic market throughout the year. Of the five major scrap material categories (plastic, nonferrous, steel, paper, and electronics), plastic has the second highest economic value per ton (nonferrous metals being first). Pricing and demand for high-grade material (clean, single-resin) are strong because it requires less processing and is therefore less costly to reclaim than dirtier and mixed-resin material. Clean, dry bales of clear, linear low-density polyethylene film generally have the highest value of film grades in both domestic and export markets because they are relatively easy to process and have a wide range of manufacturing uses. There is growing interest in developing the capacity to process film into postconsumer resin, but until recently the strength of the export market made it difficult for domestic reclaimers to compete. The Green Fence has changed the situation significantly and the supply of scrap film, except for Commercial Clear Film, has opened up. The steady state of virgin prices also helps justify investment in reclamation capacity.

Quality & Collection

Curbside & Drop-off Collection

Most consumer film packaging and bag collection programs in the United States are facilitated through drop-off sites at major grocery and retail stores. There are currently nearly 18,000 at-store drop-off locations in operation. These programs help to keep collected material clean and away from potential contaminants until it can be baled and sold. A few communities offer curbside collection of bags, sacks and product wraps. While curbside programs may be the easiest option for residents, and broad adoption of curbside collection by communities might result in greater collection, collection is not recycling. There must be an end market for the collected

material in order for it to be recycled. For most materials recovery facilities (MRFs), it is challenging to process film into a baled commodity with a decent scrap value. MRF-processed film is often heavily contaminated; retail collected film has a scrap value at least 6 times greater than MRF-processed film. The inclusion of film in curbside programs also decreases processing efficiency for other recyclable materials and adds cost, especially for facilities relying on rotating screens to separate containers from fiber.

One likely driver for increased interest in recyclability from brand companies is the How2Recycle label, which is now on the packages of more than 6 major brands, including retailers' private-label products.

How2Recycle Label



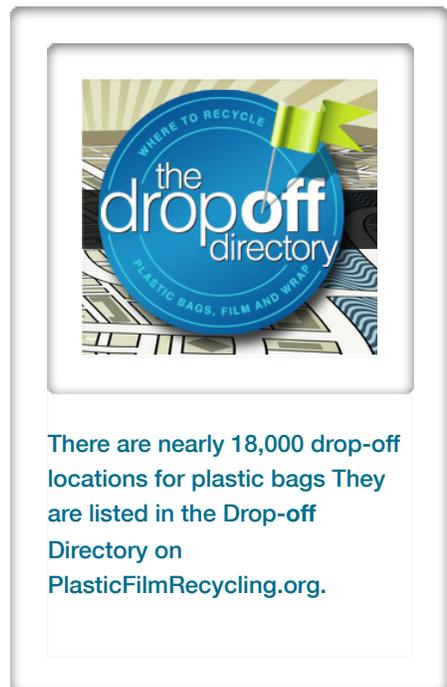
Echoing the MRF operators, most domestic reclaimers report significant challenges with Curbside Film. Despite its low cost, there are few, if any, U.S. reclaimers currently processing it.

There are two primary types of contamination. One, from general residue, occurs where collection practices fail to keep the material clean and dry. The other is from non-polyethylene film. The recycling stream is continually changing due to innovations in packaging and new materials. Fortunately, brand owners are showing increased interest in designing film packaging with recycling in mind. The plastic film recycling industry now has posters, labels, and a web resource (PlasticFilmRecycling.org) to educate consumers about the growing number of plastic film packages beyond bags that can be recycled through store collection programs.

Most film collection occurs through retail collection, which is the most efficient method, given that large stores already backhaul their film. Furthermore, retail collection alleviates the

additional transport and processing of material through a municipal collection program. Film collected through retail is of far better quality than material collected curbside; this is especially important to programs that sell to domestic markets and receive feedback about quality.

Even though currently less than half of all retailers formally instruct consumers to include other recyclable film packaging, such as bathroom tissue wrap, a growing number of customers are adding this material to the mix they are recycling at drop-offs. Grocery stores are just starting to adopt signage such as the poster displayed to



the right.

So far, according to major markets, this has had no negative impact on the quality or value of Mixed Film bales. Major markets for Mixed Film welcome an increase in film packaging in the retail mix. Increases in the recovery of films generated from consumer purchasing will likely come from consumers including more film packaging in their recycling, rather than from the recycling of more carryout bags.

Commercial Collection

Fortunately, most retail collection programs are flourishing and, in some cases, are expanding the list of acceptable materials. Many large chain stores have collected film and bags for over two decades because they derive revenue from the scrap material, avoid disposal costs, and garner community goodwill. The scrap value for Mixed Film has been strong enough that some retailers accept film and bags from smaller, neighboring businesses, as well as their own customers. This Business-to-Business (B2B) model can be found in a number of locations but is by no means widespread. Large retailers have efficient reverse logistics. As their trucks return to distribution centers, they backhaul scrap film, cardboard and other materials. However, collection is less common among small to medium businesses, since not all areas have efficient collection options available.

