Recycling Modernization Act Material List Request for Information: Compilation of Selected Responses – Paper Recycling

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State of Oregon
Department of Environmental Quality

This document is a compilation of selected responses to DEQ's Request for Information regarding the potential for recycling different materials. As optional background reading materials for members of DEQ's Technical Workgroup on Material Lists, DEQ has selected the following responses that address grades and formats of paper, which will be discussed at the April 28, 2022 Technical Workgroup meeting.

American Forest & Paper Association

March 18, 2022

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RE: Comments on Implementation of Section 22 of Oregon's Plastic Pollution and Recycling Modernization Act

Dear Mr. Allaway,

The American Forest & Paper Association (AF&PA) is pleased to submit these comments in response to the Oregon Department of Environmental Quality request for comments on the implementation of Section 22 of Oregon's Plastic Pollution and Recycling Modernization Act.

The American Forest & Paper Association (AF&PA) serves to advance U.S. paper and wood products manufacturers through fact-based public policy and marketplace advocacy. The forest products industry is circular by nature. AF&PA member companies make essential products from renewable and recycle resources, generate renewable bioenergy and are committed to continuous improvement through the industry's sustainability initiative — *Better Practices, Better Planet 2030: Sustainable Products for a Sustainable Future*. The forest products industry accounts for approximately four percent of the total U.S. manufacturing GDP, manufactures nearly $300 billion in products annually and employs approximately 950,000 people. The industry meets a payroll of approximately $60 billion annually and is among the top 10 manufacturing sector employers in 45 states.

AF&PA believes that all paper and paper-based packaging products can be easily collected and recycled into Oregon's statewide collection recycling system.

- Foodservice packaging
- Food contact packaging
- Ice cream cartons
- Liquid packaging cartons
- Magazines
- Mail
- Molded fiber containers
- Newspaper
- Office paper
- Old Corrugated Containers (OCC)
- Paper bags
- Paper cups
- Paper-padded mailers
- Paperboard without poly
- Paperboard with poly
- Pizza boxes

Paper Recycling Works

U.S. EPA data confirms the superior record and environmental success story of paper recycling from municipal collection programs.[1] According to the U.S. EPA, in 2018 (the most recent EPA data available) paper and paper-based packaging had a far higher recycling rate from municipal solid waste (MSW) streams than other major recyclable commodities: Paper (68.2%); Steel (33.1%); Glass (25.0%); Aluminum (17.2%); and Plastics (8.5%).[2] Put another way, more paper by weight is recovered for recycling from municipal solid waste streams than plastic, glass, steel and aluminum combined.[3] EPA statistics also show that in 2018, 46 million tons of paper and paperboard were recycled from municipal solid waste, compared to 3 million tons of plastics. By contrast, that year 27 million tons of plastics in municipal solid waste were sent to landfills. That is 76 percent of all plastic waste.[4]

Robust end markets for recovered paper are an essential pillar of the industry's success. Demand for recovered paper is strong and growing. In 2021, U.S. paper and paperboard mills consumed 32.9 million tons of recovered paper, an increase of 4.7% over 2020 consumption. And the U.S. exported another 18.0 million tons of recovered paper to mills around the world, an increase of 13.4% over 2020 levels.

The industry anticipates consuming more recovered paper to make paper and paper-based packaging in the years ahead. Between 2019 and the end of 2024, U.S. paper, packaging and pulp producers committed to investing more than $5 billion in new manufacturing capacity specifically designed to use recovered paper. That increased manufacturing capacity will consume some 8 million additional tons of recovered paper per year.

Materials of Interest for Recycling

Section 22 of Oregon's The Plastic and Recycling Modernization Act requires the Environmental Quality Commission to identify two lists of materials under consideration: Statewide Collection Recycling and Producer-collected Materials lists. Oregon defines the Statewide Collection Recycling materials list as: "materials collected to provide the opportunity to recycle". This refers to on-route and drop-off recycling collection opportunities provided by all local governments in the state with populations over 4,000, and requirements for solid waste disposal sites to collect materials for recycling.

Since 1994, AF&PA has performed a series of national surveys to measure the extent and track the growth of access to community paper and paperboard recycling. In 2021, AF&PA conducted the 2021 AF&PA Access to Recycling Study ("2021 Study") as an update to the last study AF&PA conducted in 2014.

[1] Advancing Sustainable Materials Management: 2018 Fact Sheet. EPA. November 2020.
[2] https://www.epa.gov/facts-and-figures-about-materials-waste-and-recycling/plastics-material-specific-data
[3] Advancing Sustainable Materials Management: 2018 Fact Sheet. EPA. November 2020.
[4] Advancing Sustainable Materials Management: 2018 Fact Sheet. EPA. November 2020

The 2021 Study measured curbside and drop-off community recycling programs provided through municipal or county governments, organized via contract or franchised through a private hauler, or available to residents via subscription services or privately operated drop-offs.

Materials Easily Justified for Inclusion in Commingled Recycling Collection Programs

In 2021, 85.7% of Oregonians had access to community curbside recycling programs and 35% of Oregonians had access to a drop-off recycling programs. The table below presents the survey results for categories in the 2021 Study for Oregonians who can recycle based on their access to curbside and drop-off recycling programs:

Percent of Oregonians Who Can Recycle Each Category Based on Availability of Curbside and Drop-Off Recycling Programs		
Material	**Curbside Access Rate**	**Drop-Off Access Rate**
Old Corrugated Containers (OCC)	83%	100%
Newspaper	82%	97%
Paperboard without poly	82%	81%
Paper bags	81%	93%
Magazines	80%	98%
Office paper	80%	97%
Mail	75%	97%
Paperboard with poly	49%	36%
Liquid packaging cartons	42%	15%
Pizza boxes	39%	66%
Foodservice packaging	2%	0%
Paper cups	0%	0%
Paper-padded mailers* *Not surveyed in 2021 Study*		

Curbside and Drop-off Recycling Access

Oregonians who have access to curbside recycling can overwhelmingly recycle seven of the categories shown in the chart above. For example, 81% of Oregonians who have access to curbside recycling can recycling paper bags. Similarly, to curbside recycling, Oregonians that have access to drop-off recycling programs have extremely high rates of recycling of paper and paper-based packaging. Seven of the categories in the have at least a 90% access rate for Oregonians who have access to a drop-off program.

The 2021 Study shows that local governments are already making residential curbside and drop-off recycling broadly accessible for the majority of paper and paper-based packaging categories.

Responsible End Markets

Oregon's Plastic Pollution and Recycling Modernization Act defines *responsible end market* as "materials market in which the recycling or recovery of materials or the disposal of contaminants is conducted in a way that benefits the environment and minimizes risks to public health and worker health and safety."

For those categories that are not currently accepted at as high a rate, like paper cups, foodservice packaging, poly-coated paperboard packaging, ice cream cartons, molded fiber containers and liquid packaging cartons, end markets also exist. For example, an AF&PA member mill in nearby Washington State sources Mixed Paper from Oregon to use in its mill. The mill successfully repulps and recycles the cups, foodservice packaging, poly-coated paper and liquid packaging cartons found in Mixed Paper into new products every day. Those categories provide high-quality fiber and recycling them from Mixed Paper extends the life of fiber that can be recycled into new products.

In addition to domestic consumption of recovered paper, recovered paper generated in the Pacific Northwest finds homes in export end markets. In 2021 the tonnage of recovered fiber exported from Oregon increased 166% over the prior year amount.

US Exports from Ports in Oregon in tonnage	2020	2021	% Change
Recovered Fiber Exports	4,419	11,766	166%

AF&PA believes that the DEQ should include all these categories in the proposed Statewide collection recycling list.

Foodservice, Food Contact Packaging and Contamination

AF&PA is aware there are some concerns about contamination of paper-based packaging like pizza boxes, cups and foodservice packaging. In 2020, WestRock, an AF&PA member company, conducted a mill study on how cheese and grease associated with pizza boxes impacted their repulpabilitiy and recyclability. The study was a continuation on an initial survey on pizza box recyclability done by AF&PA in 2019.

The WestRock study found neither cheese or grease negatively impacted repulpability, performance on the paper machine or finished product quality at typical levels of presence expected to be received in the recovery stream at MFRs and when included in the recovered fiber at expected levels of concentration in furnish at mills.

In addition, in 2013 and 2014, The Foodservice Packaging Institute conducted studies in Boston, MA and Delaware to determine whether food service packaging (e.g., pizza boxes, coffee cups, paper clamshells) and food contact packaging (e.g., cereal boxes, noodle boxes, ice cream packages) set out for recycling was more contaminated with food residue than food contact packaging that has traditionally been accepted at single stream MRFs. The studies found that "there is no appreciable difference in the amount of contamination between foodservice packaging and broader types of food packaging typically accepted in residential curbside programs….an initial indication that food contamination is a perceived rather than real barrier to residential recycling of foodservice packaging."

Paper Padded Mailers

In addition, in 2021 AF&PA surveyed its members on the recyclability of paper-padded mailers. AF&PA members overwhelmingly agreed that the mailers can be recycled. Based on the results of the mill survey, the industry crafted the following recyclability statement:

> "Paper padded mailers are widely accepted by AF&PA member company mills in an amount normally found in Old Corrugated Containers (OCC) and/or Mixed Paper bales generated in residential curbside recycling programs. We encourage communities to include paper padded mailers among the paper-based packaging items accepted in their residential recycling programs."

Statutory Criteria

Section 22 of the Recycling Modernization Act specifies 11 criteria when determining whether a material should be included in one of the state's lists of materials to be recycled. Based on the data above and current recycling practices in Oregon, AF&PA believes that paper and paper-based packaging have stable and responsible end markets, a continual stream of material going into the system, is compatible with Oregon's existing recycling infrastructure, and contamination in foodservice packaging does not affect the yield loss for the material during the recycling process.

Because of this, AF&PA believes that the DEQ should include all of these categories in the proposed Statewide collection recycling list.

Producer-collected materials list [per Section 22(1)(b)]

Section 22 of Oregon's The Plastic and Recycling Modernization Act requires the Environmental Quality Commission to identify two lists of materials under consideration: Statewide Collection Recycling and Producer-collected Materials lists.

Oregon defines producer-collected materials as materials that are largely incompatible with commingled processing systems, thereby requiring separate collection and handling in "which a producer responsibility organization must provide for the collection through recycling depot or mobile collection events as provided in section 15 of the Act.

The producer-collected materials list can be an effective policy tool for products that are difficult to process, have low recycling rates, or where healthy end markets do not exist; but none of these issues apply to paper and paper-based packaging.

AF&PA believes that paper and paper-based packaging should not be added to the producer-collected materials list.

The paper recycling rate has grown over decades, and remained consistently high, meeting or exceeding 63 percent since 2009. In 2019, the recovery rate for all paper was 66.2 percent and in 2020 – an unprecedented year of shutdowns, business changes, and temporary recycling halts – the recovery rate only decreased half a point to 65.7 percent. This speaks to the strength and resilience of the paper and paper-based packaging recovery.

As part of industry efforts to continue improving recyclability and recovery rates, on March 2, 2021, AF&PA released a new tool, the Design Guidance for Recyclability, which is a data-driven resource to aid packaging designers and brands in the design and manufacture of packaging to meet recyclability goals. The report contains research-based findings on the recyclability of corrugated packaging; bleached paperboard cartons; recycled/unbleached boxboard cartons; carrier board cartons; Kraft paper bags; multiwall paper shipping sacks; and molded fiber containers.

Being a "Challenge" to Recyclability Does Not Mean "Not Recyclable"

Something becomes a "challenge" in a mill when it impedes mill operations. For example, something may slow down a mill's pulping process, plug screening systems or leave residue on finished paper or paperboard.

<u>Being a "challenge" does not make something not recyclable</u>. The ease of recyclability depends on a mill's capability. It is important to note that each non-fiber element applied to each kind of packaging covered in the Design Guidance for Recyclability report was rated by some mills as not a "challenge"/able to be recycled.

Much of that determination is dependent on the type of fiber to which the element is attached. In addition, the impact varies based on each mill's repulping capability. Some mills are extremely sophisticated and as investments continue to be made to improve paper recycling, we can expect to see changes in the impact of non-fiber elements on different types of packaging.

Conclusion

AF&PA appreciates the opportunity to submit these comments in response to the Oregon Department of Environmental Quality request for comments on the implementation of Section 22 of Oregon's Plastic Pollution and Recycling Modernization Act.

We believe that all paper and paper-based packaging products can be easily recycled in Oregon's statewide collection recycling system.

We would appreciate any opportunity to discuss further and would be more than happy to share additional information on the recyclability of paper and paper-based packaging products.

Please contact me at Terry_Webber@afandpa.org or 971-235-8816 if you have any questions.

Sincerely,

Terry Webber
Vice President, Industry Affairs
AMERICAN FOREST & PAPER ASSOCIATION

AMERIPEN™

The power of packaging in balance.

March 22, 2022

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RE: Oregon Statewide Recycling Collection List and Producer-Collected Materials (For Recycling)

Dear Mr. Allaway,

AMERIPEN – the American Institute for Packaging and the Environment – is pleased to submit these comments in response to the Oregon Department of Environmental Quality Request for Information on the implementation of Section 22 of Oregon's Plastic Pollution and Recycling Modernization Act.

AMERIPEN is a coalition of stakeholders dedicated to improving packaging and the environment. We are the only material neutral packaging association in the United States. Our membership represents the entire packaging supply chain, including materials suppliers, packaging producers, consumer packaged goods companies and end-of-life materials managers. We focus on science and data to define and support our public policy positions and our comments are based on this rigorous research rooted in our commitment to achieve sustainable packaging, and effective and efficient recycling policies. We have several member companies with a significant presence in Oregon, and many more who import packaging materials and products into the state. The packaging industry supports more than 18,000 jobs and accounts for $5.45 billion in total economic output in Oregon.

Section 22 of Oregon's Plastic Pollution and Recycling Modernization Act requires the Oregon Environmental Quality Commission to identify two lists of materials by administrative rule – the Statewide Collection Recycling List and the and Producer-Collected Materials List. Our comments will be broken down into recommendations for both.

Additional materials to be considered for the Statewide Collection Recycling List

Oregon defines the Statewide Collection Recycling List as "materials collected to provide the opportunity to recycle". This refers to on-route and drop-off recycling collection opportunities provided by all local governments in the state with populations over 4,000, and requirements for solid waste disposal sites to collect materials for recycling. Using this definition, and access data from the 2020-21 Sustainable Packaging Coalition (SPC) Centralized Study on Availability of Recycling, AMERIPEN

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believes that all the following materials (products) can be easily collected and recycled into Oregon's statewide collection recycling system.[1]

Package Type	Access Rate
Aluminum Beverages	89%
Corrugated Boxes	88%
PET Beverage Bottles, Jugs and Jars	87%
HDPE Bottles, Jugs and Jars	87%
Steel Food Cans	87%
Paperboard Boxes	84%
Glass Beverage Bottles and Containers	76%
Aluminum Food Cans	75%
PP Bottles, Jugs and Jars	72%
LDPE Bottles, Jugs and Jars	70%

We note that U.S. Federal Trade Commission (FTC) Green Guides defines recyclable, in part, as material where 60% of the public has access to recycling. As the only quantitative metric defined in the Green Guides, access is believed to be indicative of the recycling systems ability to collect, sort and reprocess materials. While these numbers are related to federal access and not specific to Oregon, all the materials we have listed here exceed the 60% access rate thereby permitting for some flexibility to state specific differences.

While the FTC declares access as the primary means through which companies can make recyclable claims, AMERIPEN recognizes that there is increasing interest in other parameters to ensure that materials that are collected are actually used in end markets. We recognize Section 22 of Oregon's Plastic Pollution and Recycling Modernization Act requests information on additional parameters such as stable and mature end markets, compatibility with existing infrastructure, and practicalities of sorting and storing. Oregon's interest aligns with industry desires to better define recycling as a system of independent but interconnected actions. For that reason, we have identified and offer materials (products) below the 70% national access rate as materials for additional consideration and we provide data on additional parameters to help outline the systemic nature of recyclability and the promise of these materials.

Additional materials not yet widely recycled that we believe should be considered include:

- Aseptic cartons
- Aerosol containers (aluminum and steel)
- Paper-padded mailers
- Pizza boxes and other food contaminated paperboard packaging

[1] Sustainable Packaging Coalition. 2020-21 Centralized Study on Availability of Recycling (2022)

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- Polyethylene terephthalate (PET) cups and thermoforms
- Polycoated paperboard
    - Ice cream containers
    - Cups
    - Foodservice containers
    - Other
- Polypropylene (PP) tubs and other containers

Aseptic Cartons

Curbside and Drop-off Recycling Access

Data from the Carton Council indicates the following access rates for cartons within Oregon. [2]

Package Type	Access Rate
Aseptic Cartons	37% (curbside) 10% (drop off)

Responsible End Markets

Cartons have three different end markets for their products. Cartons can be sold as part of a mixed bale of paperboard, part of polycoated paperboard only bale or sold as Grade #52—a carton-only bale. There are currently five North American mills that accept Grade #52 bales and all still have excess capacity to absorb more. Additionally, West Coast markets are successfully selling grade #52 bales to three international locations in India, South Korea and Thailand. Almost all domestic mills purchase either mixed paper or polycoated paperboard grades.

