

## THE ISSUE:

### GLASS RECYCLING IN PENNSYLVANIA

By:

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*Currently, glass accounts for almost 5 percent of the municipal waste stream in the U.S. There are many benefits associated with using recycled glass one being that glass is infinitely recyclable, and can be re-melted into new containers endlessly. Glass cullet, the industry term for furnace-ready scrap glass, can be used directly in the manufacturing of a new glass container. The ability of glass to be endlessly recycled to new products brings with it many environmental, energy, and health-related benefits.*

*Despite all the positive qualities of using recycled glass, there exist many challenges. Although there is a high demand for glass cullet, a number of Pennsylvania municipalities with curbside recycling programs have recently dropped glass from their list of acceptable items. Because of the economics of glass recycling, high contamination and breakage rates and the limited outlets for recovered glass, some communities have opted to discontinue glass collection in their recycling programs. This has resulted in the erroneous assumption that markets are nonexistent for glass collected for recycling in Pennsylvania. Markets exist and are used for glass collected through the state's recycling programs.*

*This Green Paper will present a snapshot of the present state of glass recycling, reviewing the current flow of glass through the collection, processing and re-manufacturing system, the current markets for recycled glass, the problems with recycling glass and ways to potentially expand glass recycling in Pennsylvania.*

#### Overview

In July 1988, Pennsylvania passed the Municipal Waste Planning, Recycling and Waste Reduction Act, also known as Act 101. The goal of Act 101 was to reduce the state's municipal waste generation by recycling at least 25 percent of the municipal waste stream (MWS) by 1997 (Pennsylvania's statewide recovery rate of recyclables is currently estimated to be at 35 percent). The act has resulted in a massive expansion of municipal curbside recycling programs over the last 30 years. Pennsylvania residents have grown accustomed to the convenience of setting out bins of unsorted recyclable materials and having haulers tote off their contents. In 2013, over 6 million tons of recycled materials were collected from more than 2,500 recycling programs statewide.

Act 101 required municipalities to collect certain core materials in their recycling programs – including clear and colored glass. Glass is found in the MWS primarily in the form of containers such as beer and soft drink bottles, wine and liquor bottles, and bottles jars for food, and other products. Commercial waste streams may be similar to residential municipal waste, however, materials are in decidedly different proportions than in residential waste. Bars and other food service businesses, for example, typically generate much more glass than other industries.

Since the emergence of plastic in the packaging industry, the market for glass containers has been flat or slightly declining over the last two decades. The demand for glass will remain confined to specialty segments in the food and beverage industries. However, when measured by weight, glass continues to make up a substantial portion of the recycling stream, frequently ranging up to 25 percent of the total weight of the recycling stream.

Glass is made from readily available, non-toxic materials, such as silica (70 percent), limestone (10-15 percent), soda ash (10-15 percent) and cullet. Glass containers are produced in three colors: clear (flint), brown (amber), and green. Of these colors, flint has the largest number of applications and is usually in greatest demand by glass manufacturers. Amber or green glass is used in products where exposure to sunlight may cause the product to degrade, such as beer.

Glass can be recycled indefinitely without compromising quality or purity. The Glass Packaging Institute states that recycled glass can be substituted for nearly 90 percent of raw materials used in making new glass. The basic steps for production of glass containers are the same whether new materials or cullet is used. Raw materials are brought to the plant, prepared, melted at high temperature, and formed into containers. The main differences between the manufacture of new and recycled containers are the supply and preparation pathways for the materials and the additional energy required during the melting process.

A 2016 national poll by SurveyUSA indicated that Americans want to recycle glass containers, as it remains a popular recycling option. Ninety-five percent of those who live in a community that recycles glass said that glass should continue to be collected by recyclers.

## **The Glass Recycling Industry Sector-by-Sector**

Glass recycling is typically divided into two categories of economic activity. The first category includes all activities associated with the collection and processing of recyclables to make them available for use in a new industrial process. These industries are labeled “supply side.” The recycling industry is separated in this paper from industries that purchase secondary materials from the recycling industry. These industries are referred to as “recycling reliant” industries.

### **Glass Recycling Industries (Supply Side)**

The Pennsylvania municipal waste industry serves as the “front end” of recycling – collecting, hauling, separating, and processing the recycled glass that becomes the feedstock for re-use and re-manufacture into new products. Municipal curbside, both public and private, and drop-off recycling collection programs are the primary collection methods in Pennsylvania, and are an important first step in the glass recycling process. They also are a large, and often overlooked, contributor to the glass recycling economy.

