



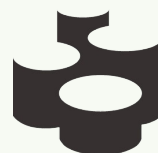
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The Aluminum Can Advantage: Sustainability Key Performance Indicators

NOVEMBER 2021

The
Aluminum
Association



Can
Manufacturers
Institute



Introduction

The Aluminum Association and Can Manufacturers Institute (CMI) are committed to providing up-to-date, complete and accurate information on aluminum beverage can industry sustainability. To that end, we release annually a comprehensive report on key sustainability performance indicators (KPI) for one of our best-known and widely used consumer products – the aluminum can.

Aluminum beverage can recycling is vital to the nation’s recycling system and overall economy. Using recycled aluminum in making a beverage can is economically efficient, and saves more than 90 percent¹ of the energy needed to produce a beverage can with new, or primary, aluminum.

In addition, aluminum’s recycling profile means that most recycled cans are turned into new cans, unlike glass and plastic bottles, making the aluminum beverage can a textbook example of the circular economy. The full aluminum can value chain – can manufacturers, consumers, aluminum recyclers, beverage brands and more – should be proud of the aluminum beverage can’s industry-leading U.S. recycling rate that averaged around 50 percent over the past 10 years.

This closed-loop process drives a virtuous cycle of high recycling rates, a large percentage of recycled content in the average aluminum can and an economically sustainable process that effectively subsidizes municipal recycling programs nationwide. However, recycling rates in the United States have been in decline in recent years. Recently, our organizations endorsed an ambitious target to achieve a 70 percent aluminum beverage can recycling rate by 2030.

The Aluminum Association and CMI member companies collectively represent the vast majority of aluminum can production and used beverage container (UBC) recycling in the United States. The following KPIs, as well as comparative information about other beverage packaging types, provide a complete picture of the aluminum beverage can’s sustainability performance.



Key Performance Indicators

Consumer Recycling Rate

Measures the amount of aluminum can scrap recycled domestically as a percentage of cans available for recycling in the United States. In order to provide a more accurate representation of U.S. consumer recycling behavior, the consumer rate excludes imported can scrap and also accounts for the movement of unfilled cans into/out of the U.S. The rate is one indication of how well municipal recycling programs are performing nationwide, though it can still be impacted by year-to-year fluctuations in metal flows and commodity prices. Additionally, the rate provides an indication of how much aluminum can scrap is either landfilled, held in inventory, or has otherwise fallen outside the association's tracking system. It is worth noting that this rate for aluminum can is similar to a "net recycling rate" (as opposed to "gross recycling rate") since the numerator represents quantities of clean shredded scrap charged into melting furnaces.

Industry Recycling Rate

Measures the amount of used aluminum can scrap recycled (melted to make new products) by U.S. aluminum producers as a percentage of cans shipped. This rate provides a measure of industry efficiency relative to overall can shipments. This rate includes both domestic and imported can scrap from foreign countries that is reclaimed by U.S. producers as well as used cans that are exported and recycled overseas. The rate is unique to the aluminum industry.

Closed-Loop Circularity Rate

A new KPI introduced in 2021, this rate measures the percentage of recycled material used to go back into the same product – in this case a new beverage container. This number captures the "closed-loop" nature of aluminum beverage can recycling as compared to competing packaging types. When products are recycled, the recovered materials can be used to make the same product (closed-loop recycling) or a new product (open-loop recycling). Open-loop recycling will often lead the material to be changed to the level that it can no longer be recycled. For example, when recycled a PET bottle most often ends up in a new product – often into a carpet or textile, both of which may not be recycled at the end of their useful life. In contrast, an aluminum beverage can most often ends up on the shelf as a new can – a process that can happen infinitely.

Recycled Content

Measures the proportion of recycled aluminum versus virgin aluminum in the average aluminum can. High recovery rates for aluminum, along with the closed loop nature of can recycling, drives a large amount of recycled content in the average aluminum can, in notable contrast to glass and plastic bottles.

Value of Material

Measures the dollar value per ton of aluminum can scrap. The value of material measure indicates the relative importance of different materials commonly found in the recycling bin to sustaining the financial viability of municipal recycling programs. The data is based on a two-year rolling average of commodity prices.



Key Performance Indicators Across Industries

	Aluminum Cans	Glass Bottles	Plastic Bottles (PET)
Consumer Recycling Rate	45.2%	39.6% ²	20.3% ³
Industry Recycling Rate ⁴	59.7%	N/A	N/A
Closed-Loop Circularity Rate	92.6%	30-60% ⁵	26.8% ⁶
Recycled Content	73%	23% ⁷	3-10% ⁸
Value of Material ⁹	\$991/ton	-\$23/ton	\$205/ton



Consumer Recycling Rate



Background

The consumer recycling rate provides a measure of the amount of domestic aluminum can scrap recycled as a percentage of cans available for recycling in the United States during a one-year time period. This rate excludes can scrap imported from foreign countries to provide a more accurate representation of consumer recycling behavior in the United States. The rate provides a snapshot of how well municipal recycling programs are performing nationwide though it can still be impacted by year-to-year fluctuations in metal flows and commodity prices. It also indicates the amount of aluminum can scrap that either finds its way to the landfill every year, was held in inventory or otherwise fell outside the Aluminum Association's tracking system. This rate for the aluminum can is similar to a "net recycling rate" since the numerator represents quantities of clean shredded scrap charged into melting furnaces.