Collection, Sortation and/or Anticipated Yield Data

With slightly less than half of Oregon consumers having access to carton recycling, we are confident that the process to collect and sort cartons is viable within the state. As the Carton Council continues to work with communities to help invest in technologies and education to help improve the sortation of cartons, we believe volume can continue to increase.

Material yields are dependent upon the final end market, but data from the Carton Council indicates that Grade #52 bales used for building materials can achieve 100% usage. A Grade 52 bale for tissue and toweling captures an estimated 67-70% of the total package with 80-95% of the fiber used. Similar numbers are reflected in Grade 52 bales used for de-inked pulp. Mixed bales sold to tissue and toweling have the smallest yield outcome with 50-60% of the total package used in reprocessing.

If Grade #52 bales can be processed by Oregon material recovery facilities (MRFs), Carton Council data indicates there is still room to increase capacity of these end markets by 50% or more.

[2] Per email from Carton Council 03-19-2022

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Ongoing Activity to Support Recycling of these Materials by Industry

The Carton Council offers education and grants to help increase aseptic recycling across the U.S. Aseptic cartons can either be hand sorted or through automatic by utilizing either optical or robotic sortation. Material recovery facilities (MRFs) that are interested in recycling these materials are offered support both in identifying the best approach for sortation but then also with grants and training to help purchase and implement these new processes with success. Additionally, the Carton Council works with MRFs who have low carton volumes and cannot make an LTL (less than truckload).

Polycoated Paperboard

Curbside and Drop-off Recycling Access

Data from the American Forest and Paper Association (AF&PA) indicate the following access rates for polycoated paper materials within the State or Oregon.[3]

Package Type	Access Rate
Polycoated paperboard	49% (curbside) 36% (drop off)

Responsible End Markets

End markets for paper-based products are expected to continue to grow. Paper-based materials that have not historically been part of the bulk of fiber yields are advancing as mills seek new sources of inputs. AF&PA reports that between 2019 and 2021 U.S. paper, packaging and pulp producers have committed more than $5 billion in new manufacturing capacity specifically designed to use recovered paper. This increased manufacturing capacity is expected to consume an additional 8 million tons of recovered paper per year.

The Food Service Packaging Institute (FPI) notes that currently 33 different mills between the U.S. and Canada accept post-consumer polycoated board. Mills will purchase it either as a unique polycoated board grade or as part of a mixed paper bales. There is a mill in nearby Washington State that sources mixed paper from Oregon. The mill successfully repulps and recycles cups, foodservice packaging, poly-coated paper, and liquid packaging cartons found in mixed paper into new products every day. Its proximity to Oregon indicates less environmental impact in terms of transit

Collection, Sortation and/or Anticipated Yield Data

Polycoated paperboard can be flat or shaped into a 3-dimensional container format such as cups or ice-cream cartons. MRF flow studies undertaken by FPI indicate that on average one quarter of cups will flow to the fiber line as they are crushed during collection and sortation with the reminder three quarters flowing towards container lines where they can either be hand sorted or redirected as a result

[3] AF&PA. 2021 AF&PA Access to Recycling Study (2022)

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of optical or robotic sortation.[4] Since there are two different bale specs for this paperboard (polycoated only) or mixed, direction to either line does not tend to create challenges. Yield varies widely amongst mills based upon their processes and technologies. Based upon information reported by FPI's mill task force yield from polycoated containers is within 70% to 90%.[5]

Ongoing Activity to Support Recycling of these Materials by Industry

Both AF&PA and FPI perform regular studies with mills and communities to access the recyclability of their paper-based products. Most commonly what they have found is that recyclability relies more on the technical equipment and skills of the specific mills rather than as a material specific issue. As the industry continues to support research and best practices, we expect access and recyclability to continue to advance.

Several FPI members have supported cup recovery efforts by offering MRF equipment grants and market development support. Some of their efforts overlap and further support initiatives with the Carton Council to help ensure increased polycoated carton recovery.

Paper-Padded Mailers

Curbside and Drop-off Recycling Access

Paper-padded mailers are a relatively new innovation within the packaging space. As a result, data on access and inclusion into curbside programs has not yet aligned with the adoption of this new packaging format. 2020 and 2021 studies on access rate did not measure paper-based mailers.

Responsible End Markets

To assess the potential for paperboard mailers to be included in curbside programs, in 2021, AF&PA surveyed its members on the recyclability of paper-padded mailers[6]. Mills overwhelmingly agreed that the mailers can be recycled. Per the Institute of Scrap Recycling Industries (ISRI), paper-based mailers are considered acceptable input for either old corrugated cardboard (OCC) or mixed paper bales. These are two widely purchased bales in mills across the US. The AF&PA study concludes: "*We encourage communities to include paper padded mailers among the paper-based packaging items accepted in their residential recycling programs*."[7]

As more curbside programs begin to recognize the benefits and pulpability of this format, we believe access will quickly grow.

[4] RRS, MRF Material Flow Study (2015)
[5] Email from FPI 3-21-2022
[6] AF&PA On Padded Paper Mailers (2022)
[7] Ibid

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Collection, Sortation and/or Anticipated Yield Data

Although, to the best of our knowledge, no yield study has been undertaken on paper-based mailers per se, interpreting from the AF&PA Mill study, we assume mailers can flow through the system and be directed accordingly to OCC or mixed paper bales, and therefore yield rates for these materials are likely to be high.

Ongoing Activity to Support Recycling of these Materials by Industry

AF&PA performs regular studies with mills and communities to access the recyclability of their paper-based products. Most commonly what they have found is that recyclability relies more on the technical equipment and skills of the specific mills rather than as a material specific issue. As the industry continues to support research and best practices, we expect access and recyclability to continue to advance.

Pizza Boxes and Other Food Contaminated Paperboard Packaging

Curbside and Drop-off Recycling Access

Data from the American Forest and Paper Association (AF&PA) indicate the following access rates for pizza boxes within the state. [8]

Package Type	Access Rate
Pizza Boxes	29% (curbside) 66% (drop off)

Responsible End Markets

Pizza boxes can be sold in either OCC or mixed paper bales.

A 2020 study by WestRock found neither cheese or grease negatively impacted repulpability, performance on the paper machine or finished product quality at their mills.[9] In 2013 and 2014, FPI conducted studies to determine whether food service packaging (e.g., pizza boxes, coffee cups, paper clamshells) and food contact packaging (e.g., cereal boxes, noodle boxes, ice cream packages) set out for recycling was more contaminated with food residue than food contact packaging that has traditionally been accepted at single stream MRFs.[10] The studies identified that: *"there is no appreciable difference in the amount of contamination between foodservice packaging and broader types of food packaging typically accepted in residential curbside programs….an initial indication that food contamination is a perceived rather than real barrier to residential recycling of foodservice packaging."*

[8] AF&PA 2021 AF&PA Access to Recycling Study (2022)
[9] WestRock, Incorporation of Post-Consumer Pizza Boxes in the Recovered Fiber Stream (2020)
[10] Per email from AF&PA 03-18-22

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Collection, Sortation and/or Anticipated Yield Data

To the best of our knowledge, no yield study has been undertaken on pizza boxes per se, but if we interpret the WestRock and FPI studies to indicate no appreciable challenge in recycling this material, we assume that food contaminated boxes can flow through the recycling system and be directed accordingly to OCC or mixed paper bales, the yield rates for these materials must be relatively high.

Ongoing Activity to Support Recycling of these Materials by Industry

Both AF&PA and FPI perform regular studies with mills and communities to access the recyclability of their paper-based products. Most commonly what they have found is that recyclability relies more on the technical equipment and skills of the specific mills rather than as a material specific issue. As the industry continues to support research and best practices, we expect access and recyclability to continue to advance.

Aerosol Containers – Aluminum and Steel

Curbside and Drop-off Recycling Access

Data from the 2020-21 SPC Centralized Study on Availability of Recycling, indicate the following access rates for the aerosol containers. [11] Aerosol containers meet the FTC Green Guides threshold for recyclable claims.

Package Type	Access Rate
Aerosol Containers	61% (Steel); 62% (Aluminum)

Responsible End Markets

i. Aerosol Containers--Aluminum

Demand exceeds supply for mixed aluminum. Research for the aerosol container industry by RRS indicates "most secondary end-markets are eager for material and willing to work with potential suppliers to unlock new sources."[12]

Although there is not an ISRI bale specification, mixed aluminum is often collected in open-top containers and then sold to either directly to one of two end markets: 1) Deox – a critical additive to steel making which helps to replace virgin material) or 2) RSI – melted into an ingot and then mixed with other materials to make a new product. Both end markets are stable and well-established.

[11] Ibid
[12] Resource Recycling Systems. Surveying State of MRFs and End Market Barriers to Recycling Steel and Aluminum Aerosols and Pet Food Cans and Identification of Solutions. 2021

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ii. Aerosol Containers – Steel

Steel aerosol containers also have stable and established end-markets. They can be readily added to steel bales at MRFs without any sortation concerns. Steel end-markets have national reach since 40 of 50 states (including Oregon) have electric arc furnaces capable of melting down steel cans, including aerosols. RRS research states, *"There is ample capacity for steel mills to absorb higher volumes of steel from scrap managers across the country."*[13]

Collection, Sortation and/or Anticipated Yield Data

Aerosol containers are widely collected and sorted within the majority of U.S. based MRF's based upon widely adopted and long-established technology. Eddy stream currents and magnets, in addition to their solid 3-dimensional shape result in an estimated 95% effective sortation rate for both aluminum and steel aerosol containers.

Ongoing Activity to Support Recycling of these Materials by Industry

In response to some concern that unemptied aerosol containers may pose safety concerns, the industry studied the potential risks that aerosol containers may pose in the recycling stream.[14] The study found that the likelihood of an accident was very low. This study led to development of additional guidelines and educational resources to capitalize on the opportunity to recycle these containers safely.

The aerosol industry has invested heavily in developing and promoting resources to educate the public that they can recycle empty aerosol containers and to increase overall recycling rates.

Polyethylene Terephthalate (PET) Cups and Thermoforms

Curbside and Drop-off Recycling Access

Data from the 2020-21 SPC Centralized Study on Availability of Recycling, indicate polyethylene terephthalate (PET) cups and thermoforms (clamshells, trays etc.) have a national access rate around 54% – just slightly below the 60% FTC threshold rate. [15]

Package Type	Access Rate
PET Clamshells, Tubs, Trays, and Cups	54%

[13] Resource Recycling Systems. Surveying State of MRFs and End Market Barriers to Recycling Steel and Aluminum Aerosols and Pet Food Cans and Identification of Solutions. (2021).
[14] Kumar R. Bhimavarapu and Dimitrios M. Karydas. Recycling Aerosol Cans: A Risk Assessment. Factory Mutual Research Corporation. (April 1996).
[15] Sustainable Packaging Coalition. 2020-21 Centralized Study on Availability of Recycling (2022)

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Responsible End Markets

As demand for post-consumer PET grows[16], there is increased interest in capturing thermoforms and cups to help supplement volume. Currently PET thermoforms and cups can be sold as part of mixed PET bottle and thermoform bale or as a thermoform only bale. Over 14 different reprocessors across Canada and the U.S. will accept PET thermoforms in one or both formats. Additionally, Republic Service's recent announcement of a new plastics recycling facility in Las Vegas will further increase demand for this material as they offer the capacity of 65 million lbs. per year of PET.[17]

Chemical recycling is also an emerging market, with Eastman's facility in Kingsport, Tennessee expressing interest in taking all formats and colors of PET for their 2023 launch.

PET has one of the more diverse end markets of the plastics resins, with demand for this material existing in the textiles, packaging and building material sectors.

Collection, Sortation and/or Anticipated Yield Data

According to a 2015 MRF study commissioned by FPI, 61% of PET clamshells and 77% of PET cups made it to a target PET bale. Losses tend to occur when these three-dimensional shapes are flattened during the collection and sortation process and then redirected to paper lines. As an increasing number of MRFs have upgraded equipment since 2015 and additional; funding for increase optical or robotic sortation becomes available, this yield is expected to increase.

Ongoing Activity to Support Recycling of these Materials by Industry

FPI's Community Partnership Program and industry specific research works directly with residential recycling programs to evaluate and increase access to recycling for many foodservice items.

Additionally, The Recycling Partnership (TRP) launches a PET recovery working group in March 2022 to help identify best practices to increase PET recovery of all formats.

Polypropylene (PP) Tubs and Other Containers

Curbside and Drop-off Recycling Access

Data from the 2020-21 SPC Centralized Study on Availability of Recycling indicate the following access rates for polypropylene (PP) tubs, cups and containers.

Package Type	Access Rate
Polypropylene Tubs and other containers	59%

[16] Both from voluntary goals but also increasing state recycled content mandates
[17] Resource Recycling Republic Services Move to Vertically Integrate in Plastics (March 2022)

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Phone: +1 651-288-3431

We note that national access is just slightly below the FTC 60% threshold and given the increase demand for this material by end markets, it is likely to exceed 60% in the very near future.

Responsible End Markets

With the rise of voluntary goals, state recycled content mandates and growing chemical recycling capacity, demand for recycled polypropylene markets is poised to grow. PP tends to be sold in one of two different bales type – either as a polypropylene only bale or as a mixed plastics bale. There is no distinction within these markets between tubs or cups and containers. At the current time there are 17 different re-processors who will put polypropylene in either bale format.
While the majority of these PP reprocessors are based in the East Coast, it should be noted that there are two emerging reprocessors in Oregon looking to source PP Bales: Denton Plastics and Green Rhino.

Polypropylene is also an emerging feedstock for chemical recycling and agreements between companies like Berry Plastics, Wendy's and Lyondell Basel who are establishing upfront commitments to use and process specific volumes of post-consumer polypropylene plastics.

Collection, Sortation and/or Anticipated Yield Data

FPI's 2015 MRF Flow study indicates that PP cups and containers have a high rate of capture. PP products appear to hold their 3-dimensional shape rather well, increasing their direction to the correct container lines. Depending on technology, MRFs were losing between 3-10% of PP containers to paper lines. As noted with PET, any investments in improving paper lines to better captured crushed plastics that are misdirected will further increase yield.

Ongoing Activity to Support Recycling of these Materials by Industry

FPI's Community Partnership Program and industry specific research works directly with residential recycling programs to evaluate and increase access to recycling for many foodservice items, including polypropylene.

Additionally, the Recycling Partnership has launched an established PP recovery working group to help identify best practices to increase PP recovery of all formats.

Additional Materials to be Considered for Producer-Collected Materials lists

Oregon defines materials to be considered for the producer-collected materials list as materials that are largely incompatible with commingled processing systems, thereby requiring separate collection and handling in *"which a producer responsibility organization must provide for the collection through recycling depot or mobile collection events as provided in section 15 of the Act."*

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We believe the following should be considered for the producer collected materials list

- Polystyrene

Curbside and Drop-off Recycling Access

Data from the 2020-21 SPC Centralized Study on Availability of Recycling[18]indicates rigid polystyrene materials (EPS) are generally collected 45% rate curbside.

Package Type	Access Rate
Rigid Polystyrene[19]	45%

The EPS Industry Alliance (EPSIA) notes that 55 communities in the U.S. offer curbside recycling access for expanded polystyrene (EPS), with an additional 214 drop off locations. In Oregon alone there are five drop off locations in Tigard, Salem, and Eugene.

Given the high demand for EPS in commercial sales, measuring recycling based on consumer curbside access may be misleading in this case.

Responsible End Markets

Tigard, Oregon is home to Agilyx, the first U.S. chemical recycling facility for EPS. As of July 2021, Agylix has converted more than 4,400 tons of mixed waste plastic and polystyrene waste and plans to continue growth. Demand is there if we can gather EPS.

Collection, Sortation and/or Anticipated Yield Data

The low weight, high bulk of EPS tends to discourage many residential communities from collecting this materials. But where drop off programs exist, or commercial collection is possible, the use of densifiers has significantly improved the economics and interest in collecting and recycling this material.

By collecting via drop-off or through commercial partners, EPS does not face challenges other materials have in running through a MRF sortation line.

We are not aware of any data on yield.

Industry Support for Recycling of these Materials

There are several industry-supported efforts to increase EPS recycling. There are six MRFs in the U.S. that have recently adopted a turnkey EPS recycling system that minimizes sortation problems and

[18] Ibid
[19] Please note that Carton Council data on aseptic cartons access is specific to Oregon access. Federal access is slightly higher.

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significantly reduces storage space. The system consistent of a refurbished freight container that houses a low volume densifier and handling materials.