Currently, more than 11.6 million Pennsylvania residents, or at least 94 percent of the state's population, have access to recycling. Almost 80 percent have convenient access to recycling through municipal curbside programs. There is also an extensive system of drop-off recycling, particularly in rural areas, which totals over 800 drop-off collection stations.

Pennsylvania's 77 material recovery facilities (MRFs) are processing facilities that handle mixed and separated recycling materials that have the capacity to sort, as well as process, materials for sale to end markets. MRFs add value to recycling by allowing municipalities and private haulers to collect material commingled, making collection more efficient. They then deliver mixed materials to the MRF, which removes metal, paper, and other glass contaminants, separates by color, and densifies materials for transport to specific end markets.

### **Glass Reliant Industries (Demand Side)**

The primary markets for glass from single-stream programs are container manufacturing plants. There are four finished glass container manufacturers in Pennsylvania and a number of smaller wholesalers. The price paid for recycled glass by manufacturers is determined by color, quality and the extent to which it has been prepared (crushed or whole). The prices paid for glass varies greatly depending upon proximity to glass container manufacturing facilities.

Glass container manufacturers produce containers typically used for liquor, beer, wine, other beverages and food. Most manufacturing facilities involved in glass recycling use only bottles and jars. These manufacturers also require collected glass to be separated by color, since the material is used to make glass of the same color. Mixing colors produces a low-quality glass container and, in many cases, an aesthetically unappealing product.

Glass product producers encompasses manufacturers (other than glass container manufacturers) which use recycled glass to produce a product. There are 10 recycled glass product manufacturers located in Pennsylvania. Examples of product producers include those producing fiberglass. Due to inconsistencies in the supply of recycled glass, fiberglass insulation manufacturers have been tentative in using glass cullet. Numerous other markets are being investigated for recycled glass including road construction, either on the surface called "glassphalt" or as a road aggregate. Many cities, including Philadelphia, have tried to use glass cullet as an aggregate in building roads but discontinued it after several years. Other uses include filler aggregate in storm drain and French drain systems, glass beads for reflective paints, abrasives, foam glass and other building materials. These uses represent just a few of the beneficial uses of recycled glass.

### **Glass Recycling Challenges**

Glass is a difficult commodity to recycle due to a number of factors. The problem begins during the collection process. Without question, municipal curbside recycling programs have fostered increased residential recycling. Although curbside recycling programs can be advantageous, there are inherent disadvantages when including glass. It is nearly impossible to prevent breakage when moving it from a curbside recycling bin, loading it onto a recycling truck, compacting it with other materials, and unloading it at the MRF.

Manned by both humans and high-tech machinery, these expansive and expensive-to-operate facilities are the next stop recyclables make after being collected. Materials are unloaded onto the tip floor at a MRF before being moved by other machinery to be separated from other materials in a mixed recycling stream. It is then further sorted by glass color. Glass containers are highly vulnerable to breakage –this can happen anytime between collection and processing in the

MRF. This broken glass contaminates other recyclables, or breaks into small fragments considered a “residual” material that is sent to a landfill for disposal, there defeating the original intent.

At MRFs, glass is hard on equipment, creating wear on conveyor belts, screens and other moving parts. This results in higher maintenance costs at facilities where glass is processed, and is hazardous for workers who assist in the sorting process.

According to the Container Recycling Institute, while 60 percent of glass from single-stream collection could be recycled into new glass containers or fiberglass, 40 percent must go to lower value, single use applications, including alternative daily cover at landfills and as a substitute material for roadbed aggregate. Thus, a primary barrier to increasing recovery of curbside collected glass in Pennsylvania is the prevalence of single stream recycling collection.

Glass bottles and jars far outweigh containers made of plastic, metal or paper. The limited number of glass manufacturing facilities, their distance from MRFs and transportation costs make glass recycling too costly financially for some municipalities. This is one of the major factors causing municipalities to drop glass from the list of acceptable items.

Another barrier is that Pennsylvania has relatively low landfill tipping fees, making the option of disposal with the MWS an inexpensive and convenient option. With these factors in mind, it is easy to understand why many municipal recycling programs are reconsidering glass for collection.