The consumer recycling rate for aluminum cans fell slightly to 45.2 percent in 2020. The updated recycling rate is below the 20-year average of around 50 percent. Aluminum packaging represents only 3 percent of the weight but nearly half of the economic value of recyclable material generated by a single family home, according to The Recycling Partnership's 2020 State of Curbside Report. Further, multiple independent studies have concluded that aluminum is the only beverage container type in the bin that more than covers its cost of collection and processing in municipal recycling programs.¹⁰

However, more than 50 billion cans, around \$800 million worth of aluminum -- were diverted from the recycling stream in 2020 that could have otherwise been responsibly recycled and made into new cans. This loss has a significant negative impact on the environment through wasted energy and resources, and on the economy through lost jobs.

Methodology

The consumer recycling rate is based on survey input from can sheet producers, can manufacturers and secondary producers of aluminum, representing nearly all can recycling activity in the United States.



THE CALCULATION TO DETERMINE THE RATE IS AS FOLLOWS:

$$\begin{array}{r}
 \text{(Pounds of UBC Melted Domestically +} \\
 \text{Pounds of UBC Exports - Pounds of UBC Imports)} \\
 \hline
 \text{(Pounds of Cans Shipped by U.S. Producers - Pounds of Exported} \\
 \text{Unfilled Cans + Pounds of Imported Unfilled Cans)} \\
 \\
 \text{Pounds of Cans Recycled by U.S. Consumers} \\
 \hline
 \text{Pounds of Cans Shipped Corrected for Imports and Exports} \\
 \\
 \text{1.382 Billion Pounds of Cans Recycled by U.S. Consumers} \\
 \hline
 \text{3.056 Billion Pounds of Cans Shipped} \\
 \text{Corrected for Imports and Exports}
 \end{array}
 = 45.2\%$$

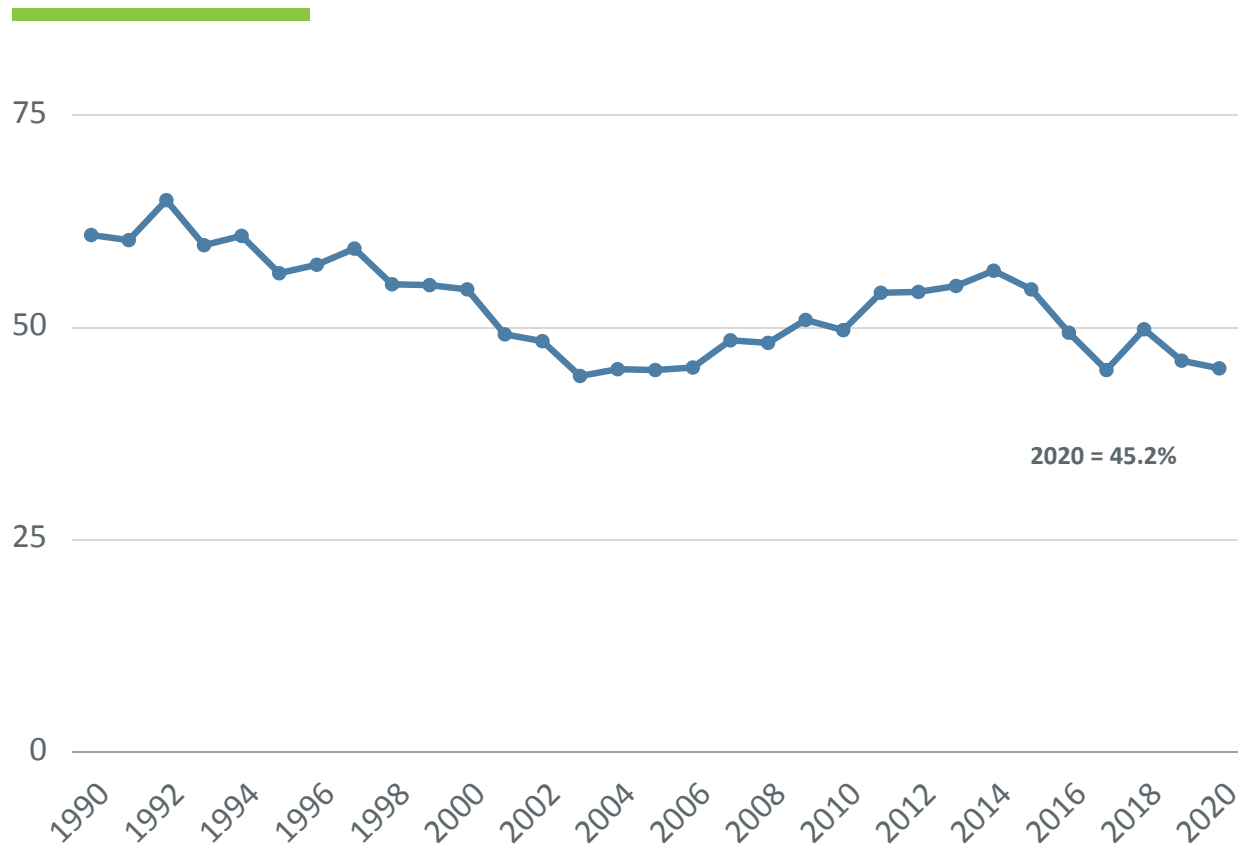


Consumer Recycling Rate History

	2012	2013	2014	2015	2016	2017	2018	2019	2020
Pounds of UBC Melted Domestically (MMlbs)	1664.0	1658.4	1637.2	1480.1	1541.6	1615.8	1755.0	1416.5	1371.2
+Pounds of UBC Exports (MMlbs)	108.7	62.9	62.1	145.1	89.6	58.8	91.6	85.7	323.6
-Pounds of Cans Recycled (MMlbs)	367.8	333.1	286.8	291.8	383.7	475.0	367.9	239.4	313.0
=Pounds of Cans Recycled by U.S. Consumers (MMlbs)	1405.0	1388.2	1412.5	1333.4	1247.5	1199.6	1300.7	1262.8	1382
/Pounds of Cans Shipped by U.S. Producers (MMlbs)	2644.0	2581.3	2555.7	2528.7	2529.2	2645.7	2622.6	2689.5	2839.0
-Pounds of Exported Unfilled Cans (MMlbs)	70	67	82	101	61	11	6	7	7
+Pounds of Imported Unfilled Cans (MMlbs)	20	15	17	17	26	23	54	59	224
=Pounds of Cans Shipped Corrected for Imports and Exports (MMlbs)	2594	2529	2491	2445	2494	2658	2670	2741	3056
=Consumer Recycling Rate	54.2%	54.9%	56.1%	54.1%	50.4%	45.1%	49.8%	46.1%	45.2%