To help maintain feedstock, Agylix has developed the Cyclyx consortium to build off their insights from drop off and collection programs to help gather increased feedstock for both their facilities as well as other emerging chemical recyclers. They also host several collection programs with communities and corporations

EPSIA as well as DART Container also offer grant programs to help place densifiers within community spaces, or corporations.

End markets and access to EPS recycling continues to grow. We believe Oregon DEQ should recognize this material as a promising market with a state-based recycler within.

Conclusion

AMERIPEN appreciates the opportunity to submit this letter. In trying to address all the various materials our members produce, we refer you as well to our peer trade associations who we understand have also submitted information and are able provide much greater detail the recyclability parameters associated with their specific material.

AMERIPEN welcomes any inquiries regarding this submission, and we would be happy to help facilitate further dialogues with our material specific peers.

With appreciation,

Dan Felton
Executive Director

CARTON COUNCIL

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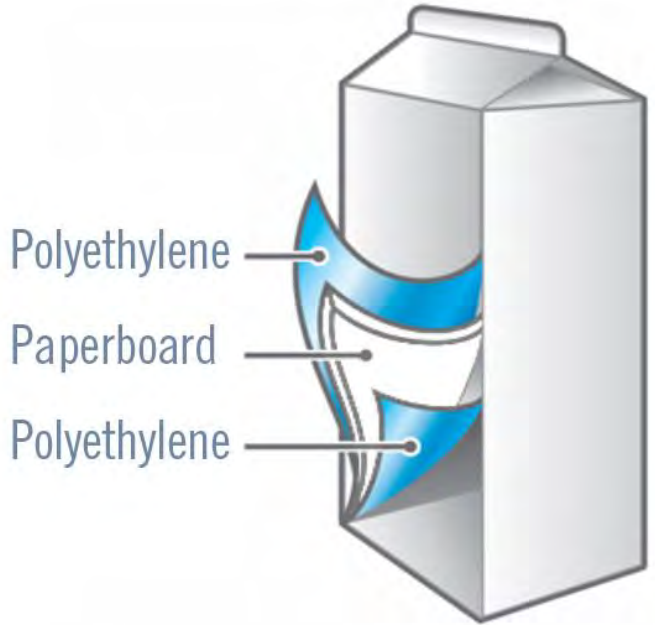
Oregon RFI Response

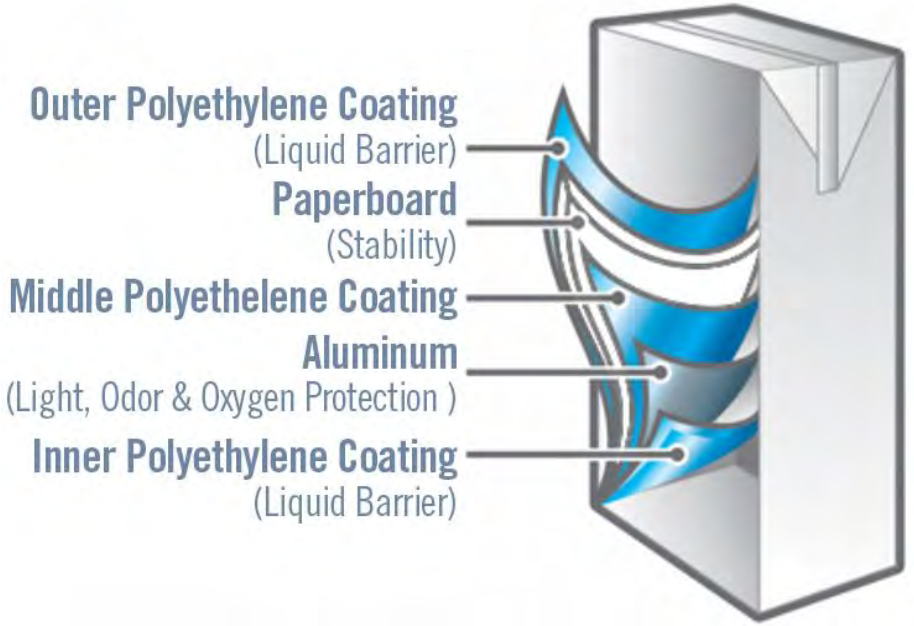
March 20, 2022

Carton design provides protection against light, air and harmful bacteria

Refrigerated “gable top”



Shelf stable “aseptic”



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Who is the Carton Council

- Composed of four leading carton manufacturers, Elopak, Pactiv Evergreen, SIG Combibloc, and Tetra Pak, the Carton Council formed in 2009 to deliver long-term **collaborative solutions** to divert valuable cartons from the landfill.

- Through a united effort, the Carton Council is committed to expanding carton recycling nationwide.

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Carton Council Strategy

OUR ULTIMATE GOAL: Increase the carton recycling rate and decrease the amount of cartons going to landfills or becoming litter

OUR OBJECTIVES:

- Expand Access
- Increase Participation

STRATEGIES FOR ACHIEVING:

- Provide counsel and resources to MRFs to encourage sorting of Grade #52 cartons
- Engage with recycling facilities/officials
- Support implementation of school recycling programs
- Partner with stakeholders/advocates
- Foster the development of solid end markets
- Educate consumers
- Encourage company/brand involvement
- Participate in legislative discussions

Cartons are increasingly used in markets that are diverse, stable and expanding

Cartons are a feedstock in end markets totaling $335B

- Building Products
  - Roofing board — $20B US Market
  - Wall board — $14B US Market
  - Exterior sheathing — $7B Global Market
  - Ceiling tiles — $2B US Market
- Tissue and Toweling
  - Tissue and toweling — $250B US Market
- Deinked Pulp
  - Market pulp — $7B Global Market
- Board, Packaging and Toweling Market– as mixed paper furnish
  - Paper mills — $35B US Market

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Carton end markets: yield and size

Recycling end market:	Building materials	Tissue and Toweling	De-ink pulp	Tissue Toweling/Packaging
Grade consumed as:	Grade 52	Grade 52	Grade 52	Mixed
% yield for entire package	100%	67-70%	67-70%	50-60%
% yield for fiber content	100%	85-90%	85-90%	65-80%
% yield for poly & polyAl content	100%	0%	0%	0%
What happens to poly & polyAl residual	Poly and PolyAl residual becomes part of end product.	Poly & PolyAl residual is either landfilled or captured and used as waste to energy.	Poly & PolyAl residual is either landfilled or captured and used as waste to energy.	Poly & PolyAl residual is either landfilled or captured and used as waste to energy.
Existing end market viability:	11,000 tpy capacity	15,000 tpy capacity	20,000 tpy capacity	est. 75,000 tpy capacity
Long term end market viability:	Potential growth capacity estimated at 200,000 tpy	Potential growth capacity estimated at 20,000 tpy	Potential growth capacity estimated at 50,000 tpy	Significant growth potential

These numbers are based on information received from mills in various parts of the US and Canada and Mexico as well as some mills overseas.
Due to the proprietary nature of this information, we are unable to provide further specifics as many recyclers were not willing to share more detailed information.
Some expressed an openness to connecting directly with DEQ.

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Grade 52/Mill Spec Poly Markets

Mixed Paper & Grade 52/Poly Markets

End Markets: validation

- Attached to this submission are letters from Kimberly Clark of Mexico, one of the end-markets for cartons, and Omnisphere, a broker that moves bales of materials including cartons.

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Environmental health and safety considerations

- Please refer to Elopak's, Pactiv Evergreen's, SIG Combibloc's, and Tetra Pak's comprehensive sustainability reporting for information on environmental health and safety.
- Additionally, please refer to Tetra Pak's alignment with the Global Reporting Initiative.

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Compatibility with existing Oregon recycling infrastructure

- Slightly less than half the households* in Oregon have access to carton recycling:
  - 37% have access through curbside recycling
  - 10% have access through drop off recycling
- Once collected, cartons are either sorted into Grade 52 or into Mixed Paper to be sent on for recycling.
- Carton Council's grant program for MRFs can help to offset the capital costs of equipment needed to sort cartons.
  - Carton Council has been engaged with and continues to look for other opportunities to increase access to carton recycling in more parts of the state of Oregon.

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*Household access data is from CCNA database managed by a third-party organization.

Cartons available for recycling per EPA

- The estimated quantity of gable-top and aseptic cartons generated in the US is 10.5 lbs/household/year[1]. At this generation rate, Oregon households would generate roughly 8,000 tons of cartons per year.
- Carton Council estimates that cartons should make up 0.5% - 1% of the inbound material stream of a typical MRF that accepts cartons for recycling. Based on this MRF composition, the quantity of cartons available to be recovered in Oregon would be between 4,000-8,000 tons annually[2].

1. US EPA, *Advancing Sustainable Materials Management: Facts and Figures 2018*

2 Oregon DEQ, *2019 Material Recovery and Waste Generation Rates Report*.

Other calculations by RRS.

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The practicalities of sorting and storing the material

- Cartons can be sorted into either PSI Grades spec 52 (Post Consumer Aseptic and Gable Top Cartons), or into a mixed paper grade along with other paper and packaging.
  - While Carton Council promotes the sortation of cartons into Grade 52, it is ultimately the decision of the MRF and their end markets as to which stream they chose to direct cartons for recycling.
- When sorting cartons into grade 52 at the MRF; cartons can be sorted by hand or using automation such as optical sortation and robotic sortation. Carton Council has a well-established grant program for MRFs to help procure the necessary equipment to accept and sort cartons. Carton Council also provides technical expertise to help MRFs find the best sorting solution.
- Carton Council has experience in working with MRFs on LTL (less than truckload) solutions where baled carton volumes might be lower. Carton Council would be willing to investigate similar solutions where appropriate in Oregon.

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Contamination

- Contamination can be present in all material used for food and beverage packaging, including metal cans, plastic bottles, jugs, tubs and jars, and glass bottles and jars, as well as cartons.
- Contamination present in carton packages could include food material, liquids, and straws (specific to juice boxes).
- Carton Council provides simple recycling education to improve consumer preparation, emphasizing the steps of emptying, placing in the recycling bin without flattening, and attaching caps. These steps align with the consumer directions for recycling packages such as PET bottles, HDPE jugs, etc.
- Carton Council provides comprehensive materials to be used in school recycling programs, featuring the "Drink, Empty, Recycle" message, as well as educational materials that students can take home to reinforce the lessons around recycling preparation with their families.
- Plastic components (caps and straws) are intended to be reattached or pushed into the carton package. This prevents them from potentially being lost as litter or residue. At the end market, the plastic components become part of the polyAl fraction as described on page 6, and may become part of an end product, used for energy production, or landfilled.

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The ability for waste generators to easily identify and properly prepare the material

- Carton Council provides extensive educational material on carton recycling, including visual and video content. All materials are available for recycling program use via www.cartonopportunities.org
- Carton Council has been an industry leader in conducting research with consumers on how they make the decision to recycle, what steps go into making behavior changes, and their perceptions of recycling. Findings from this research have been published in numerous trade articles, including those linked below.

- Study: Decision to recycle is only the first step
- Consumers Aren't Making Connection Between Recycling and Creating New Products
- Show don't tell when it comes to reminding consumers to recycle
- Additional publications and media coverage can be found at https://cartonopportunities.org/carton-news

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Economic factors

- Carton Council's grant program for MRFs helps to support the capital costs of equipment used to sort cartons.
  - Carton Council can also provide technical expertise to help MRFs find the best sorting solution.
- Carton Council has provided grant funding to almost 100 MRFs nationwide since it was established.
- While the economic factors vary from MRF to MRF, cartons can be a valuable product for MRFs to accept and sort into Grade 52 or as part of mixed paper.

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Environmental factors from a life cycle perspective

- From a life cycle perspective, cartons represent a lightweight and efficient packaging choice with a high product-to-package weight ratio. When analyzed, cartons have been found to only produce between 17%-40% CO2E emissions on a normalized basis, e.g., per 1,000 liters of product versus traditional comparable packaging formats, such as PET bottles, glass bottles, and steel cans.

- Please refer to the following LCA references:
  - US-based study for Tetra Recart: LCA: Soup in Tetra Recart carton packages (tetrapak.com)
  - Wine container systems: Life cycle inventory of container systems for wine (tetrapak.com)
  - Milk container systems: ELOPAK NORTH AMERICA: TOWARDS A SUSTAINABLE FUTURE LCA, NOVEMBER 2021 (attached)

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Thank you

- The CCNA organization appreciates your time reviewing the submitted information and we welcome the opportunity to further discuss carton recycling in Oregon.

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Kimberly-Clark de México, S.A. de C.V.

Date: March 9, 2022

Mr. David Allaway
Oregon Department of Environmental Quality

Dear Sirs,

Kimberly-Clark de Mexico (KCM), at our recycled tissue mill in Ecatepec, has been a consumer of fiber from aseptic cartons for several years. In 2017, after doing equipment modifications, we began to use ISRI Grade 52 (Post-Consumer Aseptic and Gable Top Cartons) from the US and Canada as part of our raw material. This grade is a good source of fiber for our recycled tissue products being produced at our Ecatepec mill.

Lic. Marco Antonio Jiménez Ríos
Purchasing Manager (Recycled Fibers)
Kimberly Clark de México S.A. de C.V.

Oficinas Administrativas

Jaime Balmes No. 8, Piso 9
Polanco, 11510 México, D.F.
Tel: (55) 5282-7273

OMNISPHERE CORPORATION

March 11, 2022

Mr. David Allaway
Oregon Department of Environmental Quality

Dear Mr. Allaway,

My name is Alexander F Valdes, and I am the president of Omnisphere Corporation. We are a trading company with 48 years of experience marketing waste paper from all 50 states to Paper Mills that manufacture recycled tissue and toweling. One of our primary customers is the Kimberly-Clark de Mexico (KCM) paper mill in Ecatepec, Mexico. This paper mill uses waste paper, including ISRI Grade 52 (Post-Consumer Aseptic and Gable Top Cartons), as part of its paper-making raw material.

In 2017, after equipment modifications, the Ecatepec mill began using ISRI Grade 52 from the US and Canada, and they have been a consistent monthly buyer of this grade. We believe that this interest will continue in the foreseeable future, as KCM sees value in the fiber contained in Grade #52.

We would welcome the opportunity to source ISRI Grade 52 from Oregon.

Alexander F. Valdes
President

9950 SW 107th Avenue, Suite 100
Miami, Florida 33176 Tel: 305 388 4075 Fax: 305 388 5380

ELOPAK NORTH AMERICA

TOWARDS A SUSTAINABLE FUTURE
LCA NOVEMBER, 2021

PRESENTATION TO THE NACC
(NORTH AMERICAN CARTON COUNCIL)
MARCH 3RD, 2022

ELOPAK

LCA MAIN OBJECTIVES

- Compare the environmental profiles of primary packaging for fresh milk and juice in USA and Canada
- Identify significant contributions to the environmental impacts across the product lifecycle (Cradle to grave)
- Identify possible improvement areas of the studied systems

ELOPAK AMERICAS LCA – MAY 2021

Comparative LCA of different primary packaging solutions of fresh milk and juice sold in North America (Canada and USA).

Pure-Pak®
White board

Pure-Pak®
Natural brown
board

HDPE
bottle

PET
bottle

Cradle-to-grave (multiple impact categories, ISO 14044 compliant)

LCA CONDUCTED BY ANTHESIS

- Anthesis is a specialist global sustainability services and solutions provider founded on the belief that sustainable business practices are at the heart of long-term commercial success
- Launched in March 2013 to meet market demand for an international firm whose core business is providing commercially relevant sustainability services
- Around 500 staff globally, through organic and acquisitive growth
- Global team of LCA specialists with experience across many sectors
- Strong presence in North America (Boulder, San Francisco Bay, Boston, Ottawa, New Brunswick)

Anthesis

STEPS OF LCA


1. Define goal & scope
2. Data collection
3. Analysis & impact assessment
4. Sensitivity analysis
5. Interpretation & reporting

PEER REVIEW

Lise Laurin

CEO at EarthShift Global,

New insights for Life Cycle Assessment, Sustainability and S-ROI

Bill Flanagan

Co-Founder & Director at Aspire Sustainability

Chair, Board of Directors, of the American Center for Life Cycle Assessment (ACLCA)

Rafael Auras

Professor at the Michigan State University School of Packaging

Packaging Sustainability, Polymeric Packaging Materials, LCA

COMPETITOR ANALYSIS (HDPE) – 15 SAMPLES

	Milk	Juice
Canada (1 L, 2 L)		
USA (quart, ½ gallon)		

COMPETITOR ANALYSIS (PET) – 14 SAMPLES

	Milk	Juice
Canada (1 L, 2 L)		
USA (quart, ½ gallon)		

LCA DESCRIPTION

A Life Cycle Assessment (LCA) is a tool to quantify the environmental impacts associated with a product, throughout its life cycle. The system boundary for each product system in this LCA was ‘‘cradle-to-grave’’, which comprises: the extraction/cultivation and processing of raw materials, manufacturing, forming and filling processes, end-of-life, and all transportation and waste stages.