Commercial Film collection methods include:

1. Co-collection with cardboard, most commonly by private haulers
2. Drop off at a recycling center
3. Utilizing existing reverse logistics:
 - a. Business-to-Business: small neighboring businesses utilize larger retailer's recovery program
 - b. Backhaul after delivery of product by wholesale distributor (some distributors offer their small businesses an after-delivery recycling service, accepting scrap material as they return to their distribution centers)

With the expansion of these recovery methods, more small to medium businesses will be able to contribute to the growth in film recovery, because recyclable film exists in nearly every business, and in far greater volume than can be found in the residential waste stream. Tips sheets for collection are available at <http://www.PlasticFilmRecycling.org>.



Both commercial and residential film collection programs have been dismantled due to challenges in marketing material. This is mostly limited to programs in which material was not kept

clean, dry and free of contamination. Without continued attention to quality and increased demand from domestic markets, we will likely see a drop in film collection. Quality is the key that will enable film recycling programs to provide a net economic benefit.



Green Fence

In February 2013, China's government began an effort to control scrap imports in an initiative since dubbed the "Green Fence." Since then, nearly all scrap containers imported into China have been opened and inspected. Chinese custom officials are imposing very tight contamination standards. For certain mixed film commodities—predominantly those containing bags—the Green Fence has resulted in a shift from previously strong demand to limited markets in a very short period of time.

Moore Recycling personnel visited China in September 2013 to learn about future plans for the Green Fence. Clearly, U.S. suppliers will not be able to ship low quality or mixed resin bales directly to China in the future. It is likely that some Hong Kong traders and Chinese end users will work with Southeast Asian partners to build infrastructure for sorting and high-grading, but this infrastructure is not likely to have the capacity to process all the mixed material that formerly went to China, and because of the additional cost to process offshore, the value of mixed bales will continue to be lower than prior to the Green Fence.

Moore Recycling believes that these restrictions in the Chinese market represent an opportunity to develop domestic infrastructure in North America. Before the Green Fence, potential U.S. buyers could not be assured of a regular quality supply, which restricted investment opportunities.

The Green Fence has forced some export buyers out of the market, which has freed up some plastic scrap volume. The remaining buyers can be more particular about the quality of supply they are purchasing. This will accelerate a trend among domestic and export buyers of placing a higher value on material with a higher yield. We expect producers of good-quality material will be rewarded for the extra effort involved, and producers of low-quality material may not be able to move material at all in the future.

Recommendations

Invest in Infrastructure: Collection, Reclamation, End Markets

Potential investors in recycling infrastructure need to know that they will have reliable supply, viable technology and demand for the end product. All three areas need growth. Growth in supply will come most quickly through greater access to recycling for small and medium-sized companies. Even though the commercial sector generates more than twice as much scrap film as the residential sector, the residential sector also has room for growth in recovery. More consumers are adding film packaging to their collection of recyclable bags for return-to-retail, but even in the highly motivated recycler demographic, many are still poorly informed about the recyclability of household film products. As the value of scrap film becomes more attractive, reclaimers will need continued innovation in technology and new end markets. Lastly, to expand the infrastructure, generators must be willing to create quality bales and enter into bankable supply agreements with reclaimers.

One of the conundrums of plastic film recycling is that reclaimers who handle fairly “dirty” material can handle only one resin type, and reclaimers who handle a mixture of resins cannot handle “dirty” material. Profit margins for reclamation are very tight and reclaimers are cognizant of processing costs (e.g., washing vs sortation), so they tend to seek out specific grades of material. Steady but relatively high virgin resin prices have slightly lowered some of the barriers, but entry into the reclamation industry still requires significant capital. Improving margins by reducing feedstock costs is one motivator for investment in reclamation. Consumer demand or preference is another significant motivator for the use of postconsumer resin, and one that can be supported by wider use of reliable recyclable labels and adherence to “Federal Trade Commission Green Guidelines.”

Design for Recyclability

While suitability for use is the primary product and packaging design rule, manufacturers and consumer product companies that want their products and packages to be recycled at the end of life must carefully consider ease of recyclability—including material composition and use of additives—at the design phase. The most respected, lead guidance in the field is Association of Postconsumer Plastic Recycler’s Design for Recyclability Guidelines, available at www.plasticsrecycling.org. Organizations like the Association of Postconsumer Plastic Recyclers, GreenBlue’s Sustainable Packaging Coalition and the American Chemistry Council are supporting this design feedback loop through the development of design guidelines and the How2Recycle label.

Additional Information

The Plastics Division of the American Chemistry Council, which provided funding to Moore Recycling Associates to prepare this report, provides resources to assist communities, businesses

and consumers in increasing awareness and education on the recycling of plastic bottles, containers, bags, and film. Moore Recycling is a recognized expert in the field of plastics recycling and has been conducting recycling studies for over 25 years. This work has been conducted and evaluated in an objective manner by persons qualified to do so, using procedures generally accepted in the profession to yield accurate and reliable results. For information about recycling plastic bags and film, visit www.PlasticFilmRecycling.org. Also, visit www.PlasticsMarkets.org, maintained by Moore Recycling Associates, for additional markets and information on handling guidelines. This report and others on plastic recycling can be found at www.MooreRecycling.com/m_02_00.html.

Disclaimer

The 2012 National Report on Postconsumer Plastic Bag and Film Recycling has been prepared to provide information to parties interested in the recycling of plastics, in particular plastic bags and film. 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 does 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 does ACC assume any liability of any kind whatsoever resulting from the use of or reliance upon any information, conclusion, or options contained herein. The American Chemistry Council sponsored this report.

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