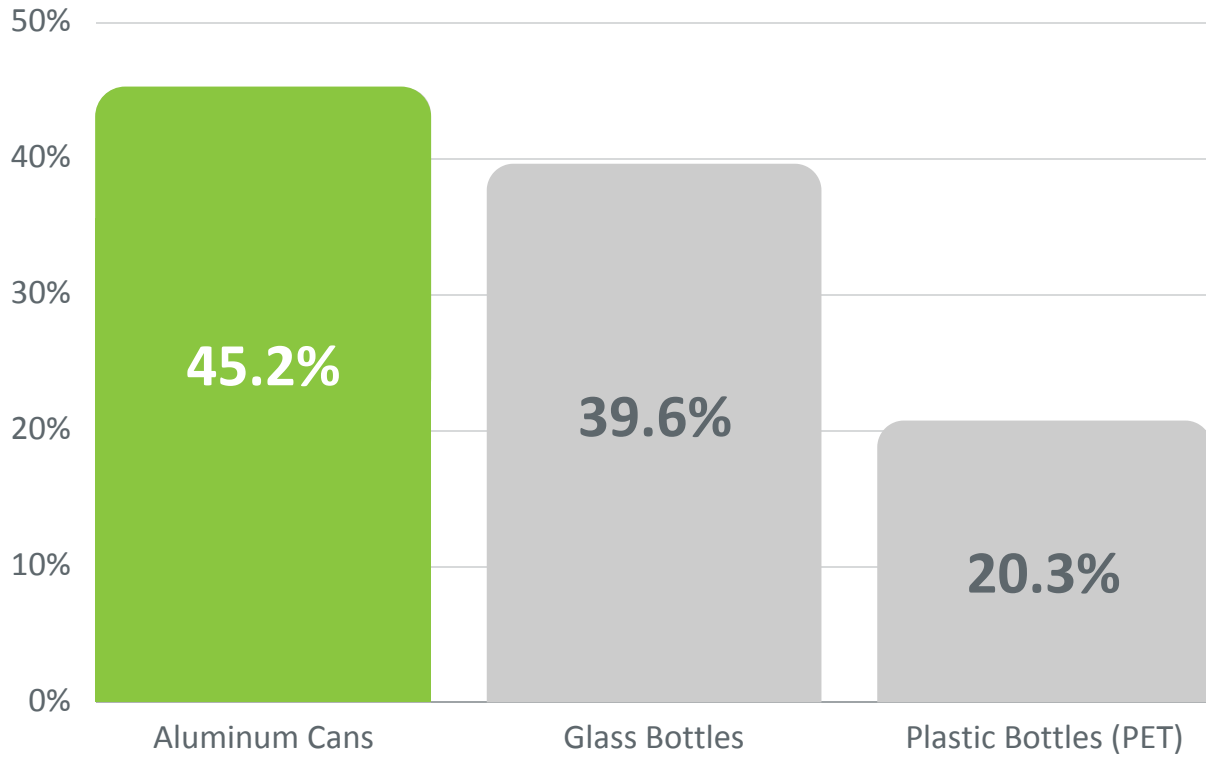


Consumer Aluminum Can Recycling Rate Through the Years





Consumer Recycling Rate for Competing Packaging Types



The aluminum can is by far the most recycled beverage container by consumers. The closed-loop nature of aluminum can recycling, and the metal's inherent high value in the recycling stream, drive a virtuous environmental and economic cycle.



Industry Recycling Rate

Background

The industry recycling rate indicates the amount of aluminum can scrap recycled by U.S. aluminum producers as a percentage of finished cans shipped by the industry during a one-year time period. In basic terms, the rate provides an indication of industry stewardship and efficiency in managing the metal. This rate includes imported can scrap as well as used beverage cans that are exported and recycled overseas. Imports in particular have become an increasingly important feedstock for U.S. can recyclers in recent years. The quantity of scrap recycled is measured directly at the point where processed (e.g. contamination removed) UBCs are fed into melting furnaces. This means that the aluminum is truly recycled, not simply “available for recycling” – the standard for some material recycling rates.

The industry recycling rate increased in 2020 to 59.7 percent. This change falls just above the 20-year average industry recycling rate of 58.6 percent.

Methodology

The industry recycling rate is based on survey input of UBC melting facilities including can sheet producers, can manufacturers and secondary producers of aluminum, representing nearly all can recycling activity in the United States.