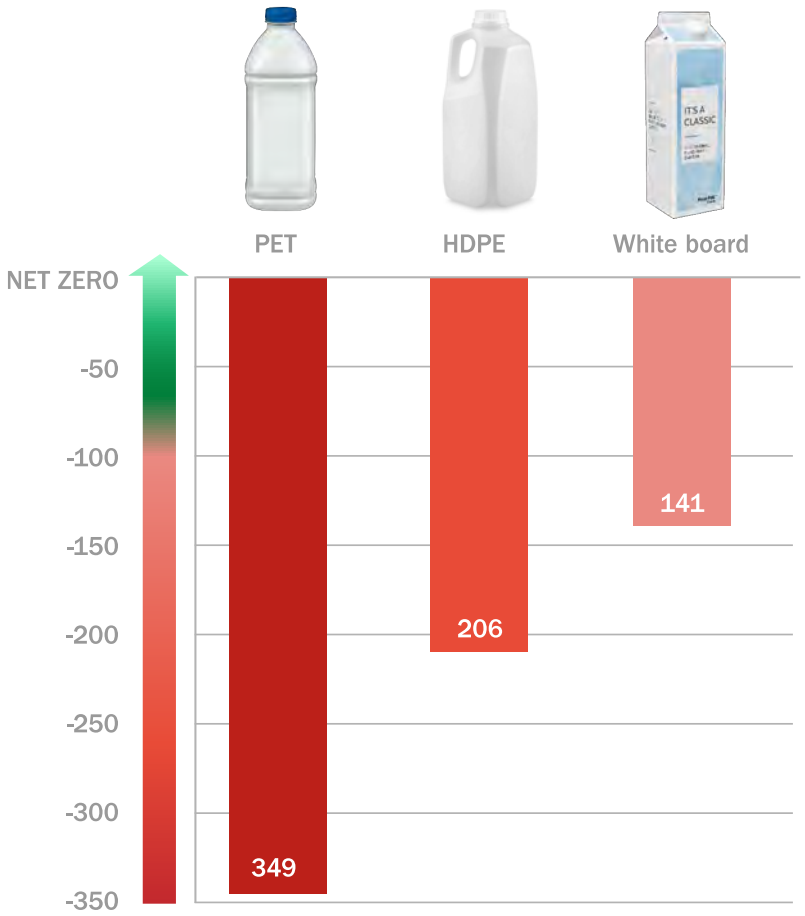
An independent panel of experts carried out a critical review of the study to ensure compliance with the ISO standards for LCA (ISO 14040 and 14044).

In this LCA, it was assumed that plastic bottles contained post-consumer recycled content, 15% for HDPE bottles and 7,5% for PET bottles which was seen as a conservative assumption in respect of cartons (i.e. favoring competitor bottles to Elopak).

A key focus for this study was the Global Warming impact category, measured in carbon dioxide equivalent.

BASIC PURE-PAK: MUCH LOWER CO2 IMPACT VS PLASTIC BOTTLES

GLOBAL WARMING
g CO2 eq/half-gallon



GLOBAL WARMING
g CO2 eq/half-gallon

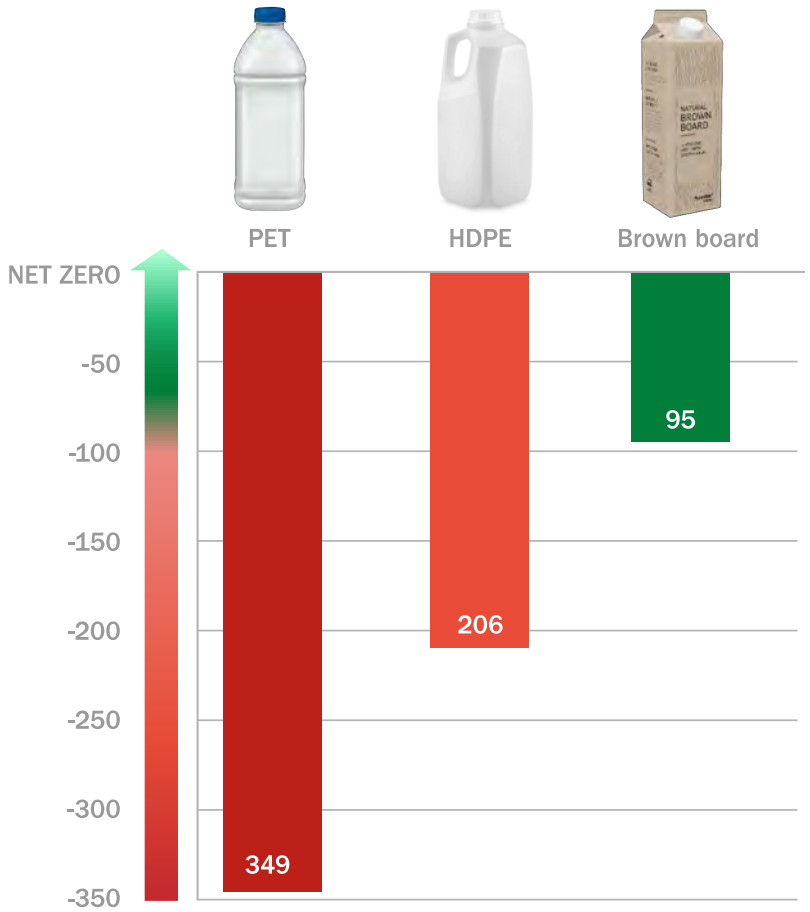
- 32%
g CO2 eq/half-gallon
Compared to HDPE

- 60 %
g CO2 eq/half-gallon
Compared to PET

North American LCA on packaging for Fresh Milk and Juices conducted by Anthesis for Elopak in May 2021

PURE-PAK NATURAL BROWN BOARD: MUCH LOWER IMPACT VS PLASTIC BOTTLES

GLOBAL WARMING
g CO2 eq/half-gallon



GLOBAL WARMING
g CO2 eq/half-gallon

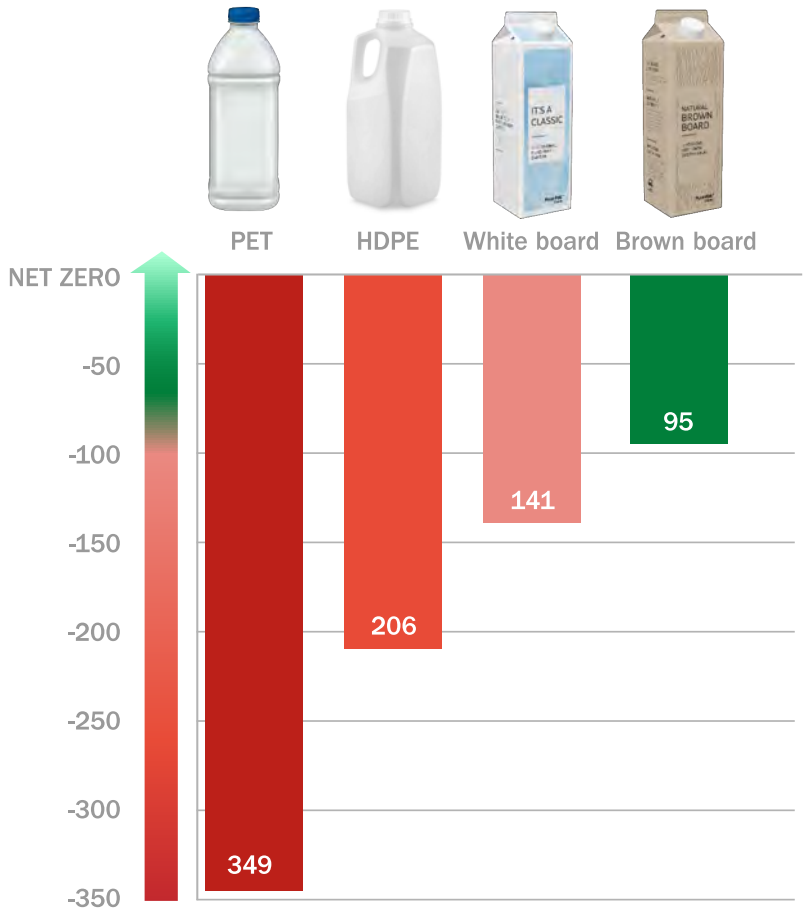
- 54%
g CO2 eq/half-gallon
Compared to HDPE

- 73 %
g CO2 eq/half-gallon
Compared to PET

North American LCA on packaging for Fresh Milk and Juices conducted by Anthesis for Elopak in May 2021

ELOPAK'S CARTONS HAVE A MUCH LOWER CARBON FOOTPRINT THAN A TYPICAL HDPE BOTTLE OR PET BOTTLE

GLOBAL WARMING
g CO2 eq/half-gallon



GLOBAL WARMING
g CO2 eq/half-gallon

- 32%
g CO2 eq/half-gallon
Compared to HDPE

- 60 %
g CO2 eq/half-gallon
Compared to PET

- 54%
g CO2 eq/half-gallon
Compared to HDPE

- 73 %
g CO2 eq/half-gallon
Compared to PET

ELOPAK

Overview of all impact categories assessed in the LCA, indicating where cartons perform better than plastic bottles

	Key Criteria	White carton	Natural brown carton	Key Comments
1	Global Warming	✓	✓✓	Significant CO_2e reduction versus PET and HDPE
2	Fine Particulate Matter Formation	✓	✓✓	Significant reduction versus PET and HDPE
3	Fossil Resource Scarcity	✓	✓✓	Significant reduction versus PET and HDPE
4	Fresh Water Eutrophication	✓	✓✓	Significant reduction versus PET and HDPE
5	Marine Eutrophication	✓	✓✓	Significant reduction versus PET and HDPE
6	Mineral Resource Scarcity	✓	✓✓	Significant reduction versus PET and HDPE
7	Terrestrial Acidification	✓	✓✓	Significant reduction versus PET and HDPE;
8	Stratospheric Ozone Depletion	✓	✓✓	Impact mostly from the paperboard production and the coating material production. Nylon production is one of the main contributors.
9	Ozone Formation Human Health	✗	✓✓	Impact mostly from fossil fuels-derived energy and direct emissions at paper mills during paperboard production in North America (white carton)
10	Ozone Formation Terrestrial Ecosystems	✗	✓✓	Impact mostly from fossil fuels-derived energy and direct emissions at papermills during paperboard production in North America (white carton)
11	Land Use	✗	✓✓	Forest-based products require some use of land, however, Elopak source only from responsibly managed forests, secured through third party verified certified or controlled sources.
12	Ionizing Radiation	✓	✗	Nuclear power in the grid electricity mix in Sweden (40% nuclear) where the brown paperboard is produced
13	Water Consumption	✗	✗	Cooling water for nuclear power plants in Sweden (brown paperboard) and paperboard production in North America (white carton)

LCA

1. Key learning of our LCA: the level of CO_2 of one pack versus another is related to the source of the raw material and the converting process
2. Recycling plays a minor role in CO_2; recycling is about reducing litering

CO2eq/Half-Gallon	Total	End of life	%
White board	140.62	4.27	3%
NBB	95.21	3.84	4%
HDPE	206.2	8.7	4.2%
PET	348.96	10.37	3%

OREGON DEQ RFI RESPONSE: PAPER CUPS

Oregon Statewide Recycling Collection List and Producer-Collection Materials for Recycling

This information is submitted by the Foodservice Packaging Institute in response to the February 3, 2022 Request for Information: Oregon statewide recycling collection list and producer-collected materials (for recycling).

We welcome questions and can provide additional details upon request. Please contact:
Ashley Elzinga
571-407-1434
aelzinga@fpi.org

Background

The Oregon Department of Environmental Quality has requested technical information that can be used to evaluate materials against evaluation criteria set forth in statute. The Oregon Plastic Pollution and Recycling Modernization Act was passed into law in 2021 requiring numerous changes that are intended to modernize and stabilize recycling services in Oregon.

The Foodservice Packaging Institute (FPI) was founded in 1933 and is the leading authority for the North American foodservice packaging industry. FPI encourages the responsible use of all foodservice packaging through promotion of its benefits and members' products. FPI's core members are foodservice packaging manufacturers and their raw material and machinery suppliers. With over 75 members, FPI includes approximately 90% of converters and suppliers in the foodservice packaging industry in North America, and over 200 foodservice operators, distributors, and educational institutions.

FPI is committed to reducing the impact of its products on the environment and is dedicated to making sure these items recovered and diverted from the landfill. FPI has a separately funded recovery group with a focus on paper and plastic cups, containers, bags, and boxes. Since 2011, this group has been working with communities, recycling facilities, composters, and end markets to expand to find stable and sustainable recovery solutions for these valuable materials. This group receives technical support from Resource Recycling Systems (RRS).

Through the Community Partnership program that launched in 2017, FPI has partnered with 15 residential programs to add foodservice items to their accepted material lists. The specific items are determined through consultation with the individual program, the Material Recovery Facilities (MRF) and end markets that process the community's' materials. Once FPI determines viability for inclusion of foodservice packaging materials into the prospective community recovery program, FPI works with the city and/or municipality to educate residents on best practices for recovery. Because these efforts are market-based, they have proven stable and sustainable without further assistance from FPI, and the partners report numerous benefits to their programs[OBJ].

A number of years ago, in an effort to accelerate the adoption of paper cup recycling, a select group of FPI members decided to commit additional funds for paper cup recovery in the U.S. This group includes many key stakeholders of the value chain such as manufacturers, users, and recyclers of paper cups. The paper cup recovery efforts complement the Community Partnership program and include market development work and equipment grants for MRFs who require additional sorting to process paper cups.

This RFI submission provides information regarding recyclability factors related to paper cups, to support decisions around their inclusion in the uniform statewide collection list (USCL). The data has been compiled with the assistance of technical consultant, RRS, who has conducted ongoing research on recycling and recyclability of these materials for FPI and other clients.

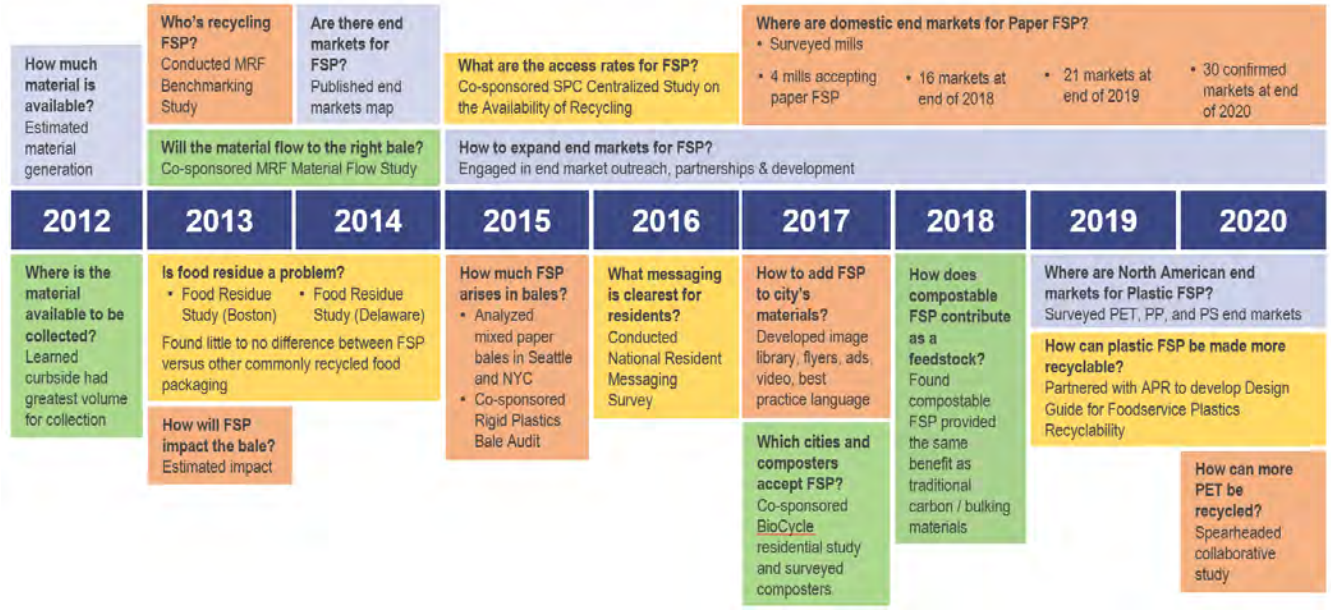
Fiber: Paper Cups and Paper Containers

This submission focuses on polycoated paper beverage cups. Most paper cups used in the US are made from solid bleached sulfate (SBS) white paperboard and are traditionally lined with polyethylene (PE). A very small percentage are lined with polylactic acid (PLA). Unless otherwise specified, the term "polycoat" cups refers to both PE and PLA-lined cups. Cups used for hot beverages have the polycoat layer only on the inside, whereas cups used for cold beverages have a second layer of coating on the outside to protect the integrity of the cup from condensation. Wax-coated cups no longer play a significant role in the paper cup market.

