Small Format Recycling Project

August 2023 Summary

THE SUSTAINABILITY CONSORTIUM™

What is Small Format?

- The Association of Plastic Recyclers (APR), the leading recyclability authority for brands, designates items smaller than 2” in at least two dimensions as small format and non-recyclable.
- Examples of small format plastic items that could be recyclable if they could be easily recovered include dental floss containers, pharmaceutical bottles, contact lens cases, and disposable razors, which cannot be captured by typical recycling equipment in the US due to their size.
- Other small format plastics, such as condiment packs, cigarette boxes, and many cosmetic products, would not be recyclable even if they were larger, due to inherent recyclability barriers such as food contamination or multi-material construction.
- Few studies have been done to understand the prevalence and recyclability of small format packaging and products; however, sales data modeling suggests that **25-40% of plastic packaging by number of items and 5-10% of plastic packaging by weight meets APR’s definition of small format.**[1]
- As a result, small format presents a major challenge for brands that have set ambitious goals to make 100% of their packaging reusable, recyclable, or compostable by 2025.

TSC’s Approach

- The Sustainability Consortium’s (TSC) mission is to use the best sustainability science to help companies make the everyday products we use better and more sustainable.
- In 2020, TSC began work with a group of corporate, academic, and NGO stakeholders to explore potential pathways to small format recyclability.
- In 2022, TSC sponsored preliminary waste characterization research to better assess the incidence and recyclability of post-consumer small format packaging and products in the US waste stream.

Preliminary Results

1. Small format items were found to be a very small percentage, by weight, of the overall waste and recycling streams.
2. While many small format items are made of readily recoverable single resins that are clean and appropriate for recycling (e.g., pill bottles, bread bag closures), a meaningful subset is not recyclable because it is contaminated by its contents (condiment packs); comprised of non-recyclable multi-material components (multi-layer wrappers; cigarette packs, most coffee pods), or degraded beyond recovery (shredded paper/cardboard and broken glass).
3. While most small format items were correctly placed in the trash, roughly ¼ were placed in recycling bins by consumers.
4. Caps and closures, which made up one of the largest categories of identifiable small format items, may not be available for recovery separately from currently recyclable bottles.[2]

1 Euromonitor Passport, 2022 U.S. sales of product with plastic packaging data was used to calculate these figures. Additionally, a 2015 study conducted in the UK, “WRAP Plastics Compositional Analysis at MRFs” found 12% (by weight) of plastic recyclables to be small format.

5. Compaction matters. With every step of collection and processing at recycling facilities. Larger format products and packaging break apart and become small format.[3]
6. Small format items were also found to be very heterogenous in their shape and material composition, making recovery a particular challenge.
7. Qualitative results indicate that disposal of small formats may have a seasonal component or occur in bulk (e.g. Birthday parties, spring cleaning, etc.) which can be a challenge for representative sampling.

Future Actions

- A customized measurement protocol focused exclusively on small format characterization is recommended to better understand the diversion opportunity, as current waste and recycling audits focus on larger items at the expense of accurate classification of small format materials.
- Given the small sample size represented in these studies, additional research is needed to quantify small format volumes in residential waste and recycling streams, as well as the prevalence of disposal in non-residential locations such as hospitals, restaurants, or gas station parking lots.
- An ongoing dialog is needed between manufacturers and material recovery facilities to ensure the current state of small format recovery and measurement methods are informing future study design as well as product design.

Methodology and Discussion

The small format material definitions, or sort categories, used in these studies were created by Stina Inc. based on research objectives and feedback from TSC's small format stakeholder group. Categories were designed to provide insight into the distribution of small format packaging and products by material type, application, and format.

The list of material definitions and photo examples were provided to MSW Consultants to attempt two pilot studies to estimate the amount and composition of small format items. In this first stage of research, it was decided that MSW Consultants would integrate small format sorting and weighing as an add-on to conventional waste and recycling composition studies that sort larger items into traditional recyclable, compostable, and other constituents. MSW Consultants added a 2-inch square screen to its routine sorting protocol in municipal waste studies taking place in two midwestern communities in the United States. A senior professional staff member with MSW Consultants was assigned to receive the 2-inch "unders" from the main sort table, and subsort small format items in both studies.