THE CALCULATION TO DETERMINE THE RATE IS AS FOLLOWS:

$$\frac{\text{Pounds of UBC Melted Domestically} + \text{Pounds of UBC Exports}}{\text{Pounds of Can Shipped by US Producers}} =$$

$$\frac{\text{Pounds of Cans Recycled by Industry}}{\text{Pounds of Cans Shipped by US Producers}} =$$

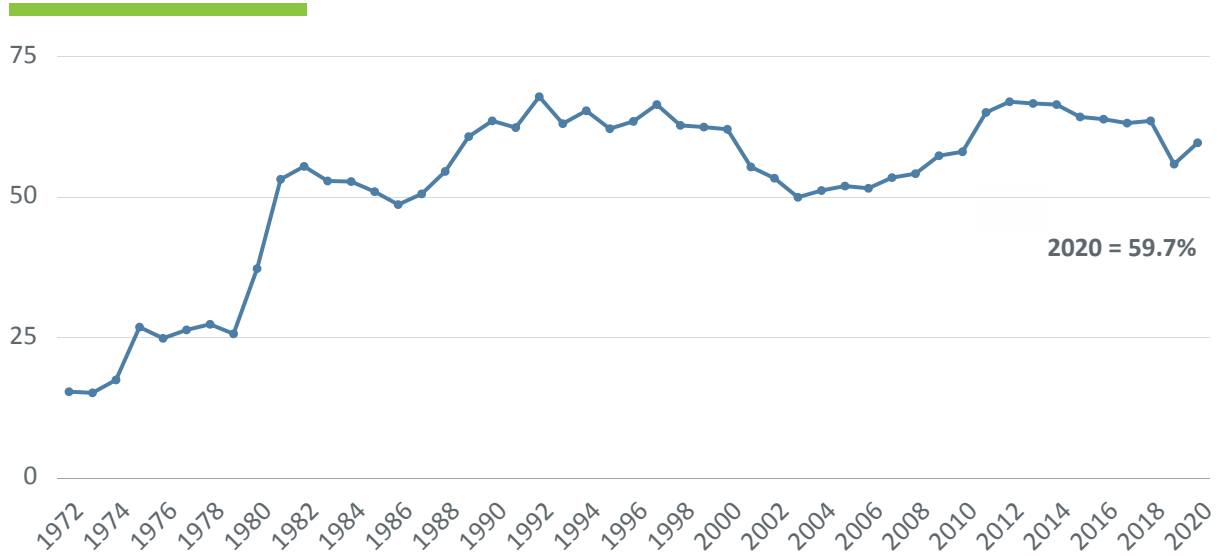
$$\frac{1694.8 \text{ Million Pounds of Cans Recycled}}{2838.6 \text{ Million Pounds of Cans Shipped}} = \mathbf{59.7\%}$$

Industry Recycling Rate History

	2012	2013	2014	2015	2016	2017	2018	2019	2020
Pounds of UBC Melted Domestically (MMlbs)	1664.0	1658.4	1637.2	1480.1	1541.6	1615.8	1577.0	1416.5	1371.2
+Pounds of UBC Exports (mmlbs)	108.7	62.9	62.1	145.1	89.6	58.8	91.6	85.7	323.6
-Pounds of Cans Recycled (MMlbs)	1,772.8	1721.4	1699.4	1625.2	1631.2	1674.6	1668.6	1502.2	1694.8
/Pounds of Cans Shipped by U.S. Producers (MMlbs)	2644.0	2581.3	2555.7	2528.7	2529.2	2645.7	2622.6	2689.5	2838.6
=Industry Recycling Rate	67.0%	66.7%	66.5%	64.3%	64.5%	63.3%	63.6%	55.9%	59.7%

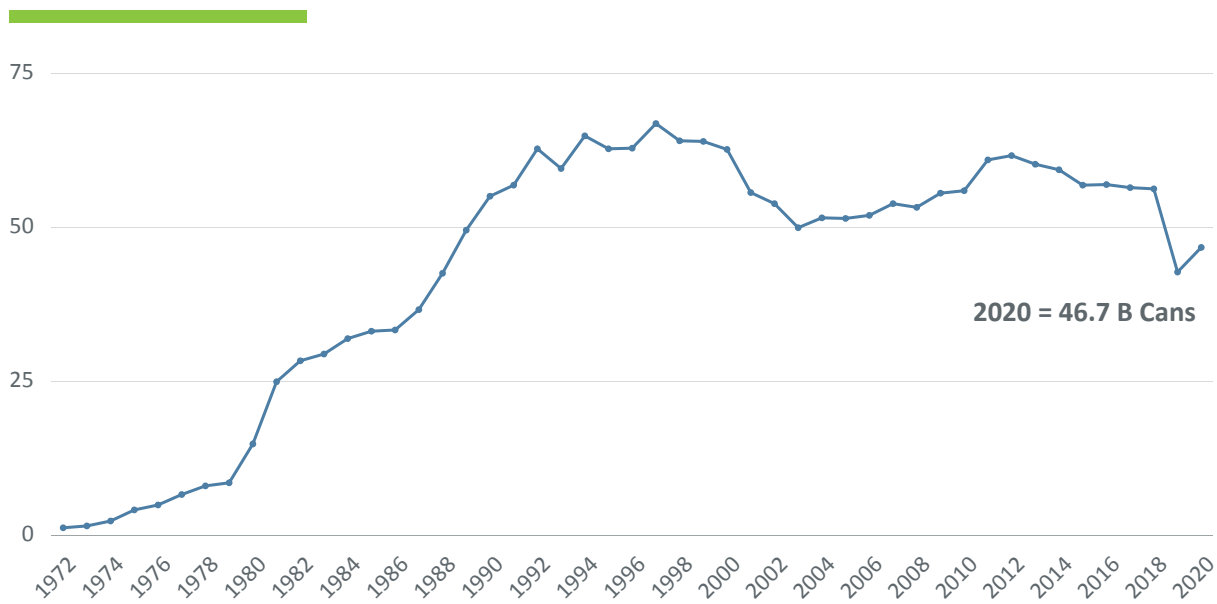


Industry Recycling of Aluminum Cans Through the Years



The aluminum industry recycling rate was 15.4 percent when first reported in 1972. This rate has dramatically improved over the last four decades, with the 2020 industry recycling rate rising to just above the 20-year average industry recycling rate of 58.6 percent.

