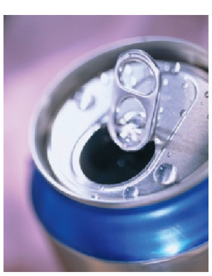
Part 6: Reuse and Recycling Systems for Selected Beverage Packaging

Commodity Markets

Recovered beverage containers are a global commodity. Supply and demand for recycled container material fluctuates, sometimes drastically, with ever changing market conditions. Markets vary depending on how much of a commodity is available and the consistency of its supply. The quality of the material (degree of contamination) is also a factor.

Following the market crash of 2008, commodity prices for recyclables saw a significant decline (since the crash, plastic and aluminum prices seem to have recovered). Buyers were increasingly discriminating when it came to contamination levels, and as a result, municipalities with curbside collection programs were hit the hardest. Nevertheless, in most cases, even though revenues were down, the material was still able to move as it had in the past. This was partly due to the fact that much of this material was collected through deposit-return systems (DRS). Compared to programs collecting containers that are commingled with other materials, DRSs collect the highest quality material and earn the highest commodity price per tonne.

The following is a description, by material, of the supply and demand for empty beverage containers collected in Canada. Included is a discussion of the recycling process and of the end uses for recycled beverage container material.



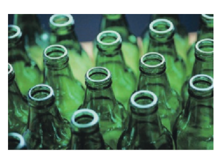
Aluminum Cans

The market share for used aluminum beverage cans is higher than all other non-refillable beverage containers in Canada; this is the case in every province. In 2012 alone, over 6 billion cans were sold in the country.

The collection rate for aluminum cans varies sharply by province, but is usually higher in those where cans are covered under deposit-return as opposed to curbside collection programs. As of 2013, Ontario and Manitoba were the only two provinces that did not have deposits on soft drink cans; their collection rate for non-alcoholic beverage cans was 59%. This is considerably lower than the collection rates reported by deposit-return jurisdictions. The lowest collection rate reported for non-alcoholic cans in a deposit system was 63% in Newfoundland.

In Ontario, aluminum cans had an average monthly value of about $1,612 per tonne from 2011-2013, or 2-cents per can. On account of their value, aluminum beverage cans are a desirable commodity to the collectors and sellers of recycled scrap. As with other beverage container materials, the price of aluminum dropped in 2009 (to $1215/tonne), but has since recovered.

Following collection, sorting, and cleaning, used beverage containers are crushed, compacted into biscuits, and transported to aluminum markets (mostly in the United States, for example, in states like Kentucky, Tennessee, and New York) where they are melted down and reformed into rolled stock. New aluminum cans are punched out from these sheets at a can production plant, and the offcuts or in-house scraps are all recycled. The entire process could take as little as 60 days.[36]



Glass Bottles

Calculating the collection rate of glass beverage containers is extremely challenging when bottles are collected via municipal curbside recycling programs. This is because in such jurisdictions, all glass – both beverage and food container glass – is jointly reported. Moreover, collection rates do not account for losses incurred in processing (due to contamination, for example) nor do they consider the fact that different end-use applications have very different environmental impacts (for example, using recycled glass to manufacture new bottles or fibreglass has a higher environmental benefit than using recycled glass as road aggregate).

The province with the highest collection rate for non-refillable glass beverage containers is B.C. at 94%. At the other end of the spectrum is Manitoba. Manitoba, which does not have deposit-return legislation, has a collection rate of approximately 55%, with most collected glass currently being used as aggregate replacement rather than being recycled into new products.

The market value of recycled glass depends on the method by which it was collected. In Canada, two main glass collection systems are employed: colour-separated collection and multi-material collection. The first sorts the material at the point of collection by colour type (flint, green, brown, or mixed colour) and provides the recycler with a colour-specific load that is free of contamination. Given the high quality of the material, it may or may not require additional processing. The second method collects glass along with all other material types. The additional handling and truck compaction in this method results in a significant amount of breakage, and thereby lower quality and lower value recycled glass. About 20% to 40% of the glass collected in this way ends up in landfill as cover material. Another 20% is marketed as glass fines used for low-end applications such as road aggregate or as a sandblasting base. The remaining 40% to 60% is crushed into small pieces (known as cullet) and is used to manufacture new bottles or fibreglass.

In Ontario, the majority of wine, spirit, and beer container glass is sold to Owens-Illinois (OI) for bottle-to-bottle manufacturing or to Owens Corning for fibreglass production. Most of the glass collected via the province's Blue Box program is used to produce fibreglass insulation or glass bottles, as a sandblasting medium, or as drainage material. Due to circumstances of geography and low population density, most glass collected in northern Ontario ends up in landfill.