FPI Research

Since the inception of FPI's recovery efforts over ten years ago, FPI has been conducting research on recyclability of foodservice packaging in order to understand and overcome potential barriers to its recovery. This research has provided the foundation for FPI's successful Community Partnership program. Many of these studies have been collaborations with other industry stakeholders including the Association of Plastic Recyclers and the Sustainable Packaging Coalition, and since 2012, much of this research has been conducted with technical support from RRS and other technical experts including Cascadia Consulting, DSM, Stina (formerly More Recycling), and Moore and Associates. Below is an overview of these research efforts and the questions they were designed to address.

Overview of FPI's Foundational Research



Overviews of studies are available at www.recycleFSP.org

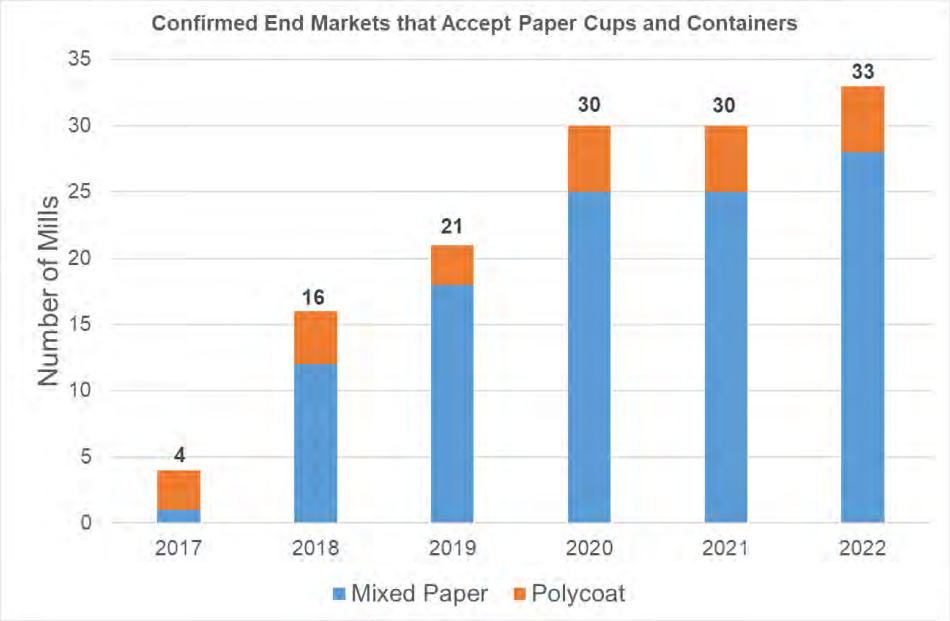
Studies of particular relevance for paper cups and containers are:

- Food Residue Studies
- MRF Flow Studies
- Mixed Paper Bale Audits

In addition, a recent white paper by Moore & Associates summarizes the landscape and developments related to recycling of paper cups.

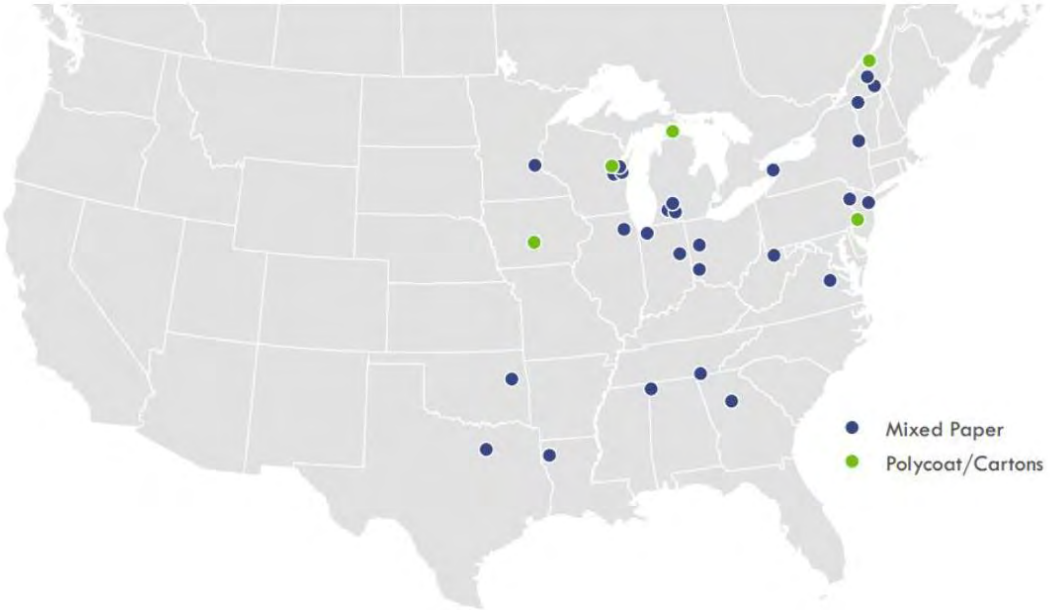
The Stability, Maturity, Accessibility and Viability of Responsible End Markets

The paperboard in paper cups contains long, strong fibers that are desired by mills. Traditionally, paper cups and other polycoated items have not been sought by recycled paper mills due to their coatings. However, fiber market trends such as the declining supply of recovered printing grades (e.g., sorted office paper) and the overall desire of the fiber industry to recover more fiber are driving growing interest in this material. Numerous companies have conducted trials of paper cups in their mills and begun to accept post-consumer paper cups as part of their furnish. The following table illustrates the change in end market acceptance over the last several years.



Growth in end markets for post-consumer paper cups, 2017-2022

As of March 2022, there are 33 confirmed end markets in the US and Canada that formally accept post-consumer polycoated (i.e. PE-coated or PLA-coated) paper cups. Of these, 28 accept cups in residential mixed paper. Another 5 end markets purchase polycoat bales consisting of cartons and cups. FPI maintains a list of end markets for cups (included as an appendix) and an interactive end markets map that are updated to reflect any changes.



End markets that accept paper cups. Source: https://www.recyclefsp.org/s/End-Markets-for-Paper-Cups.pdf

As of March 2022, this list includes the following end markets:

Mixed Paper Markets

The following mills purchase residential mixed paper bales containing paper cups. Some also accept other paper foodservice packaging.

Cascades, Ashland, VA (operational Q1 2023)
Cascades, Kingsey Falls, QC
Cascades, Niagara Falls, NY
Essity, Barton, AL
Essity, Menasha, WI
Essity, Middletown, OH
Essity, South Glens Falls, NY
Georgia-Pacific, Green Bay, WI
Georgia-Pacific, Muskogee, OK
Graphic Packaging International, Battle Creek, MI
Graphic Packaging International, East Angus, QC
Graphic Packaging International, Middletown, OH
Graphic Packaging International, Kalamazoo, MI
Green Bay Packaging, Green Bay, WI
ND Paper (sourcing via ACN), Fairmont, WV
Pratt, Conyers, GA
Pratt, Shreveport, LA
Pratt, Staten Island, NY
Pratt, Valparaiso, IN
Pratt, Wapakoneta, OH
WestRock, Aurora, IL
WestRock, Battle Creek, MI
WestRock, Chattanooga, TN
WestRock, Dallas, TX
WestRock, Eaton, IN
WestRock, Missisquoi, VT
WestRock, St. Paul, MN
WestRock, Stroudsburg, PA

Polycoat / Carton Markets

The following end markets purchase bales containing paper cups along with aseptic and gabletop cartons.

Continuus, Des Moines, IA
Continuus, Philadelphia, PA

Great Lakes Tissue, Cheboygan, MI
Sustana (Breakey Fiber), Levis, QC
Sustana (Fox River Fiber), DePere, WI

Notably, the 28 mixed paper mills that have formally confirmed their acceptance of paper cups represent over 75% of the US/Canadian mixed paper market by tonnage consumed. FPI facilitates a mill task force that is working to increase recovery of paper cups and paper foodservice packaging. The companies in that task force were joined by several other mill companies to release a joint mill statement of their cup acceptance and commitment to paper cup recycling. This statement is included as an appendix.

At this time, the landscape of mills that explicitly accept cups is concentrated on the eastern half of the US. This is in part a function of the overall distribution of paper mills in the US, which skews toward the east, and also a reflection of the global market dynamics which have long resulted in recovered materials from the western US flowing to overseas markets. While FPI's focus and priority has always been on strengthening North American end markets, some MRFs and brokers do send fiber bales with cups from the western states to Asian markets. Considerably less mixed paper is flowing offshore than it did a few years ago due to changes in China's policy, but a number of Asian markets do play a role in recovering mixed paper, and several South Korean mills consume polycoat/carton bales.

Today, there are mills that do not accept paper cups in their furnish. There is a need for more domestic/North American outlets for materials arising on the west coast and FPI continues to address this challenge and work on end market development. This work includes its mill task force, collaboration with AF&PA to develop information for mills, and direct engagement with mills to offer technical assistance and to facilitate mill trials for paper cups. FPI is particularly interested in increasing end markets in the western US and is in dialog with a paper mill in Washington regarding its acceptance of paper cups and other foodservice items.

The Anticipated Yield Loss for the Material During the Recycling Process

MRF Capture / Yield loss

In a 2015 MRF flow study co-sponsored by FPI (see appendix), approximately one-quarter of the paper cups flowed to the fiber line, and approximately three-quarters flowed to the container line. These numbers represent the average of results from five MRFs with very different configurations and represent a baseline, i.e., MRFs that were not optimized to capture paper cups.

Based on our work with MRFs, a common assumption is that paper cups that are flattened during collection will flow with fiber, while only round cups will flow to the container line.

FPI has conducted several more recent RFID tests, using both flattened and intact cups, to help MRFs understand where and how to best capture cups. These studies have shown that around 70% to 90% of 3-dimensional cups flow to the container line, and approximately 60% to 80% of flattened cups flow to the container line.

If the targeted bale is mixed paper, cups that enter the container line do not necessarily represent yield losses, as MRFs that accept paper cups will generally capture them from the container line using manual sortation or automated technology. If the targeted bale is a polycoat bale, the percentage of cups that flow to mixed paper do not necessarily represent yield losses, because they also can be recovered through that bale. The rate of successful capture to the target bale depends on a variety of factors including which bale is targeted, the MRF's 2D/3D screening system, the size and weight of the cup, and the use of manual or automated cup sortation. FPI does not yet have data on MRF capture/yield loss from MRFs that are actively targeting cups.

Mill Recovery / Yield Loss

Yield varies significantly according to a mill's technology and its furnish. Because this is proprietary, FPI does not have comprehensive data on cup yield. Based on information reported by several members of FPI's mill task force, yield from the cup is in the 70 to 90% range, depending on whether the cup has single- or double-sided coating and on the pulping system in use.

The Material's Compatibility with Existing (Oregon) Recycling Infrastructure

According to FPI research, most foodservice packaging is discarded at home or in the workplace. This means that residential curbside collection offers significant potential for capturing this material to achieve optimal diversion. Due to conditions spurred by the ongoing pandemic, takeout and delivery have likely prompted more opportunity for at home collection.

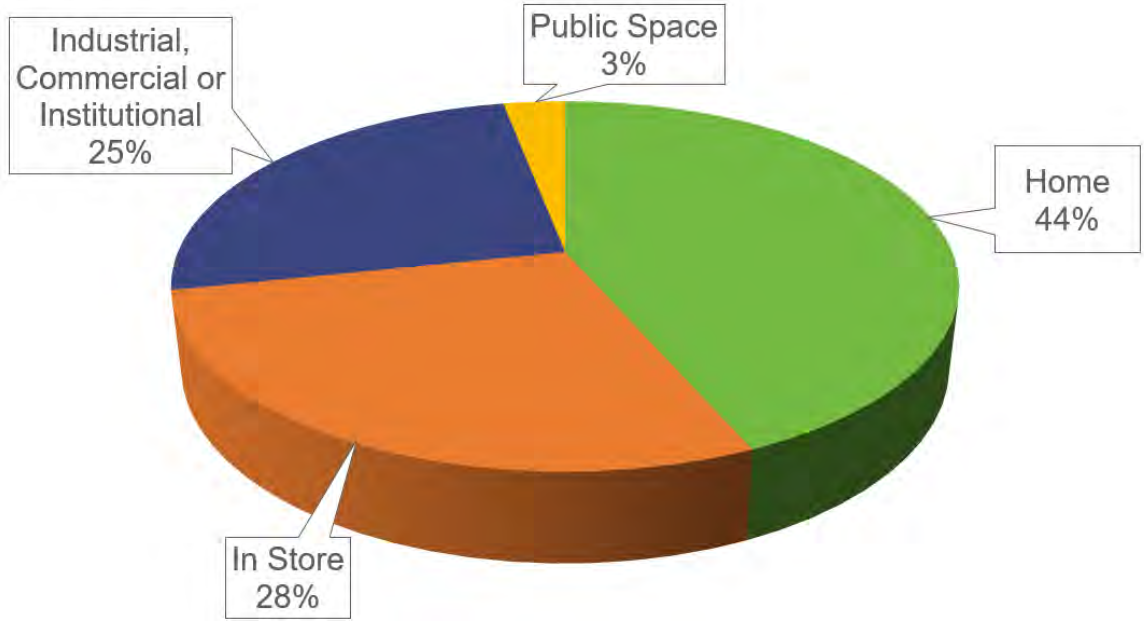


Chart showing breakdown of foodservice packaging by point of disposal

Paper cups are not yet generally accepted in Oregon's franchise agreements, but if they were accepted, residential education could be updated to reflect this. An FPI-sponsored study is currently underway which will provide more detailed insights into whether any Oregon communities accept paper cups in residential programs.

As FPI is aware of very few Oregon recycling programs accepting paper cups, we do not have information on how specific Oregon MRFs are handling cups they do receive but would expect that they are allowed to flow to mixed paper and/or residue.

The Amount of the Material Available

According to industry estimates, there are roughly 600,000 tons of paper cups produced annually in the US.

The US EPA does not track paper cups specifically but estimates that there are 2.84 billion pounds of paper cups and plates in the municipal waste stream (2018 EPA SMM Facts and Figures).

In the case of paper cups, sources suggest that as much as 70% leave the store/restaurant and at least half end up in the home, where they are available to be recycled in the residential stream.

The Practicalities of Sorting and Storing the Material

Recovering paper cups does not require sorting them to a new bale; they can be recovered through either of the two existing commodities, mixed paper or a polycoat bale consisting of cartons and cups.

MRFs who choose to include cups in mixed paper can allow the cups on the fiber line to flow to that bale and can redirect cups from the container line to the fiber line or to mixed paper. Based on bale audits conducted by FPI (see appendix), paper cups make up a very small percentage of the bale (less than 0.5% by weight). However, MRFs handle large volumes of mixed paper, so storage (and storage time) would not be a concern.

Similarly, MRFs who choose to sort cups into a polycoat bale can pick the cups from the container line and direct them to that bale. This positive sort can be a manual sort, however some MRFs are investing in automated solutions (i.e., optical or robotic sorters) that can recover cups along with cartons and other polycoated fiber. Cups can contribute a significant quantity of material to a carton/polycoat bale, making up around 10-25% of that bale by weight. This additional volume can be welcome as it allows the MRF to reach truckload quantities sooner.

FPI has an equipment grant and technical assistance program for MRFs who require additional equipment to process paper cups.

Contamination

FPI commissioned studies of food residue on foodservice and food-contact packaging in the residential recycling stream in 2013 and 2014. These studies found that the amount of residue in foodservice packaging was similar to any other type of food contact packaging and determined to be consistent with what markets are accepting. Cups are used to contain liquids, and generally, residual liquid drains out of the cup by the time it reaches the MRF.

The real-world experiences of communities and MRF accepting cups indicate that with good resident education, paper cups and other foodservice packaging can be added successfully while reducing overall contamination. The communities and MRFs that have participated in FPI's Community Partnership program have not reported any problems with quality or marketability of bales as a result of adding paper cups, and the foodservice items added via the partnerships remain in their programs.

The Ability for Waste Generators to Easily Identify and Properly Prepare the Material

Paper cups are easily identifiable by resident, and easy to describe and depict in program guidance due to their distinct shape, and the consistent use of the term "paper cup" to refer to them, both in the recycling industry and among the lay public.

The only preparation needed is to empty the cup and remove the lid or any other ancillary items.

FPI inventoried the messaging used in leading recycling programs, the terminology recommended by several industry groups, and conducted a resident messaging survey, that is specific to foodservice packaging in order to develop best practices. FPI employs these findings in every Community Partnership program and resident communications for program additions. These best practices include recommended terminology, effective graphics, and simple preparation instructions aimed at promoting recycling of clean and empty items and minimizing contamination (the resident education kit, including the study results, is available for download). The recommended graphics feature clean, empty cups, with no lids or straws attached. This messaging strategy has proven effective, and our partner communities have reported reductions in residue following the communications campaign.