Number of Cans Recycled by U.S. Aluminum Industry



Since tracking began in 1972, the aluminum industry has recycled more than 2 trillion aluminum beverage cans.



Closed-Loop Circularity Rate



Background

The closed-loop circularity rate in this KPI report reflects the percentage of recycled material used to go back into the same product - in this case new beverage containers. It is partly a measurement of the quality of recycling. When products are recycled, the recovered materials can be used to make the same (closed-loop recycling) or a different and sometimes lower grade product (open-loop recycling). Closed-loop recycling is preferred because typically the recycled product maintains similar quality with the primary material and the process can be repeated over and over again. In contrast, open-loop recycling can lead to compromised material quality through either a change in chemistry (e.g. shortening of fibers, change of molecules) or an increase in contamination (e.g. addition of unwanted elements, change of material color, etc.) in the new product.

Further, the material could be recycled into a different product that is not recyclable or is unlikely to be recycled again (e.g., a plastic bottle into carpet fiber or a t-shirt), which is referred to as downcycling. In short, closed-loop recycling can help close the material loop to achieve a more circular economy, while open-loop recycling will often lead the material to be downgraded to the level that it can no longer be recycled. As a consequence, open-loop recycling typically requires the production of more primary material to replenish society's demand for new products.

The Aluminum Association is incorporating this indicator for the first time in the 2021 KPI report. We believe this is an important indicator to track because higher closed-loop recycling means improved recycling quality and a greater likelihood that recycled material will continue its life over multiple cycles, benefitting society from a resource, environmental and economic perspective.

Methodology

The data for calculating the closed-loop circularity rate for the aluminum beverage can comes from the Aluminum Association's 2021 Life Cycle Assessment of North American Aluminum Cans survey.¹ Data for PET bottles comes from the National Association for PET Container Resources (NAPCOR) Postconsumer PET Recycling Activity in 2018 report.¹¹ Industry data for glass bottles was not available. This report used information from Metabolic's *Recycling Unpacked* report to estimate a closed-loop circularity rate for glass bottles.¹²



THE CLOSED-LOOP CIRCULARITY RATE IS CALCULATED BY THE FOLLOWING FORMULA FOR ALL THREE MATERIALS:

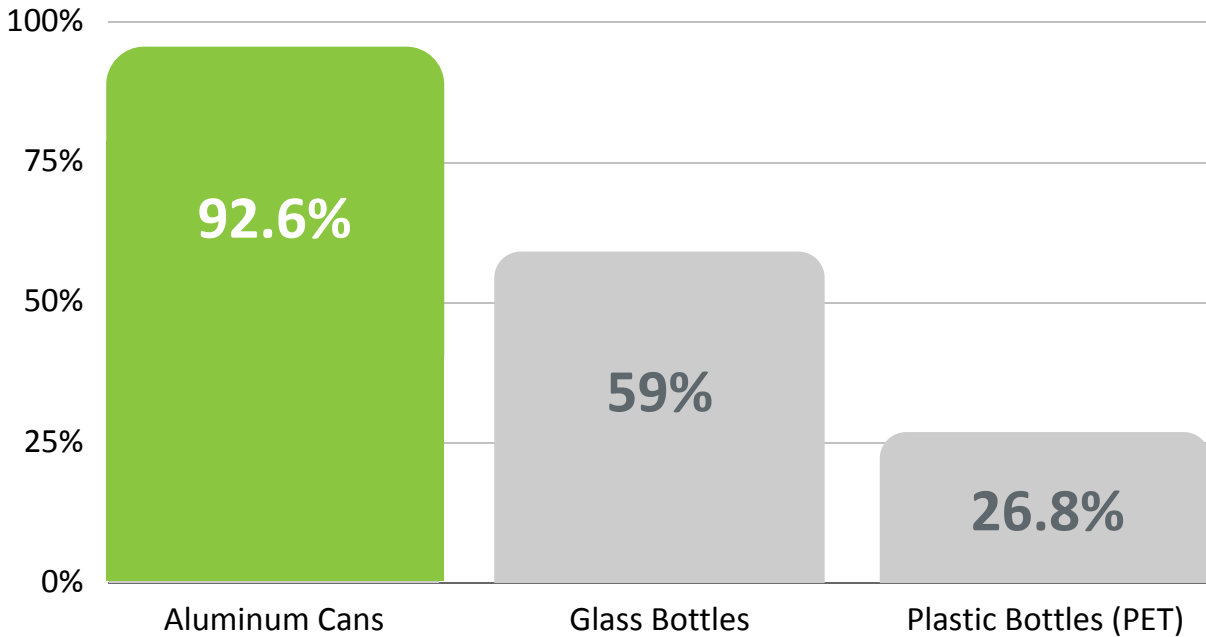
$$\frac{\text{Pounds of Recycled EOL Beverage Containers Used to Make New Beverage Containers}}{\text{Total Pounds of EOL Containers Recycled Domestically}} \times 100 \%$$

2017 ALUMINUM CAN CLOSED-LOOP CIRCULARITY RATE

$$\frac{1.497 \text{ billion lbs}}{1.616 \text{ billion lbs}} \times 100 \% = \mathbf{92.6\%}$$



Closed-Loop Circularity Rates for Competing Packaging Types



Of the three material types, aluminum cans have the highest circular performance in the current U.S. recycling system. This higher rate means there is less need for primary material production, which results in decreased greenhouse gas emissions, less material in landfills and a greater preservation of natural resources.