For both studies, a significant fraction of the material passing through the 2-inch screen consisted of food waste, broken glass, dirt, grit, and shredded paper and plastic items that were not technically small format when discarded or recycled. These non-targeted small particles were sifted out and not analyzed further. A secondary, item-by-item sort was done on the remaining sub-samples to create an inventory of specific small format items. Once sorted, small format materials were weighed and then integrated into the overall sample weight so that the resulting analysis could identify the fraction of wastes and recyclables that consist of small format items targeted in the study.

2 For example, a plastic bottle cap is a small format packaging component, but most recycling programs encourage the cap to remain attached to the bottle. The cap is only problematic to recover if it is separated from the bottle.

3 For example, otherwise recyclable cardboard and paper becomes shredded as it degrades during collection and handling, adding to the potential volume of small format material.

The first of the two studies was conducted in Spring 2022. Small format was separated out from 26 samples of refuse and 25 samples of recyclables obtained by taking mechanical grabs from tipped loads of refuse and recyclables that had been delivered to the disposal or recycling facility by the hauler. By the time these samples were obtained, trash and recyclables had been collected and compacted in a truck body, tipped on the floor of a transfer station, and mechanically removed from the tipped pile by a bucket loader – all actions that tend to degrade wastes and dislodge smaller items that may not have started out as loose in the material stream. Small format samples were sorted by material (paper, plastic, metal, glass) and further sorted by application and packaging versus product. This study found limited volumes of small formats and a wide variety of packaging and product types. In terms of plastics, the most common applications were attributed to food packaging, pharmaceutical packaging, and coffee pods (which were technically classified as multi-material items but are identified as mostly plastic cups).

The second study was conducted in the fall of 2022. For this sort, a sample was defined to include the aggregated weight of the setouts from 25 households, intercepted at the curb before being collected by the commercial collection vehicle. A total of five “batch” samples (one batch of 25 households per collection day) were obtained for both refuse and recycling. Small format samples were removed and sorted by material. These samples had not yet been compacted in, or tipped by, heavy collection vehicles, and smaller items had less chance to dislodge and degrade because they were intercepted at the point of set-out. Small format plastic from these batch samples was further sorted by format type (e.g., tube, sachet, bottle), which provided another resolution for differentiating between subcategories of small format items in this project. Small format plastic samples were also sent to Stina Inc. for further sorting based on application type.

In both pilot studies, the incidence of small format items in the overall waste and recycling stream was estimated and found to be very small. Both studies also estimated the relative incidence of different types of small format packaging and products.
These pilot studies highlighted two important challenges to characterizing small format items.

First, many items that met the definition of small format strictly based on their dimensions were clearly shredded, ripped, crushed, or otherwise degraded from an item that may not have been set out in the trash or recycling in such condition. As this issue is studied further, it will be important to reach consensus on whether a size-reduced item should be considered part of the small format diversion challenge, or whether the research (and corresponding potential to divert more material from landfill) should be limited to packaging and products that originate in small format from the moment of manufacture.

Second, although the data set is still very small, the incidence of small format packaging tended to increase as the waste stream progressed from set-out to collection to tipping. For example, a bottle cap would only be small format in these pilot studies if the cap was found loose at the time of sorting. If the bottle cap were attached to the bottle when the bottle was set out for collection, it may not have been sorted as small format during the second study. However, this same bottle cap could have dislodged and been counted as small format in the first study. Extending this thought process beyond these two pilot studies to the entire material handling process, an affixed bottle cap could also become a loose, small format item at any point in the MRF as the bottle traversed various conveyors and screens; or never, if the bottle makes it all the way to the baler with the cap still attached.

These findings highlight a need for brands and recyclers to agree where in the process it is best to measure the incidence of small format items, how to define and/or exclude items from consideration that become small format due to degradation, and whether small format items that never become loose in the material stream are to be targeted in future small format recycling research.