Economic Factors

Recent years have seen dramatic changes in market pricing for mixed paper, as well as fundamental changes in the supply of sorted office paper (SOP) and other grades. As with any material, strong pricing helps to drive MRF investments in sortation. Mixed paper has averaged $55/ton over the last 6 months and is currently trading at around $40 - 45/ton in the Northwest (based on data from recyclingmarkets.net). Due to different pricing dynamics for mixed paper vs. polycoat bales, the fact that cups may be marketed in more than one grade can be

an advantage; FPI has observed that some MRFs seek to maintain operational flexibility to direct cups to the most economically advantageous bale.

Appendices

- Moore & Associates: White paper
- Multiple companies: Joint mill statement
- FPI and AF&PA: FAQ for Mills
- FPI: FSP in Mixed Paper Bales: Audit Results
- FPI: End market list
- RRS, Reclay StewardEdge, and Moore Recycling: MRF Flow Study
- FPI: Food Residue Study Overview
- FPI: Community Partnership Results Summary

MOORE
& Associates

White Paper: The State of Paper Cup Recycling

January 27, 2022

1. The Evolution of Paper Cup Recovery Efforts

Residential Paper Cup Recycling in the US

In 2011 the Foodservice Packaging Institute (FPI) formed an alliance of restaurant and foodservice packaging industry leaders to investigate how paper-based single-use foodservice packaging could become more widely recycled. A series of studies indicated that at least half the packaging generated by foodservice locations makes its way back to the home. In the case of paper cups, sources suggest that as much as 70% leave the store.[1] The Paper Recovery Alliance (PRA) was formed with the initial task of benchmarking the types of paper cups in use, where cups are used, and where cups end up at 'end-of-life'. If most single-use cups are taken to home or work, cup collection at the store will have limited impact. The PRA determined that the best opportunity for paper cup recovery efforts would be through existing residential recycling programs, whether curbside or drop-off.

FPI's research showed that paper cups were treated differently than other types of paper foodservice packaging in residential recycling programs. While pizza boxes, paper bags, and molded fiber trays were generally accepted by most recycling programs, paper cups were usually explicitly excluded. Emmet County, Michigan started an initiative to collect and recycle cups in 2009, becoming the first location in the US to do so.

Emmet County provides a unique example of several key elements coming together at the right time. The county started by identifying end markets first. The local Materials Recovery Facility (MRF) was already sorting polycoated aseptic and gabletop cartons and marketing these to a tissue-producing mill in a nearby county. After discussion with the county, the mill agreed to experiment and try using cups along with the cartons. In order to get the community involved, the county developed educational materials about cups and added these to grocery store shelves where aseptic and gabletop cartons were sold. A local artist developed a series of sculptures composed of recycled materials that were available on request for public and private events, creating substantial word-of-mouth publicity that paper cups could now be recycled. Emmet County was initially hesitant to add cups to local programs because of limited space at the MRF, but ultimately interest from the purchasing mill provided enough encouragement to continue. The county now collects cups through residential curbside, business curbside, schools, and special events.[2]

Other early adopter cities such as Seattle and New York City followed suit, introducing paper cups into residential recycling in the 2010-14 period.[3] San Francisco added cups to residential recycling programs in 2017.[4]

FPI continued to improve understanding of the potential for paper cup recovery from the residential stream by conducting a variety of studies on contamination, MRF material flow, and bale composition. With the additional knowledge generated, it was evident that paper cups could be a viable target for recovery through residential recycling programs. FPI understood that identifying end markets for recovered cups was the first step and began discussion with mills across the US to explore their ability to process paper cups.

With end markets under development, the next step was to expand 'supply.' FPI developed a program called Community Partnerships that engages local communities, encouraging them to include foodservice packaging in curbside recycling. The program will help communities:

- Conduct outreach to stakeholders such as MRFs, waste haulers, and end market buyers;
- Collect data on recycling stream composition and other metrics; and
- Develop communications and messaging to complement education and outreach done by the community.

Communities are also eligible for grants to assist with resident education on the additions to the program, as well as reducing contamination. This program indirectly benefits local MRFs that receive materials from the curbside programs, and ultimately end market buyers.[5]

Since 2017, FPI's Community Partnerships program has added paper cups to curbside recycling programs for approximately four million households, in the following locations:

- Washington, D.C. (launched 2017)
- Louisville, KY (launched 2017)
- Chattanooga, TN (launched 2017)
- Denver, CO (launched 2018)
- Sioux Falls, SD (launched 2019)
- Clark County, IN (launched 2019)
- Kent County, MI (launched 2020)
- St. Lucie County, FL (launched 2020)
- Athens-Clarke County, GA (launched 2020)
- Lansing, MI (launched 2021)
- East Lansing, MI (launched 2021)
- Atlanta, GA (launched 2021)
- Dekalb County, GA (launched 2021)
- Detroit, MI and surrounding metro area (launched 2021)
- Madison, WI (launched 2021)

Successful Community Partnership programs have developed a knowledge base that is used to support new programs in other communities. Active programs share insights on communications campaign development, data collection, reducing contamination, and the like as new communities incorporate paper cups into their curbside recycling programs.[6]

Residential Paper Cup Recycling in Canada

Ontario, the largest province in Canada (40% of total population) was home to one of the first curbside recycling programs in North America, the Blue Box program, launched in 1981. Since 2002, recycling in Ontario has been based on a stewardship approach where the cost of recycling programs is a shared between producers and municipalities.[7] Municipalities are required to accept a shortlist of recyclables but can also add items of their choice, which has led municipal programs that vary widely across the province. For example, while the City of Toronto did not accept paper cups in September of 2021, the cities of London and Waterloo did.[8]

In June 2021 Ontario finalized legislation to implement a full Extended Producer Responsibility (EPR) program that will bring a number of changes to recycling in Ontario. It will standardize the items collected across the province; provide recycling in small communities and rural areas that have not had access to date; and will expand the types of buildings to be served by recycling programs (to include multi-family and retirement residential, schools, and public areas). Items accepted will be expanded to include many

single-use foodservice items such as paper cups, paper plates, stir sticks, and the like. The transition to the new program will start with select municipalities in 2023 and is expected to be complete by 2025.[9,10]

The province of British Columbia was the first in Canada to initiate a full EPR program in 2014. This led to the addition of many types of packaging to curbside recycling, and programs were made consistent across all jurisdictions in the province. As a result, polycoat items such as paper cups and aseptic and gabletop cartons have all been accepted in curbside, multi-family, and drop-off locations for some time.[11]

Commercial Paper Cup Recycling

Starbucks, the US's second largest quick-serve chain, may have been the first to start thinking about how to make single-serve beverage cups more sustainable. As early as 2006, Starbucks began working with the US Food & Drug Administration (FDA) to allow 10% post-consumer recycled fiber in food contact paper cups. Between 2009 and 2011, Starbucks held several large "Cup Summit" symposiums to generate new ideas and initiate change, in order to meet an internal goal that all of Starbucks cups should be reusable or recyclable by 2015. The symposiums included representatives from all parts of the paper and plastic cup value chain, from municipalities and raw material suppliers through cup manufacturers, and retail and beverage businesses.[12]

At that time, Starbucks implemented in-store recycling in 18 markets and initiated three recycling pilot programs across the country. Starbucks tested the compatibility of post-consumer cups in paper recycling operations at a number of paper mills and demonstrated that used paper cups can be recycled into new paper cups. Eventually, collection efforts from stores were discontinued, however, as contamination was a significant problem and costs were higher than expected. At this point, Starbucks publicly supported FPI's activity in paper cup recycling and encouraged other foodservice organizations to get involved via FPI. Starbucks then began to invest in a broader approach to recycling, focusing on all foodservice packaging including cups, and committed to rolling the program out in stores across North America.[13]

The buzz generated by Starbucks activity during this period encouraged other organizations to take action. In 2010 Green USA's 'Coalition for Resource Recovery' (CoRR) began a pilot project in Manhattan with the objective of recycling paper cups and fast food packaging. CoRR collaborated with the Pratt Institute and The New School, collecting foodservice packaging from The New School's café and paper hot beverage cups from seven Starbucks' stores in Manhattan. The educational institution designed collection bins and implemented consumer education in the form of posters and tabletop signage. While this effort did not progress beyond the pilot project, it did generate valuable learning regarding the technical aspects of repulping and recycling paper cups due to the volume of material that was collected.[14]

Canada's largest coffee chain, Tim Hortons, tried an alternative approach to paper cup recycling in 2011. Using Nova Scotia as a test region, Tim Hortons began to collect paper cups at over 150 stores in the province. A partnership was developed with a regional molded fiber producer that tested methods to turn paper cups into molded fiber take-out trays. The "Cup-to-Tray" program had some success in the region and Tim Hortons became the first quick-service restaurant in Canada to 'close the loop' and recycle used cups into another product.[15] Since that time, Tim Hortons has implemented a number of other initiatives to collect and divert cups from restaurants across the country.

Early efforts at commercial recycling of paper cups were well received by consumers at the time. Though many did not survive long term, the ground work was laid for more recent advances. In December 2018, a Denver-area hauler and MRF operator announced they would begin accepting cups generated by coffee shop customers in the area in the commercial recycling stream.

In early 2020, the City of Vancouver, Canada initiated a pilot study in which coffee cups are collected in specially designed bins in commercial buildings in downtown Vancouver. The pilot is part of an existing recycling program in BC called 'Return-It' that recovers 12 types of beverage containers, along with a range of other hard-to-recycle products.[16] The pilot has been on hold as a result of the

pandemic, but the city plans to relaunch the program in the spring of 2022.[17]

Currently most global foodservice organizations, including many FPI members, are actively working to reduce waste and improve the sustainability of single-use packaging. The current packaging sustainability goals of several of the largest US foodservice organizations are outlined in more detail below.

2. Processing Cups at the Materials Recovery Facility (MRF)

Recovered Paper Grades and Cups

The vast majority of paper cups on the US market are made from solid bleached sulfate (SBS) white paperboard fibers with a polyethylene (PE) coating. Wax coated cups are virtually extinct and while new types of coatings that may be more readily recycled by mills are starting to emerge, market penetration of the new coatings is very low in the US (coatings are discussed in more detail below).[18]

Post-consumer cups may be found in several of ISRI's (Institute of Scrap Recycling Industries) standard grade designations, including:[19]

- #37 Sorted Office Paper (SOP)
- #52 Aseptic Packaging and Gabletop Cartons (Cartons)
- #54 Mixed Paper (specifically Residential Mixed Paper (RMP))
- #56 Sorted Residential Paper & News (SRPN)

Comparison of the annual ***production volume*** of each of these grades in the US in 2020, relative to cups, shows the following:[20]

- #54 Residential Mixed Paper 4,055,000 tons
- #37 SOP 2,555,000 tons
- #56 SRPN 1,961,000 tons
- #52 Cartons 630,000 tons
- Post-Consumer Cups 683,000 tons

After collection in the residential recycling stream, used cups, cartons, and other paper products are transferred for sorting at a MRF (Materials Recovery Facility). The easiest pathway for cups to follow at the MRF is through the paper line to the Mixed Paper grade. The vast majority of MRFs that accept cups pack them in Mixed Paper, although small quantities may end up in SOP or SRPN. Anecdotally, at least one MRF has occasionally directed cups to SOP bales. A few MRFs pack a carton bale which, when cups are included, becomes described as a 'mill specific polycoat' bale, a bale that is not standard, but specific to a particular mill end-user.[21]

Since 2018, a number of larger mill companies that do not buy grade #52 Cartons have announced they will accept cups in Mixed Paper. Among the small number of US and Canadian mills that buy cartons, several have indicated that they will accept cups in the carton bale. In effect, cups are similar to other paper-based polycoated food packaging such as ice cream tubs and frozen food boxes in that they are a good source of high quality SBS for mills, when the mills can handle the poly coating. It is possible that in future, a 'polycoated paperboard packaging' grade could be developed and paper cups could be included in that grade.[22]

Flow of Paper Cups through the MRF

When a MRF is interested in adding a new item such as paper cups to its list of explicitly accepted materials, there are a number of issues to consider. A successful cup recovery effort will have at least 3 elements. First, demand from an end market buyer for the targeted paper grade must be assured.

Second, in order to maximize potential volume, the MRF needs to partner with the local municipality and provide public education to develop awareness about the opportunity to recycle a new item such as cups through residential programs. Finally, the MRF must anticipate how the new item will flow through sorting operations to become part of a recovered paper grade, taking size and shape of the targeted material into account as well.[23]

In the past, conventional wisdom held that when cups were 'sorted' at the MRF, flattened cups would remain in the paper stream while 3-dimensional cups would flow to the container line. Numerous flow studies have now shown that while paper cups may move through the MRF in different ways, the vast majority of cups actually flow to the container line. Percentages vary with MRF practices and equipment, but recent studies have shown that typically around 70% to 90% of 3-dimensional cups flow to the container line, while around 60% to 80% of flattened cups do so.[24]

The destination success rate is influenced by the fiber/fines screening technology in place at the MRF, but size and weight of the cup may be more important than whether it is 3-dimensional. Once a cup is on the container line, it can easily be identified and sorted to be included in mixed paper, cartons, or other paper grades. Alternatively, cups can be intercepted along with other fiber on the container line and redirected to the paper line.

MRFs have begun to invest in optical sorting and robotics in order to improve their ability to sort paper cups, foodservice packaging, and other smaller volume types of paper packaging. Technology investment has been gradual to date, and primarily focused on optical sorting, due to low Mixed Paper prices at this time and the need to develop end markets that accept polycoated paper packaging such as cups. With much improved prices for Mixed Paper (and Old Corrugated Containers) in 2021, growing investment in optical sorting as well as robotics is expected.

In Mixed Paper, cups account for a small percentage of the bale, typically less than 0.5% of the bale by weight. To decrease the number of cups going into Mixed Paper, a handful of MRFs have decided to positively sort cups by picking them from the fiber and/or container line and re-directing them into the carton bunker. Cups that are positively sorted into a carton bale will typically account for 10% to 25% of the bale of combined polycoated paperboards.[25]

Challenges in Paper Cup Recycling

As with all recovered paper grades, a higher quality bale improves value and marketability. In the past, many MRFs were opposed to accepting cups and other foodservice materials due to concern about food contamination. More recent observation has shown that by the time the cup makes it to the MRF, liquids are usually gone. Cups may be accompanied by plastic lids, straws and stir sticks, but plastic components are also present on other types of paper packaging. MRFs have improved processes to remove more plastic from the paper stream, and mills are able to handle the small volume of such plastic items in recovered paper.[26]

In most of the US, the decision on what to include in curbside recycling is up to local municipalities. As manufacturers and legislators look to improve sustainability in packaging and expand recycling of small volume package types, these policies are expected to evolve over time in favor of including cups and other polycoated packaging in curbside recycling. A few states in the Northeast, such as Massachusetts, Rhode Island, and Connecticut, have recycling guidelines that do not include cups and other polycoated paper packaging (such as aseptic and gabletop cartons) on the list of mandatory materials that must be collected in curbside recycling. Municipalities ultimately make the final decision however. Many encourage recycling of other items such as cartons, #3 through #7 plastic containers, telephone books, textiles, and discarded mail.[27]

MRFs may generate cups from commercial or residential sources: some combine the streams for sorting while others sort the streams separately. Either way, the volume of cups is low enough that MRFs are unable to measure the volume of cups from either source, or attach a cost to sorting and baling cups specifically. MRFs with greater volumes of cups may sort cups as a separate grade or as part of a carton/cup bale. Ultimately, which grade to target is a business decision made by the individual MRF. When there is a positive business case, MRFs may aggregate cups and sell as a higher-value grade. [28]

3. Technical Considerations in Paper Cup Recycling

SBS fibers are among the highest quality paper materials available for recycling. As recovery rates for all paper grades continue to rise in the US, while supply declines, cups could be an excellent additional source of high-quality fibers for the paper industry. In particular, as the supply of printing and writing paper declines, reducing supply of recovered paper for tissue mills, demand for fiber from cups in Tissue & Towel production will likely increase.[29, 30]

Cup Construction – Coatings

There are two types of paper cups with PE coating: 'poly 1-side' cups have the poly coating applied only to the inside of the cup only and 'poly 2-side' cups have the coating is applied on both sides of the paper substrate before it is made into a cup or container. Poly 1-side cups are typically used for hot beverages. Poly 2-side cups are often used for cold beverages so that the coating on the outside of the cup prevents condensation from softening the cup wall during use. The vast majority of paper cups are poly 1-side cups used for hot beverages. Hot cups are typically made using a PE coating because it can withstand high temperatures without breaking down.