Recycled Content



Background

Recycled content data measures the proportion of recycled aluminum versus new or virgin aluminum in the average aluminum can. High recovery rates for aluminum along with the closed loop nature of can recycling truly sets the aluminum can apart as a sustainable package type. In contrast to glass and plastic bottles, a large percentage of the average aluminum can is made from recycled material.

The high recycled content in the average aluminum can is an indicator of environmental stewardship of the package.

The recycled content of the can contains metal from both post-consumer and post-industrial scrap sources. However, the calculation excludes internal run-around scrap metal (i.e., metal generated during a manufacturing process that is subsequently recycled on-site).

The association's recycled content figure follows the guidelines and definitions laid out by the Federal Trade Commission (FTC) "Green Guides" as well as UL Environment, an environmental label certification company. The approach also aligns with International Organization for Standardization (ISO) compliance according to the 14021 standard in section 7.8.1.

Methodology

The recycled content figure for the aluminum can is based on a survey of the five main producers of aluminum can sheet in the United States – Alcoa, Constellium, Logan, Novelis, and Tri-Arrows. These companies provide data to determine the composition of an average aluminum can. The survey is conducted every 4 to 5 years, and is also part of AA's beverage can life cycle assessment (LCA) studies. Data is collected by asking the responders to report the total annual quantities of different metal input sources into can sheet ingot and can sheet productions as well as other inputs of material and energy, and releases of environmental emissions and wastes. The previous figure was calculated using 2012 data and found a 70 percent total recycled content figure for the average aluminum can.

The latest time periods for the survey were 2016 and 2017, and the recycled content number is the average of the two time periods, 73 percent. This compares to an average of 23 percent recycled content for glass⁷ and 5.6 percent recycled content for plastic (PET) according to EPA estimates.⁸



RESULTS FROM THE LATEST ALUMINUM CAN RECYCLED CONTENT SURVEY ARE REFLECTED BELOW (WHEN SCALED INTO A FULL CAN WITHOUT COUNTING THE INTERNAL SCRAP AS A METAL SOURCE):

12.99 grams (metallic weight of an average aluminum can):

3.57 grams = Primary aluminum¹³ = 27%

5.60 grams = Used beverage can (UBC) scrap = 43%

0.86 grams = Non-UBC post-consumer scrap¹⁴ = 7%

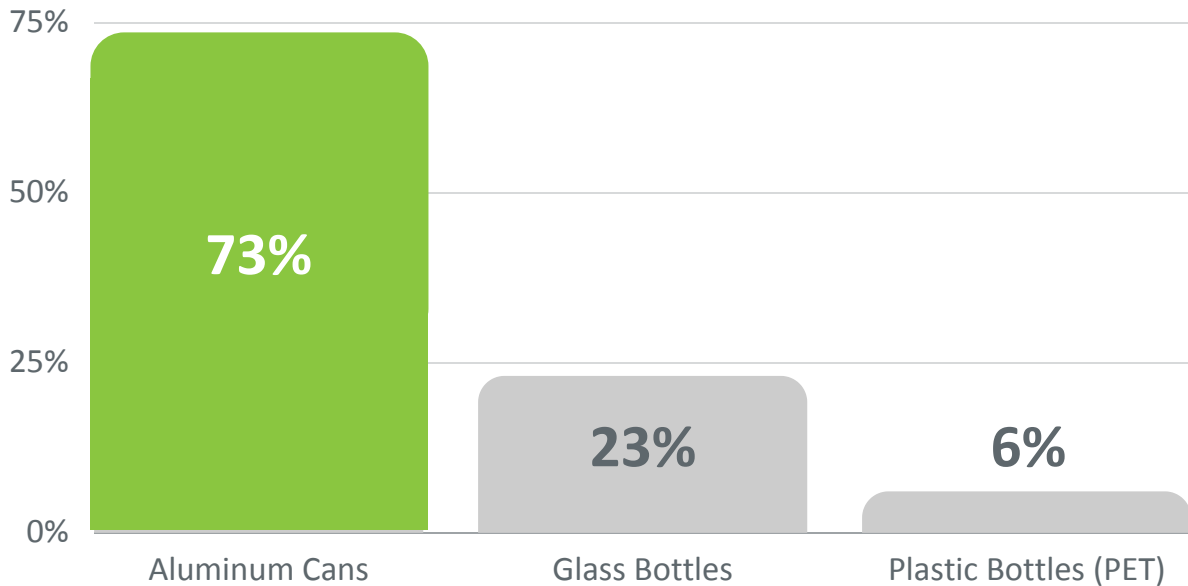
2.96 grams = Post-industrial scrap¹⁵ = 23%

Recycled Content = 73%

More detail on how aluminum cans are made, what source of metals are used, and on the calculation methodology is available at www.aluminum.org.

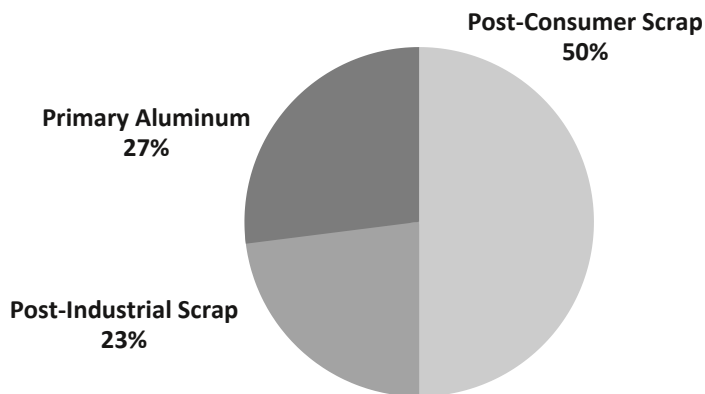


Recycled Content for Competing Packaging Types



The high recycling rates and closed loop nature of aluminum can recycling mean that aluminum cans contain far more recycled content than competing packaging types. Unlike other package types, aluminum cans are most often recycled directly back into themselves not downcycled into new products that often end up in landfills.