Prior to April 2013, 70% of Québec's glass was processed at a facility in Longueil, Québec. Since the plant shut down in 2013, most of the glass is being used as an aggregate or in landfill operations as roadbed.

In Alberta, recycled glass is spun into thin strings (like cotton candy) and used to produce fibreglass insulation.[37]

Glass from British Columbia is either sent to Alberta where it is recycled into glass sand for making fibreglass insulation, or to Seattle where it is recycled into new glass bottles.[38]

Glass containers collected in Saskatchewan are shipped to different end-markets depending on colour; clear glass is sent to a processing facility in Moose Jaw, Saskatchewan, while the coloured glass is sent to a facility in Airdrie, Alberta where it is manufactured primarily into new glass bottles and jars. Some coloured glass is also made into fibreglass insulation.

In Manitoba, glass is usually crushed and used locally as fill in roadways and sidewalks.[39]

Most of the glass collected in the Maritimes is shipped to OI in Montreal for bottle-to-bottle recycling.

In Northern Canada (Yukon and the Northwest Territories), glass is crushed and used as an alternative daily cover at landfills or as a gravel substitute. Some also ends up as sandblasting material.

Refillable Beer Bottles

With a countrywide collection rate of approximately 98%, the refillable beer bottle is Canada's most recovered beverage container. No province has a collection rate of lower than 84%.

Following collection and sorting, refillable beer bottles are returned to the brewery for their labels to be scraped off. They are then washed, refilled, capped, and crated. On average, the industry standard beer bottle (ISB) can be reused 15 times (the "trippage rate") before it is taken out of circulation. Other than being recycled by a bottler, a bottle may be taken out of circulation because of breakage (e.g. by a consumer) or scuffing.

Scuff marks on a refillable bottle – rings that develop on the bottle as a result of contact with the guide rails of the washing, filling, and bottle-handling equipment – become more noticeable with each reuse and can have a significant effect on bottle aesthetics, which in turn, can render them less marketable over time.

PET (Polyethylene terephthalate) Plastic Bottles

Taking up 33% of the market, plastic is the second most common material used for non-refillable beverage containers on a unit-sold basis. It is challenging to estimate sales and collection rates for PET in Canada because many provinces report it within the plastic category as a whole. In the deposit-return provinces, PET usually has a collection rate of 70-80%, but due to the low collection rate (56%) in heavily populated Ontario, the national average is roughly 62%.

The average monthly value for a tonne of mixed PET from Ontario's Blue Box program was $485 for the period of 2011-2013. After dipping to a low of $187/tonne in 2009 the value peaked at $652/tonne in 2011. It has since dropped to $373/tonne in 2013.

Clear PET containers are baled, shredded, and flaked. Plastic flake may be turned into a fibre that can be used to make fleece clothing and carpet underlay or new bottles for detergent, motor oil, and other non-food products. Increasing numbers of PET bottles from deposit-return programs are melted down and made into new beverage containers. According to recent data,[40] 39% of recycled PET is turned into a fibre, 10% for strapping, 21% for food and beverage containers, 23% sheet and film, and 4% is used for non-food containers. A very small percentage (2%) becomes engineered resin or other materials.

In British Columbia, plastic goes to Merlin Plastics, a facility located in the municipality of Delta, B.C. PET from Saskatchewan and Manitoba is shipped to U.S. and Canadian processors that flake the material. Some PET from Manitoba is made into plastic lumber for railway ties. PET from Québec and Ontario is brokered into the market with multiple end destinations. In the Maritime Provinces, most plastic goes to Novapet Inc., a facility located in Amherst, Nova Scotia. PET from the Northwest Territories is sent to markets in B.C. and Alberta.

HDPE (High-density polyethylene) Plastic Bottles

Like PET, HDPE plastic is generally reported as part of the plastics category as a whole (which may or may not include non-beverage container plastic). For this reason, it is difficult if not impossible to report specific collection rates for HDPE.

From 2011-2013, the average monthly value for mixed HDPE from Ontario's Blue Box program was reported to be $532 per tonne. HDPE markets are very similar to PET markets and follow similar geographical flow patterns (see paragraph on PET Plastic Bottles).

HDPE milk jugs and juice containers are baled, chipped, and washed. The clean chipped plastic is melted at high temperatures and formed into pellets, which are used as resin feedstock for the manufacture of non-food containers, plastic formed products, furniture, and toys.