The challenge for mills in using cups and other polycoated paper packaging has always been the time required in the hydro-pulper to remove the paper fiber from the poly layer. A poly 1-side paper cup requires considerably less time for separationfrom the fiber and creates less waste in the pulping process in comparison to a poly 2-side cup.[31]

Innovation in Cup Coatings and Materials

With the growing importance of sustainability in packaging, the pace of innovation in all types of packaging is increasing. In an effort to produce a more sustainable 'to-go' cup, many alternative types of cup materials and barrier coatings have emerged. In 2018, Closed Loop Partners initiated a competition, the Next Generation Cup Challenge, to accelerate the process of cup innovation. By early 2019, 28 candidates with innovative cup ideas had been selected and 12 winners were announced. Of the 12 winning designs, 3 companies proposed reusable cup systems and several in Europe offered new bio-degradable, plant-based materials for cup construction. One of the US winners produces cups and other foodservice packaging made from molded fiber. The remaining participants proposed alternative barrier coatings to PE that are more easily recyclable and/or compostable.[32]

The most common alternatives to PE coatings are polylactic acid (PLA) and water-based aqueous coatings. PLA is a 'bioplastic' made from plant-based materials such as sugar, corn starch, cassava, sugar cane, and sugar beet. When selected as a cup coating, the rationale is usually that it is derived from renewable biomass, not fossil fuels, and may be compostable and/or biodegradable. Yet recycling is a higher and better use than composting because the long fibers in the cup are recycled and used in a new product.

Aqueous coatings, or water-dispersed emulsion polymer coatings, can be used when the barrier layer does not require structural integrity on its own. Aqueous coatings are easier for mills to repulp and recycle than PE coatings because water is part of the paper-making process.[33] US packaging producers continue to develop new substrate materials and coatings for cups and other foodservice packaging that are marketed as more sustainable and environmentally-friendly. However, market penetration is likely still very low as no data appears to be available to measure this trend.

4. End Markets for Recovered Cups

End Markets in North America

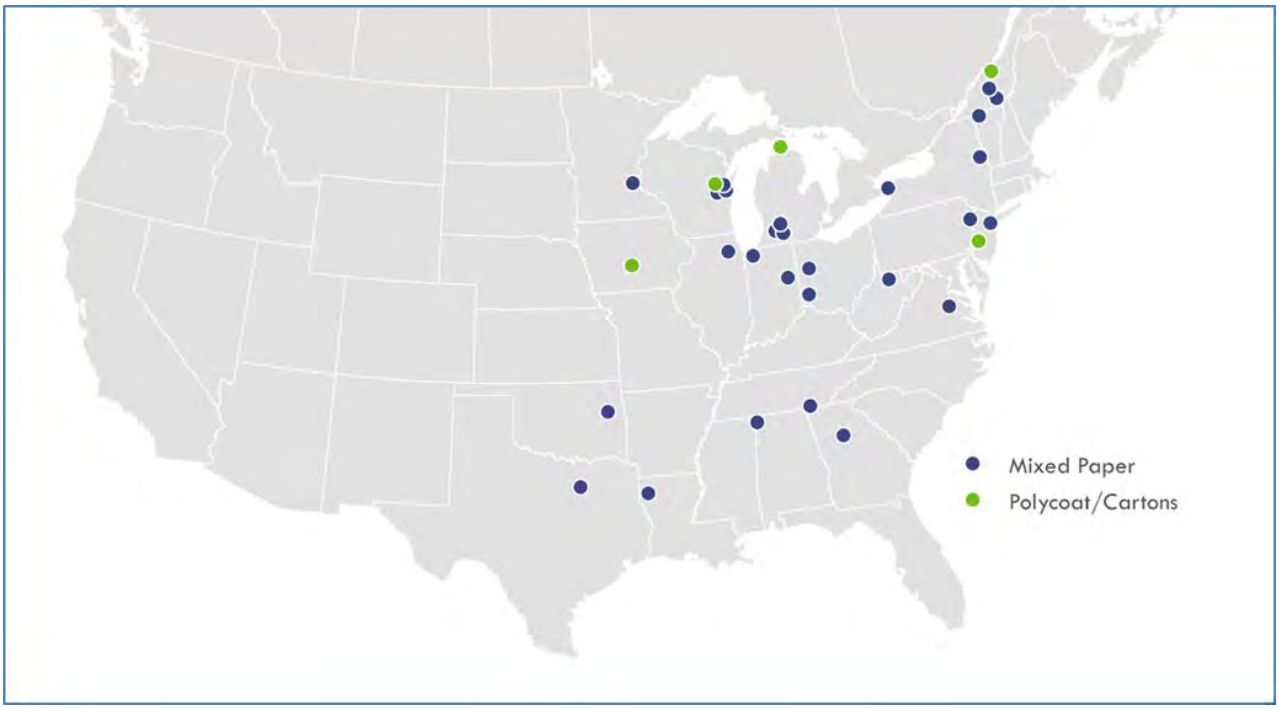
The end market mills accepting paper cups include producers of:

- Tissue and towel products
- Recycled paperboard (food and other goods packaging)

- Containerboard (for brown corrugated boxes)
- Recycled market pulp

Prior to 2018, very few North American mills explicitly accepted cups in Mixed Paper. Given FPI's long-standing focus on developing domestic end markets for foodservice packaging, it engaged in several years of outreach and dialog with US mills and provided data and material to mills for testing. Numerous mill trials were conducted. As a result of FPI's efforts, individual mill commitments, and the growing interest across the value chain in more 'circular' packaging alternatives, paper cups are currently accepted at 31 North American mills that consume Mixed Paper bales, and 5 domestic end markets that consume polycoated bales. (see Figure 1 below)

Figure 1: End Markets for Paper Cups in North America, 2022



Source: FPI, 2021

In December 2021, a group of prominent paper mill companies that buy recovered paper signed a "declaration of acceptance" and announced their commitment to increasing the recycling of paper cups. The companies involved include Essity, Georgia Pacific, Graphic Packaging International, Great Lakes Tissue Company, ND Paper, Pratt Industries, Sustana Fiber, and WestRock. This group accounts for 75% of Mixed Paper demand in the US and Canada and represents 31 paper mills that now actively accept cups in Mixed Paper. Senior executives acknowledge that cups provide high quality fiber.[34]

Appendix A provides several case studies of mills that accept paper cups, describing the volume of material processed and the grades that cups go into. Appendix B contains a list of mills that accept paper cups, and indicates the relevant recovered paper grades for cups. As is the case with all recovered materials, it is necessary to check with mills within the shipping range of any specific MRF in order to determine the status of paper cup acceptance at any point in time.

As is typical for all recovered paper grades, the larger the quantity of material a MRF produces on a

regular basis,the more interested mills will be in the material. This is an area where brokers can be very useful as they frequently accumulate recovered paper from multiple sources in order to ship larger quantities to mills. A list of brokers who deal in recovered paper grades that may contain paper cups is provided in Appendix C

Export Markets

Exports have always been an important part of the US market for recovered paper. In 2020 almost 34% of recovered paper collected in the US was exported to Mexico, Canada, Asia, and other parts of the world, down from 37% in 2019. Exports of recovered paper are declining overall, and Mixed Paper exports in particular are declining at a faster rate. In 2019, 39% of Mixed Paper was exported relative to the 37% for total recovered paper. In 2020, 34% of both total recovered paper and Mixed Paper are exported. This suggests the importance of developing US markets for Mixed Paper which includes polycoated paper packaging such as cups.[35]

Mexico and Asia are the most important export markets for recovered paper grades containing paper cups, with Korea, India, and Thailand the largest country buyers in Asia. Although the volume of Mixed Paper exported is still substantial, it is particularly important that exporters to Asia ensure the receiving country allows bales that contain post-consumer paper cups.

The primary use of recovered paper cup-containing grades in Asia is for tissue and towel, but in India they are used for printing and writing papers. In Mexico, the primary users are tissue mills, but some paperboard mills are exploring use of the grade.

Export of recovered paper is a specialized part of the paper recycling business and a large percentage of it is handled by export brokers. There are a number of export brokers that handle poly-coated paperboards and have expressed an interest in handling recovered paper cup grades. A list of these brokers and their contacts appear in Appendix C. Although none are headquartered on the west coast of the US, they all operate in that region as well as throughout the US. In addition to export, these companies are also domestic brokers that can be helpful with sales in the US.[36]

5. Looking Ahead

As consumers and activist groups pressure large chain restaurants and consumer packaged goods brands to make packaging more recyclable, there is growing interest and activity in paper cup recycling. Foodservice organizations, communities, and consumers alike have expectations that more types of single-use packaging should be recycled more often in future. The response from many restaurant brands and other foodservice operators has been to develop sustainability goals for the organization, in which packaging plays a major role. Sustainability goals relating to packaging, including cups, are shown below for some of the largest foodservice operators in the US:[37]

- ***McDonald's:*** Goal to source 100% of guest packaging from renewable, recycled or certified sources and to recycle guest packaging in 100% of McDonald's restaurants, by 2025.
- ***Starbucks:*** Working to reduce waste and promote reusability, Starbucks will be testing recyclable and compostable cups in select cities worldwide in 2022. Starbucks currently uses 10% post-consumer fiber in hot cups, as well as recycled content in paper shopping bags, napkins and cup sleeves.
- ***Restaurant Brands International (Tim Hortons, Burger King, Popeye's):*** Working with suppliers to innovate and reduce the use of packaging, transition to more sustainable materials, and help guests to reuse and recycle.
- ***Inspire Brands (Dunkin'):*** Majority of packaging currently has one or more sustainability attributes. 100% of packaging is recyclable where facilities exist, 30% of packaging is made with recycled content, 35% is compostable, and 30% is biodegradable.

- ***Delaware North (hospitality & foodservice management):*** Goal is to source 100% of single-use packaging products in the US from materials that are recyclable, renewable, compostable or contain post-consumer content, by 2025. Will prioritize products with environmentally sound certifications such as Forest Stewardship Council or Biodegradable Packaging Institute.

The impact of meeting the goals outlined on foodservice packaging is something that will develop and will be monitored over time. Another factor that has impacted recycling over the past two years is the pandemic. We know that residential waste collection volume has increased substantially since spring 2020 while commercial volume has declined due to the surge in 'working-from home' (WFH) among office workers. With more residents at home all day, and greater use of take-out restaurant meals vs. dine-in, the volume of foodservice packaging being disposed at home may well have increased. In addition, consumers may have heightened awareness if their curbside programs do not include foodservice and paper cup recycling.

The increase in WFH trend is expected to gradually diminish over the next year or two as workers return to the office, however, it seems likely that not all will return to the office. The percentage who continue to WFH will most likely stay higher than it was pre-pandemic, implying that volumes of residential waste will remain at higher levels than pre-pandemic. This suggests a potential increase in the volume of cups available from residential sources – unless home workers have switched from take-out beverages to making their own. No data is available yet to determine the impact of many factors on cups in the residential recycling stream, however, if WFH remains high, past estimates of cup residential recycling potential may need to be revised upwards. At the same time, when workers do begin to return to the office, the opportunity to discover the types of recovery processes that work best in restaurants and workplaces will open up.

6. Conclusions

While developing the processes needed to recycle paper cups from the curbside recycling has taken considerable time and research, FPI has now built a solid foundation and will continue to expand this initiative. In the last 2-3 years, significant progress has been made in adding cups to residential recycling programs, and identifying end-markets at mills. At least 20 residential curbside programs across the US, representing hundreds of communities, now explicitly accept cups. A total of 31 individual paper mills, plus 1 building product manufacturer, now accept cups. This suggests a significant opportunity to continue the expansion of cup recovery through residential recycling programs.

At the majority of MRFs, cups currently go into Mixed Paper bales, while a small number of MRFs do a positive sort into a carton and cup bale. The growth of optical sorting is helping to reduce the cost of positive sorting, but the most challenging issue at the MRF is the length of time it takes to build a bale, given the low volume of cups and similar material such as cartons. An opportunity to improve volume through development of a polycoated bale grade is apparent.

As the use of alternative barrier coatings to PE begins to expand, cups and other polycoated packaging will eventually become easier for mills to manage. Market share of alternative coatings for cups is too low for measurement in North America at present, but the growth of more easily recyclable coatings and cup materials in Europe suggests there is potential for widespread adoption in the long term.

APPENDIX A:

CASE STUDIES OF MRFs ACCEPTING CUPS

WestRock Recycling, Chattanooga, TN

End market: WestRock Chattanooga paper mill, who accepts paper cups in Mixed Paper bales

Plant size: Medium (4,000 to 7,500 tons per month range)

Paper grade sold: #54 Mixed Paper

Sorting method: Manual sorting on the paper line. Sorting paper cups and other SBS food service paper containers.

Residential / Commercial inbound material: 40% residential, 60% commercial, which is higher than normal on the commercial side. However, paper cups are primarily originating from the residential single stream program.

Other observations: Currently cup volume is not measured due to limited volume. Investment in sorting automation would be considered if the volume could increase to the 50 tons/month range.

WestRock Chattanooga is very unique, having the end market and processing facility located in the same city. This is a great example of how to start small and grow using the resources and synergies within a major paper company.

GFL – Alpine Recycling, Denver, CO

End market: Domestic paper mill

Plant size: Large (7,500 tons per month or more)

Residential / Commercial inbound material: 65% residential, 35% commercial. Paper cups are coming from their residential single stream program.

Paper grade sold: #52 Aseptic Packaging and Gable Top Cartons

Sorting method: Mechanical sorting using robotics through artificial intelligence

Other observations: GFL Denver avoids typical foodservice containers due to high contamination concerns, but does include aseptic packaging (Tetra Pak), clean ice cream cartons, and clean popcorn tubs.

Millennium Recycling, Sioux Falls, SD

End market: Domestic paper mill

Plant size: Small (2,000 to 4,000 tons per month)

Residential / Commercial inbound material: 65% residential, 35% commercial. Paper cups are coming primarily from their residential single stream program.

Paper grade sold: #54 Mixed Paper

Sorting method: Manual, leaving paper cups in the Mixed Paper stream. On the processing side, they leave any clean paperboard products including SBS cartons, paper cups, and plates in the Mixed Paper stream.

Other observations: Two critical components for the MRF's success were establishing a consistent sales market through WestRock's St. Paul, MN mill and working with the local Sioux Falls municipality to add paper cups to the recyclable material list. Adding paper cups to the Mixed Paper stream did not add cost to the MRF and was a simple and effective solution. Millennium Recycling is proactive in its resident communication, utilizing its website, blog, and social media. The MRF makes a commitment to ongoing education regarding acceptable recyclables, including paper cups.

APPENDIX B:

North American Paper Mills/Manufacturers that Accept Paper Cups

Paper Mills:

Cascades, Ashland, VA – Mixed Paper (opening in 2022)
Cascades, Niagara Falls, NY – Mixed Paper
Cascades, Kingley Falls, QC – Mixed Paper

Essity, Barton, AL – Mixed Paper
Essity, Menasha, WI – Mixed Paper
Essity, Middletown, OH – Mixed Paper
Essity, South Glens Falls, NY – Mixed Paper

Georgia-Pacific, Green Bay, WI – Mixed Paper
Georgia-Pacific, Muskogee, OK – Mixed Paper

Graphic Packaging International, Battle Creek, MI – Mixed Paper
Graphic Packaging International, East Angus, QC – Mixed Paper
Graphic Packaging International, Middletown, OH – Mixed Paper
Graphic Packaging International, Kalamazoo, MI – Mixed Paper

Great Lakes Tissue, Cheboygan, MI – together with Aseptic Packaging and Gable-Top Cartons

Green Bay Packaging, Green Bay, WI – Mixed Paper

ND Paper (sourcing via ACN), Fairmont, WV – Mixed Paper

Pratt, Conyers, GA – Mixed Paper
Pratt, Shreveport, LA – Mixed Paper
Pratt, Staten Island, NY – Mixed Paper
Pratt, Valparaiso, IN – Mixed Paper
Pratt, Wapakoneta, OH – Mixed Paper

Sustana (Breakey Fiber), Levis, QC – together with Aseptic Packaging and Gable-Top Cartons
Sustana (Fox River Fiber), DePere, WI – together with Aseptic Packaging and Gable-Top Cartons

WestRock, Aurora, IL – Mixed Paper
WestRock, Battle Creek, MI – Mixed Paper
WestRock, Chattanooga, TN – Mixed Paper
WestRock, Dallas, TX – Mixed Paper
WestRock, Eaton, IN – Mixed Paper
WestRock, Missisquoi, VT – Mixed Paper
WestRock, St. Paul, MN – Mixed Paper
WestRock, Stroudsburg, PA – Mixed Paper

Building Materials:

Continuus Materials, Des Moines, IA – together with Aseptic Packaging and Gable-Top Cartons

APPENDIX C:
Export Broker Contacts

Ekman Recycling Group
Wall Township, NJ
Brian Heckel
brian.heckel@ekmangroup.com
732-202-9500

Federal International
St. Louis, MO
Sam Still
samstill@federalinternational.com
314-721-3377

GP Recycling (Georgia Pacific)
Jericho, NY
Mike Belus
mike.belus@gapac.com
516-770-1030

The Paper Tigers, Inc.
Schaumburg, IL
Nick Halper, President
NHalper@papertigers.com
847-919-6500

Wilmington Paper
Pine Brook, NJ
Brett Lurie
BML@WPCRMS.com
973-445-2382

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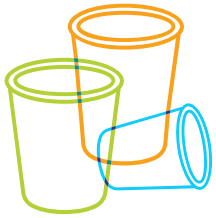
We Want Your Paper Cups!