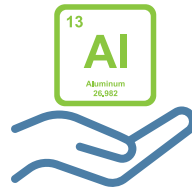
Recycled Content of the Average Aluminum Can



By far the largest percentage of material in the average aluminum can is post-consumer scrap generated from the UBC recycling stream and other scrap sources. Another large percentage of recycled content comes from scrap generated during manufacturing processes.



Value of Material



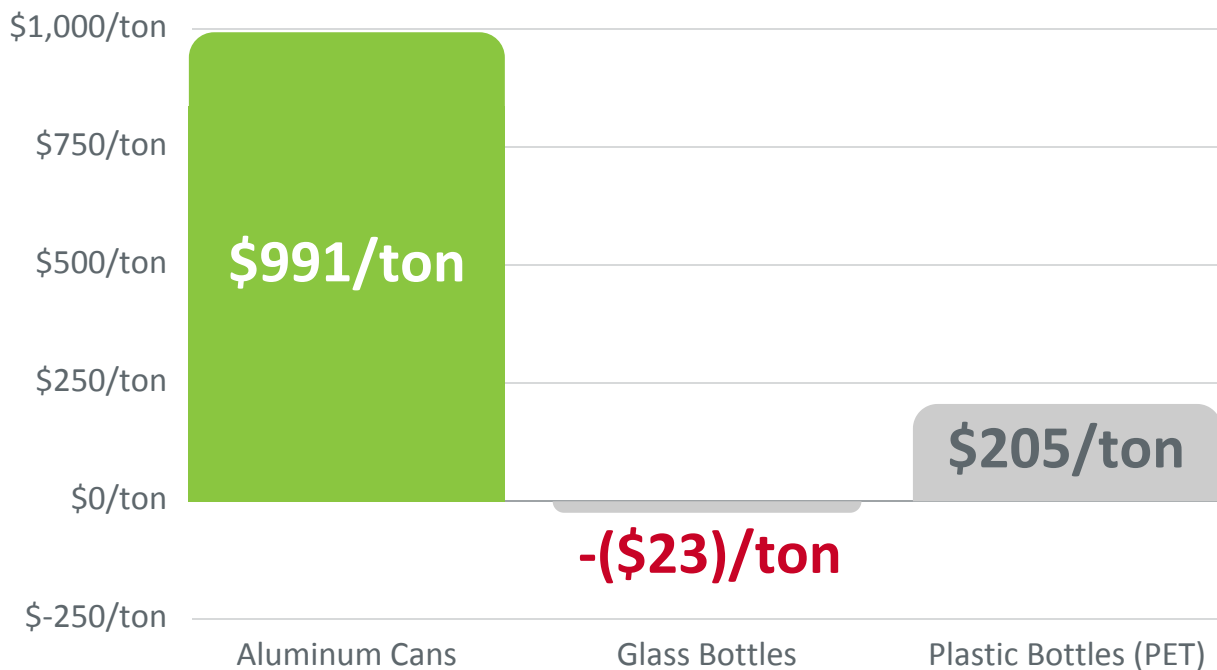
Background

The value of material data measures the dollar value of aluminum can scrap. Many municipal recycling programs rely on re-selling the material collected in curbside bins to help subsidize their programs. The high value of aluminum in the scrap stream means that, without it, very few curbside pickup programs would be financially viable.

Methodology

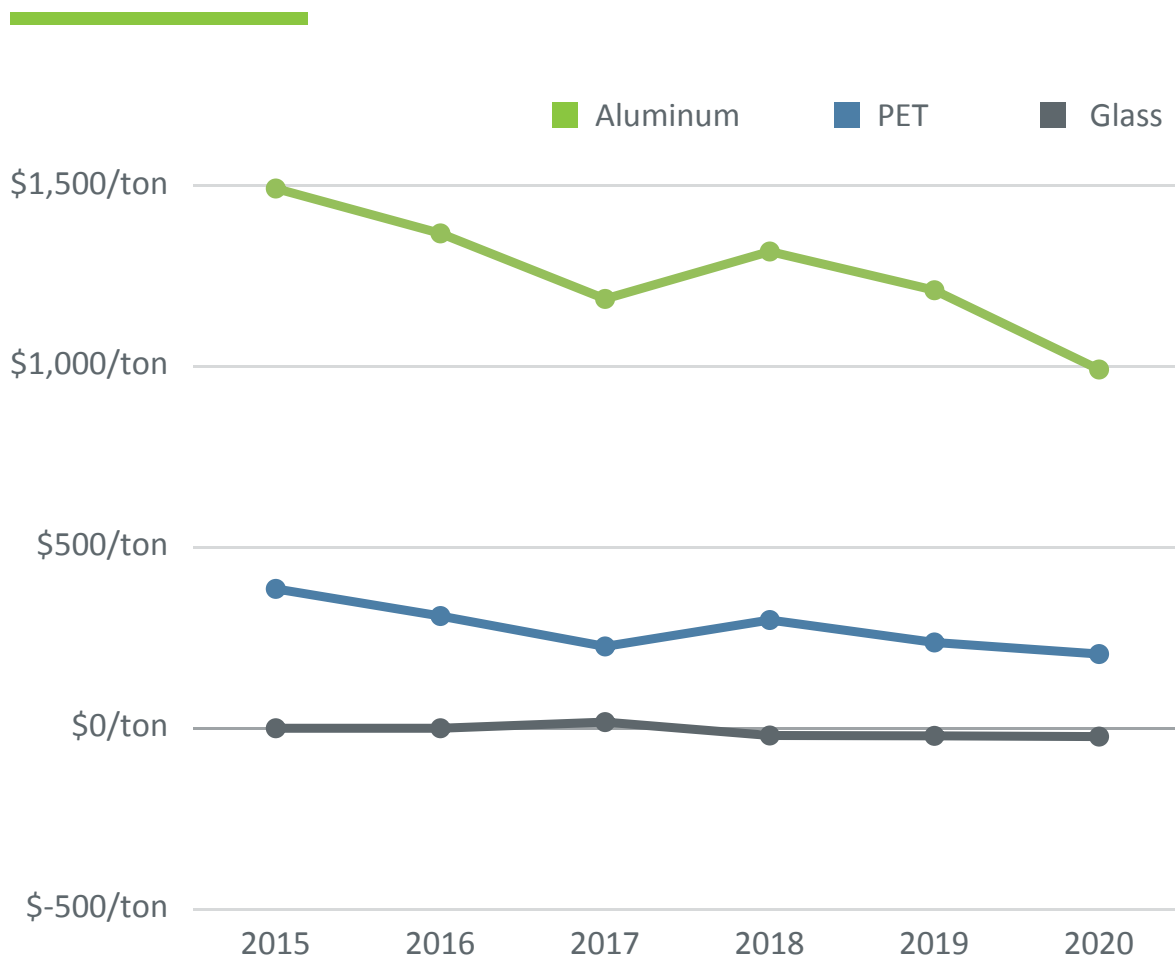
This data is based on a two-year rolling average of commodity prices from February 2019 to February 2021 for various material types via <http://www.recyclingmarkets.net/>.