Steel and Bi-Metal Cans

Steel and bi-metal cans make up a very small share of the beverage container market (approximately 1%). Their average collection rate is 65%.

From 2011 to 2013, steel cans collected in Ontario's Blue Box program were worth an average of $289 per tonne. The value of recycled steel cans dropped from a high of $335 per tonne in 2011 to $254 per tonne in 2013.

Steel cans are crushed, baled, and shipped to market (to steel brokers in the U.S. and Canada) where they are melted down with other scrap metal, which can then be used as construction rebar or in the manufacture of other steel products.

Tetra Pak Boxes

Tetra Pak cartons or drink boxes are made up of paper, an aluminum lining, and a plastic coating, and are usually reported as part of a wider "polycoat" or "aseptic and gable top packaging" category. For this reason, it is impossible to quantify sales, returns, and collection rates for Tetra Paks alone. If considering the larger category as a whole, however, collection rates are over 50% in each of the deposit provinces and 30% or less in Ontario and Manitoba.

Tetra Pak containers are hydro-pulped and separated into different material types. The resulting paper pulp (about 65% of the recycled material) is sent to paper mills in the U.S., China, and Korea where it is made into tissue. The remaining aluminum and plastic mix (about 35% of the recycled material) can be used to manufacture durable products like pallets and paper core plugs, but most end-markets currently do not use the aluminum and plastic mix for value-added products.

Gable Top Cartons

Gable top cartons (used for juice and milk) are made up of "polycoat," a lightweight, high-grade paperboard sandwiched between two thin layers of polyethylene film (and sometimes a foil laminate). It is impossible to calculate a specific collection rate for gable top containers as they are generally reported with Tetra Paks, as part of a larger category of collected material. Collection rates for the larger category as a whole are calculated to be at 68% in Alberta (where milk containers are on deposit), over 50% in each province where Tetra Paks are part of the deposit-return program, 30% in Ontario, and less than 20% in Manitoba.

Polycoat is converted into new material by hydro-pulping, which uses a combination of heat, water, and agitation to break down the material to produce pulp or raw fiber. This pulp can be used as feedstock to make new paper products, such as corrugated medium (the inner layer of corrugated cardboard), linerboard, household tissue products, and fine paper. The small amount of residual polyethylene can be screened off for use in other plastic and composite materials.

Most gable top material is sent to facilities in the U.S., China, and Korea for tissue production.

Poly Pouch Containers

Although they represent only a small portion of the beverage container market today, poly pouch drink containers are rapidly increasing in popularity. A typical poly pouch container is made up of an outside PET layer, ink that is printed on the inside of the PET layer, an aluminum foil adhesive layer, and an inside linear low-density polyethylene (LLDPE) sealant.

Compared to other beverage container types, poly pouches take up minimal space in landfill. They are also extremely lightweight relative to their volume, and so the carbon footprint associated with their transportation is comparatively small. In fact, according to a study by the Packaging Machinery Manufacturers Institute (PMMI) trade association, the beverage volume transported in a truckload of quart-sized pouches would require nine trucks of glass or plastic bottles.[41] Because of their associated environmental benefits, the PMMI expects poly pouches to gain a greater share of the beverage container market over the next decade.

Traditional methods used to recycle aluminum and plastics are not practical for poly pouch containers as this material is a contaminant in both processes. Although none currently exists, several recycling agents – particularly in provinces that mandate the recycling of all beverage containers (as opposed to their being sent to landfill or incinerated) – are attempting to source a permanent market for recycling this material. So far, test batches have been sent to processors in North America, Europe, and Asia.

Cups

There is another type of container that is used almost exclusively away-from-home and is not covered by deposit-return legislation in any of Canada's provinces or territories—polystyrene or paper-based, plastic-lined cups. There is no way to determine a collection rate for these containers since their sales and returns are not tracked.

For the most part, these cups are exempt from beverage container regulations, which typically define the beverage container as one that is "sealed by the manufacturer" or "ready-to-drink." Although some provinces like Ontario and Québec require retailers or brand owners of these cups to financially support the recycling of these containers, very few municipal recycling programs are actually accepting and recycling these materials.

There is a challenge with recycling polystyrene cups. For one, the associated cost of shipping, given their large volume to weight ratio, is very prohibitive. In general, polystyrene cups are commingled with other polystyrene materials collected in expanded recycling programs and shipped to facilities in Ontario, the U.S., and overseas.

Paper cups can be recycled by some paper mills either on their own, mixed with gable top containers, or mixed in with boxboard material. Depending on the end use (which is usually tissue), the yield rate is about 80%.[42] Paper cups can also be composted (cups with a poly-based liner can also go into municipal compost, with the liner being screened out of the final product). Wax-coated cups used for cold beverages provide even greater recycling and composting challenges because of the wax.