## **Status of Glass Recycling in Pennsylvania**

As previously mentioned, when Act 101 was passed, municipalities in Pennsylvania began adopting single-stream recycling curbside collection programs. Single-stream programs allow municipalities to save on collection costs and broadly increase access to recycling. This collection and processing system is widely used throughout Pennsylvania. Although it tends to increase program tonnage, it has increased contamination of recyclables and higher amounts of non-marketable residue.

Pennsylvania’s recycling programs successfully recover high volumes of glass, but at a cost. Revenue from the sale of recycled glass typically does not cover the expense of processing and transporting it to a secondary processor or end user. In fact, a number of municipal recycling programs in the state have pulled glass out of their recycling programs, including the City of Harrisburg. As a result, glass recycling here, and nationally, is at a crossroads.

The supply of recovered glass is out of sync with demand in several respects:

- Recycled glass (cullet), while offering several advantages to glass furnaces, still competes with less expensive virgin raw materials, limiting the prices that the market will bear.
- Pennsylvania’s single-stream recycling programs have increased the state’s recycling rate, but have also led to more contamination in the glass that recycling facilities produce. Lower quality is one reason glass revenues have dropped and creates a barrier to other potential markets.

Glass manufacturing industries indicate that cleaner glass would have a higher value, and would allow them to accept more glass. Recycling programs could produce cleaner glass by investing in additional personnel and technologies. The fundamental questions, however, are (1) who would bear the cost of the improvements, and (2) would MRF operators realize a realistic return on investment to meet the quality standards desired by end-markets?

## Glass Recycling Outreach & Engagement

The Glass Recycling Institute suggests that the ideal recycling program for glass is one which “results in color separated, contaminant-free recycled glass.” The institute goes on to say, “While curbside collection of glass recyclables can generate high participation and large amounts of recyclables, drop-off and commercial collection programs often yield higher-quality container glass.” Recycling infrastructure, however, is not easy to change and demands a significant amount of capital.

Several actions can result in a more efficient glass recycling effort. They include:

- **Encouraging partnerships and initiatives.** Over the past several years, the Pennsylvania Recycling Markets Center (RMC) has worked with numerous stakeholders (MRF operators, cullet processors and glass manufacturers) that have a dedicated interest in recognizing the importance of securing recycled glass for their manufacturing industries. The RMC has conducted workshops, webinars and conferences with stakeholders, encouraging them to continue their efforts to ensure that glass recycling is recognized as a key component of manufacturing in Pennsylvania.
- **Encouraging on premise bar, restaurant, and hotel recycling initiatives.** More than 28 percent of beverages packaged in glass are sold in restaurants and other out-of-home venues. These venues are a valuable source for collecting large volumes of high-quality recycled glass.
- **Cooperation in rural areas.** In regions that are not well served by MRF infrastructure, as well as in areas of the state that currently lack recycling collection, pooling and hauling materials can help the economics behind glass recycling. This concept is called “hub-and-spokes” referring to the ability for smaller or more remote communities, or “spokes,” to connect to a larger municipality, which acts as a central pooling “hub.”
- **Enact “bottle bill” legislation.** Legislators in Maryland are considering a “bottle bill.” This bill would place a 5-cent value on all plastic, aluminum and glass beverage containers sold in Maryland. The current recycling rate for beverage containers in Maryland is 25 percent. The rate for the 10 states that already have deposit programs ranges between 60 percent and 90 percent. A bottle deposit program has significant potential to triple the rate of recycling of beverage containers in Maryland. Bottle bill legislation has been introduced in the Pennsylvania General Assembly numerous times over the last 20 years, but has never gained traction. A bottle bill’s biggest opposition lies among grocery and convenience stores and manufacturers, who argue that the increased costs to bottlers, distributors and retailers will result in higher prices to consumers.

## Conclusion

Glass will continue to be a challenging commodity for cost-effective recycling at MRFs. There are several reasons, however, that glass recycling remains a viable option, primarily because it is still less expensive and more sustainable to recycling glass than send it to a landfill. With the challenges to produce a marketable glass product, it is crucial for MRFs, public and private sectors, secondary processors and glass manufacturers to come together to develop diverse, economical markets for continued glass recycling in Pennsylvania and across the nation.

## **Editor's Note**

*Green Papers are issued periodically by the Joint Legislative Conservation Committee staff. As indicated by the subtitle, each Green Paper is a brief on a specific environmental issue currently being examined by the Committee. Green Papers are intended to provide a more in-depth look at specific issues than normally permitted by other Committee publications, such as the Committee's monthly newsletter, the Environmental Synopsis.*

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