Value Per Ton of Competing Packaging Types





Beverage Container Recycling Value Per Ton Through the Years



Aluminum is by far the most valuable item in the recycling bin on a per-ton basis. It effectively subsidizes less valuable items like glass and plastic. Many municipal recycling programs would not be viable without aluminum in the recycling stream. Aluminum scrap value declined significantly over the most recent time period driven by COVID-19 economic disruptions but appears to be recovering dramatically.



Citations

- 1 <https://www.aluminum.org/sites/default/files/2021%20Aluminum%20Can%20LCA%20Report%20Full%20Version.pdf>
- 2 Data for glass beer and soft drink bottles via the Environmental Protection Agency (EPA) Advancing Sustainable Materials Management: https://www.epa.gov/sites/default/files/2021-01/documents/2018_tables_and_figures_dec_2020_fnl_508.pdf (p. 7)
- 3 Data for PET bottles via National Association for PET Container Resources (NAPCOR) 2018 PET Recycling Report: <https://napcor.com/wp-content/uploads/2021/07/Postconsumer-PET-Recycling-Activity-in-2018.pdf> (p. 11)
- 4 No equivalent data available for glass or plastic bottles.
- 5 Data range for glass bottles estimated via Can Manufacturers Institute/Metabolic Recycling Unpacked report: https://www.cancentral.com/sites/cancentral.com/files/public-documents/Metabolic_Report_RecyclingUnpacked.pdf (p. 36)
- 6 Data for PET bottles via National Association for PET Container Resources (NAPCOR) Postconsumer PET Recycling Activity in 2018 report: <https://napcor.com/wp-content/uploads/2021/07/Postconsumer-PET-Recycling-Activity-in-2018.pdf> (p. 11)
- 7 Data for glass bottles via the Environmental Protection Agency (EPA) Individual Waste Reduction Model (WARM) v15: https://www.epa.gov/sites/default/files/2020-12/documents/warm_containers_packaging_and_non-durable_goods_materials_v15_10-29-2020.pdf (Exhibit 1-8)
- 8 Data for PET bottles via the Environmental Protection Agency (EPA) Individual Waste Reduction Model (WARM) v15: https://www.epa.gov/sites/default/files/2020-12/documents/warm_containers_packaging_and_non-durable_goods_materials_v15_10-29-2020.pdf (Exhibit 5-5)
- 9 Data based on a two-year rolling average of commodity prices from February 2019 – February 2021 for various material types via <http://recyclingmarkets.net/>, which is how we have consistently measured value of material in the past. In 2020, the price for used beverage can scrap was unusually low due to the COVID-19 pandemic but has recovered significantly in recent months.
- 10 <https://www.cancentral.com/sites/cancentral.com/files/public-documents/GBB%20Report%20Aluminum%20Can%20Drives%20U.S.%20Recycling%20System%20Final%202020-0623.pdf>
- 11 “Postconsumer PET Recycling Activity in 2018.” <https://Napcor.com/>, National Association for PET Container Resources (NAPCOR), 16 Dec. 2019, <https://napcor.com/wp-content/uploads/2021/07/Postconsumer-PET-Recycling-Activity-in-2018.pdf>.
- 12 “RECYCLING UNPACKED Assessing the Circular Potential of Beverage Containers in the United States.” <https://www.cancentral.com>, METABOLIC, Oct. 2020, https://www.cancentral.com/sites/cancentral.com/files/public-documents/Metabolic_Report_RecyclingUnpacked.pdf.
- 13 Newly produced virgin aluminum and added alloying elements.
- 14 Non-UBC scrap from end-of-life products from other market sectors.
- 15 This includes scrap generated from the can manufacturing process and recycled back into the manufacturing process, as well as manufacturing scrap from other market sectors such as building and transportation.