The Use of Recycled Content in Beverage Containers

Although the focus of this report is on the collection of used beverage containers, *Who Pays What* would be incomplete without any reference to the issue of recycled content. The recycled content of a beverage container (or any other product) is the fraction of recycled material in the final material normally expressed as a percentage. When recycled beverage containers are converted into new products, the need to extract and consume raw materials and energy is significantly reduced because all of the primary resource extraction functions are avoided.

The closed-loop system of using recycled beverage container material in the production of new containers has been acknowledged as the most beneficial end-of-life scenario for most types of packaging. Deposit-return programs offer the best chance of closed-loop recycling due to the fact that the containers collected are pre-sorted, eliminating the potential for contamination from other packaging and foodstuff residues.

Recycled Content by Material Type

Aluminum

According to the 2011 "Waste & Opportunity" report, aluminum has the highest recycling rate and recycled content of all beverage containers.[43] Approximately 75% of all the aluminum ever manufactured is still in productive use today,[44] and it is estimated that 50% of all aluminum cans on retailers' shelves have been recycled at least once.[45] This makes sense, given the recycling process for aluminum requires 95% less energy than making a new can from virgin ore.

While, in general, aluminum cans in North America contain a significant portion of recycled content, the exact amount is difficult to ascertain because unlike glass and plastic, the percentage of recycled material in an aluminum can is not determined by the company, but rather by the aluminum supplier. The fact that manufacturers sometimes use different standards to define the amount of recycled content in their products can add to this ambiguity.

PET Plastic

Making new bottles from recycled PET resin requires 30% less energy than using virgin material. For every tonne of plastic produced, this is equivalent to the energy contained in about 11 barrels of oil.

Many companies have set goals for recycled PET and have made commitments to increase this percentage over the next few years. However, most claim there is a lack of post-consumer PET on the market from which they can make recycled bottles. According to the National Association for PET Container Resources (NAPCOR), of the 1,718 million pounds of PET containers available for recycling in 2012, only 30% were recycled.[46]

Instead of bottle-to-bottle recycling, much of the recycled PET available to manufacturers is being used to make other containers (open-loop recycling), such as those for non-beverage products (e.g. shampoo, food). A significant amount of recycled PET is also used for sheet and film, strapping, non-food bottles, and to produce fibre for clothing and carpet.[47]

Glass

Using recycled glass cullet in the production of new glass has been acknowledged as the most beneficial end-of-life scenario for glass packaging. Glass is 100% recyclable and because it is not chemically altered by the recycling process, it is one of the very few materials that can operate forever in a closed-loop system with essentially no loss of quality or purity. According to the Glass Packaging Institute (GPI) – the trade association representing the North American glass container industry – for every 10% recycled cullet used in the manufacturing process, energy savings of 2% to 3% are achieved.[48]

The GPI has set a goal to manufacture all containers with a minimum of 50% recycled material by 2013, to increase to 60% by 2017. Currently, although different bottle manufacturers have varying recycled-content levels, the average recycled-content rate of glass bottles sold in North America is about 33%.[49]

The Canadian brewery industry's industry standard bottle (ISB) contains a higher percentage of 60% to 65%.[50]

At the global scale, the average percentage of recycled content is lower than it is in Canada, largely because there is a lack of high-quality cullet available to meet manufacturer demands for new glass containers.

Measures for Increasing Recycled Content in Beverage Packaging

There are several ways to increase the use of recycled content in the manufacture of new containers. One of the most effective measures is minimum recycled content laws. While no province in Canada has enacted such laws as of yet, we can look to the United States and Europe for examples.

In California, manufacturers are required to use at least 35% recycled content for glass food, drink, and beverage containers made, sold, or used in the state (AB 2622, Chapter 1095, Statutes of 1990). The Department of Conservation's Division of Recycling regulates and oversees the container minimum content mandates and receives reports annually about the amount of recycled material that is used. Certain labelling laws support the manufacturing of recycled-content products indirectly.

Other measures to promote markets for recycled-content material include: labelling laws that require products to be labelled with their recycled-content percentage; low-interest loan programs, offered to businesses that produce recycled-content materials and products, to site new facilities or expand existing operations; individual producer responsibility, whereby producers are made 100% financially and physically responsible for the end-of-life management of their products; mandated minimum recycling rates; government procurement policies to purchase certain recycled-content products; and, in the case of glass, mandatory colour-separation at source.