OUR COMMITMENT TO RECYCLING

We, the undersigned organizations, are committed to increasing paper cup recycling. With the ever-increasing need to accelerate the recovery of foodservice packaging, we have taken many foundational and intentional steps to increase the viability of paper cup recycling and ensure end market acceptance.

A HIGHLY DESIRABLE RECYCLED MATERIAL

Paper cups are made with long, bleached fiber that are highly desired by paper mills because it adds strength and quality to new products made with recycled fiber. To date, there are 28 paper mills across eight companies in North America that accept residential mixed paper bales with paper cups included. Additionally, there are 5 mills/facilities across three companies that accept paper cups into bales of aseptic and gable top cartons ("Grade 52" bales). Participating paper mills have performed pulpability testing and/or mill trials to determine their ability to successfully recover fiber from paper cups and use the fiber in their furnish.

MAKING NEW EVERYDAY PRODUCTS

To provide a liquid barrier to the fiber, paper cups have a coating either on the inside (for hot drink cups) or on both sides (for cold drink cups). The pulping systems in use at our mills can separate the coatings from the fiber and recover the fiber as a feedstock for new products. Yield from the cup is in the 70 to 90 percent range, depending on whether the cup has a single or double sided coating and the pulping system in use. These fiber products go on to be made into a variety of everyday items such as cereal boxes, facial tissues, corrugated boxes, and new paper cups!

ADDING PAPER CUP RECYCLING

Material recovery facilities (MRFs) can add paper cups to their accepted material list. Communities can advocate for the inclusion of paper cups in their recycling stream by working with their waste haulers and MRFs.

A list of mills that accept paper cups and a map are on the next page. You can also find them on an interactive map **here**.

JOIN THE PAPER CUP RECYCLING MOVEMENT

Many of us are members of the Foodservice Packaging Institute, which provides industry-funded grants to MRFs, waste haulers, and communities that expand paper cup recycling access, increase current recovery capabilities, and educate residents on new paper cup recycling programs. If you are interested in partnering with FPI to add paper cup recycling to your recycling program, visit **www.recyclefsp.org** or email **recyclefsp@fpi.org**.

Additional information about paper cup recycling may be found at: **www.recyclepapercups.org**.

Cascades

essity

GP PRO Georgia-Pacific

Graphic Packaging INTERNATIONAL

Great Lakes Tissue Company

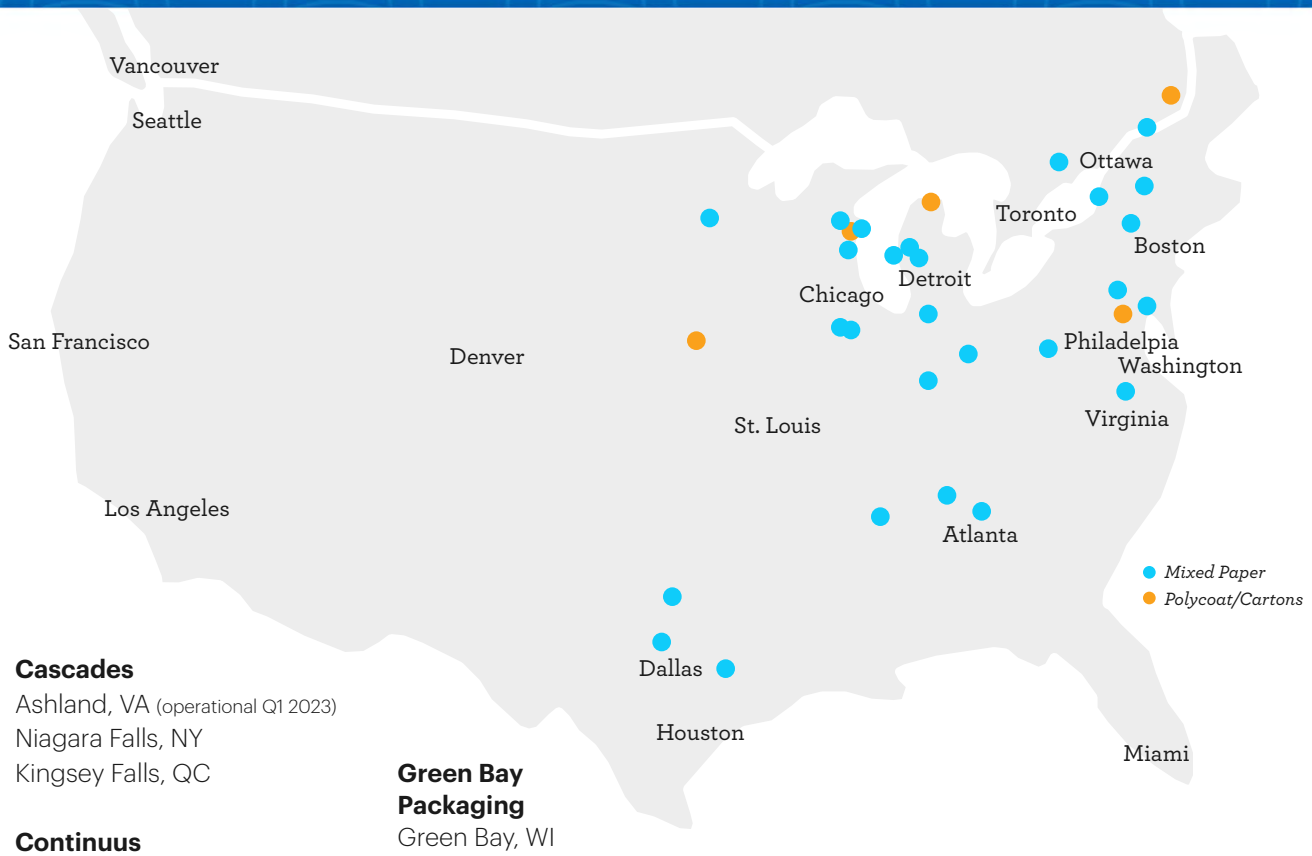
ND PAPER

U.S. MANUFACTURER OF RECYCLED PAPER · PRATT 100% RECYCLED · DEDICATED TO SUSTAINABLE PACKAGING

SUSTANA FIBER

WestRock

We Want Your Paper Cups!



Cascades
Ashland, VA (operational Q1 2023)
Niagara Falls, NY
Kingsey Falls, QC

Continuus
Des Moines, IA
Philadelphia, PA

Essity
Barton, AL
Menasha, WI
Middletown, OH
South Glens Falls, NY

Georgia-Pacific
Green Bay, WI
Muskogee, OK

Graphic Packaging International
Battle Creek, MI
East Angus, QC
Middletown, OH
Kalamazoo, MI

Great Lakes Tissue
Cheboygan, MI

Green Bay Packaging
Green Bay, WI

ND Paper
Fairmont, WV

Pratt
Conyers, GA
Shreveport, LA
Staten Island, NY
Valparaiso, IN
Wapakoneta, OH

Sustana
Levis, QC
DePere, WI

WestRock
Aurora, IL
Battle Creek, MI
Chattanooga, TN
Dallas, TX
Eaton, IN
Missisquoi, VT
St. Paul, MN
Stroudsburg, PA

THE MIXED PAPER MILLS ON THIS LIST REPRESENT:

of the U.S./Canadian mixed paper demand (% by quantity consumed)

of the U.S./Canadian mills consuming mixed paper (% by mill count)

Generators should contact end markets directly or via their broker to determine specifications and terms.
*as of 1/2022

FAQs ON RECYCLING PAPER CUPS FOR PAPER MILLS

As paper mills consider whether to accept bales containing paper cups, mills may have a variety of questions. Below are answers to some of the most anticipated questions:

Why should I accept bales with paper cups?
Paper cups are typically made with long, virgin fibers, something all mills find valuable. And, at a time where traditional sources of fiber – like newsprint and office paper – are in decline, mills may be looking for new sources of valuable fiber. In addition, cup fiber may lend strength to short fiber.

What materials are found in a typical paper cup?
Paper cups typically consist of bleached white virgin fiber with a thin polymer coating. Often, this coating is made from polyethylene (PE), but sometimes polylactic acid (PLA) is used. While wax may have been a common coating in the past, this is not true today. They also don't include wet strength chemicals, as they are not needed when a poly coating is used. Cups may contain low levels of starch.

Cups for hot liquid applications typically have one polymer layer on the inside of the cup, while cups for cold applications have two polymer layers, one on the inside and one on the outside. This coating provides insulation and helps prevent leaks. The coating ranges from roughly 5 to 12 percent by weight of the finished cup, depending on whether it's a cold or hot cup, and whether it has a PE or PLA coating.

While polymer coatings are used on almost all cups today, new repulpable water-based coatings are entering the market that can replace the traditional poly coatings.

Hot cups have printing ink directly on the fiber, while cold cups have ink on the exterior polymer coating. This is an important distinction, considering not all mills have deinking capabilities.

What happens to the poly coating after the pulping process?
That depends on the mill. In most cases, the poly will be sent to a landfill with any other residuals. In other cases, a mill may be able to recycle it or send it to a waste-to-energy facility. The industry is also working on processing innovations. For example, an emerging technology utilizes heat and pressure to extract usable fiber from polycoated and food-soiled packaging.

In which bales can I expect to see paper cups?
Based on the findings of a MRF flow study conducted several years ago (highlights found here), paper cups typically end up in mixed paper (ISRI grade #54) or carton bales (ISRI grade #52). They may also be sorted into other bales, like sorted office paper. Incoming material, operational considerations and preferences of paper end markets are factors used by the MRF to determine which bales will contain cups.

What fiber yield can I expect when recycling paper cups?
Yield correlates closely to the percent fiber versus polymer by weight, therefore fiber yields can be expected in the roughly 88 to 95 percent range. Yield may be higher with new repulpable coatings.

Won't my mill be flooded with paper cups if I decide to accept them?
While paper cups are part of our busy lives, the reality is that they are a very small part of the recovered fiber stream. According to industry estimates, there are roughly 600,000 tons of paper cups produced annually in the U.S. That is less than one percent of all paper and paperboard produced in the U.S. in 2018.

Research sponsored by the Foodservice Packaging Institute found that if the paper cups are included in a mixed paper bale, you can expect less than 0.5 percent of that bale to be paper cups. This is based on industry estimates as well as bale audits of residential mixed paper from two cities (New York City and Seattle) that accept paper cups for recycling.

If the paper cups are directed to a carton bale, you can expect 25 percent of that bale to be paper cups, based on industry estimates. According to one mill currently accepting bales with cartons and cups, cups represent about 10 to 20 percent of the bale. Adding cups to this bale provides additional volume, which may be desirable given that cartons are another low-volume commodity.

Aren't cups too contaminated with food to be recycled?
No. Cups and other foodservice packaging items are no more contaminated than commonly recycled food-contact items like bottles, jars or cans. This assertion is based on two studies done in Boston and Delaware that examined food contamination found in curbside recycling programs. And, in both studies, the majority of the samples of foodservice packaging was rated as low-residue (1-2 on a scale of 1-5). Read more about the studies here or watch the webinar on this topic here.

Since cups are used to contain liquids, the contents are easily emptied (and residents are likely to empty the cups before recycling to avoid spills in the home). In addition, any liquid left in the cups when recycled is expected to drain out during transport to the MRF.

Will I be able to process bales with paper cups?
That depends. All mills are different. As mill equipment and capabilities vary, it is recommended that mills conduct trials before accepting cups. Some mill experience suggests that the polymer coating can separate readily during pulping in both continuous and batch pulping processes. Mill cleaning systems enable the removal of the separated polymer strips from the pulping process. However, other mills have reported challenges with effectively separating the polymer coating in their pulping processes and/or cleaning systems.

If my mill wants to run a trial first, what should I consider?
If you're interested in running a trial, first know that we are here to help! Having helped other mills with trials, here are a few considerations:

- *Sourcing cups:* If you need help sourcing paper cups, or bales with paper cups, please let us know. It's up to you whether you want to run a trial with just pre-consumer cups, or post-consumer in a bale of your

choice. You may want to start with pre-consumer, and if that's successful, move to post-consumer bales. We can also help you determine the quantity of cups to include in the trial, based on the expected volumes of cups in the marketplace that are available or expected to be recycled.

- *Metrics:* You probably have metrics you'll want to track, but be sure to note the following (applicability may vary depending on whether you are running a trial with pre- or post-consumer cups):
    - Whether fiber is being consumed or is part of the tailings coming out of the pulper
    - Amount of poly in the pulper
    - Acceptability of polycoat (as a percentage)
    - Yield of typical bales containing paper cups
    - Yield loss
    - General contamination level in bales
    - Non-fiber material in bales
    - Storage issues: degradation of bales while in storage; storage time; storage requirements
    - De-trashing composition
    - Odor and insect/rodent presence
    - Residue

- *Length of trial:* This is for each mill to decide, but it's assumed that it will be for a finite period of time, providing the mill an opportunity to better understand the processing capabilities in mill operations, including the pulpability and yield of this material. A minimum of eight hours is recommended.

What's the next step if I decide I'd like to accept post-consumer paper cups in my mills?
First, let us know in which fiber grades/bale types you'll accept cups. Ideally, you're willing to communicate this acceptance publicly and be placed in our online end markets map (found here) and list (found here). But, if you prefer a less public approach initially, we'll work with you to find a suitable one. For example, you can communicate this via your buyers to your existing suppliers. We can also help by letting MRFs in your region know of your willingness to accept bales with paper cups (feel free to reach out directly, too!).

Finally, if you really want some added exposure, we're always looking for paper mills to highlight successful paper cup recycling. Just let us know and we'll contact you regarding future articles, speaking opportunities, etc.

Produced by the American Forest & Paper Association and FPI's Paper Cup Alliance.

Foodservice Packaging in Mixed Paper Bales: Audit Results

Background

The Foodservice Packaging Institute's Paper Recovery Alliance (PRA) and Plastics Recovery Group (PRG) are working to increase the recovery of foodservice packaging by overcoming real and perceived barriers. One of the barriers for paper foodservice packaging was concerns expressed by mills and materials recovery facilities (MRFs) about adding these items to standard commodity bales such as mixed paper. To that end, the PRA had developed "desktop" estimates of the quantities of foodservice packaging that would be present in these bales when communities promoted collection of paper foodservice packaging for recycling. In order to test these estimates against "real world" examples, the PRA decided to conduct audits of mixed paper bales.

The Study

In order to better understand the amount and type of paper foodservice packaging that is being recovered through the residential curbside recycling system in communities that currently accept paper FSP, a team led by RRS sorted six mixed paper bales from two markets (New York City and Seattle) in October 2014. The sort sought to quantify the following types of paper foodservice packaging items:

- Hot Drink Cups
- Cold Drink Cups
- Takeout Containers
- Paperboard Pizza Box
- Cup Sleeves
- Takeout Bags
- Beverage Carriers
- Egg Boxes

All eight targeted material categories were listed as accepted on the websites of the New York City and Seattle recycling programs as of October 2014.

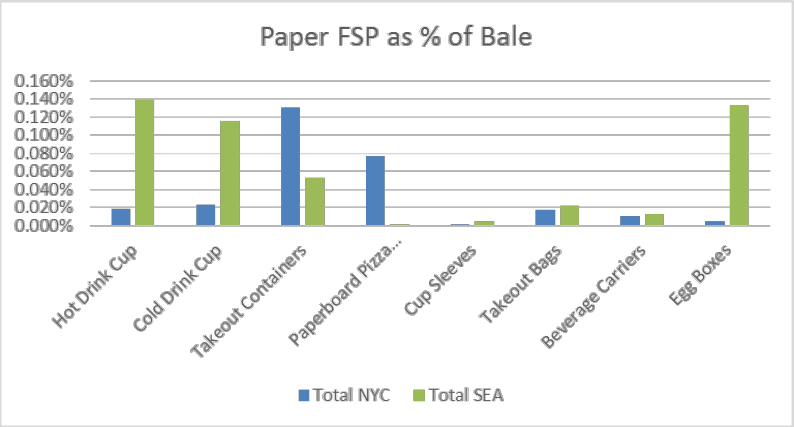
Sorting the hot and cold cup categories was based on a visual inspection and relied in large part on factors such as brand (e.g. soda vs. coffee), caution statements, etc. The target materials were all weighed and noted. The balance of the bales were mixed paper and other contaminants.

The Results

In total, foodservice packaging comprised only several pounds (approximately 2.5-10 lbs) out of each bale. On a percentage basis, samples from both cities averaged under 0.5%. The Seattle samples had a higher proportion of foodservice packaging (averaging 0.48%) than New York City (averaging 0.28%). For comparison, PRA's "desktop" estimates projected that paper foodservice packaging would make up of 3% of a mixed paper bale, given a future foodservice packaging recovery rate of 10%.

The prevalence of paper foodservice packaging item types found in each bale varied substantially between types of packaging, and the relative mix differed significantly by city.

Paper Foodservice Packaging as a % of Bale Weight (averaged by city)

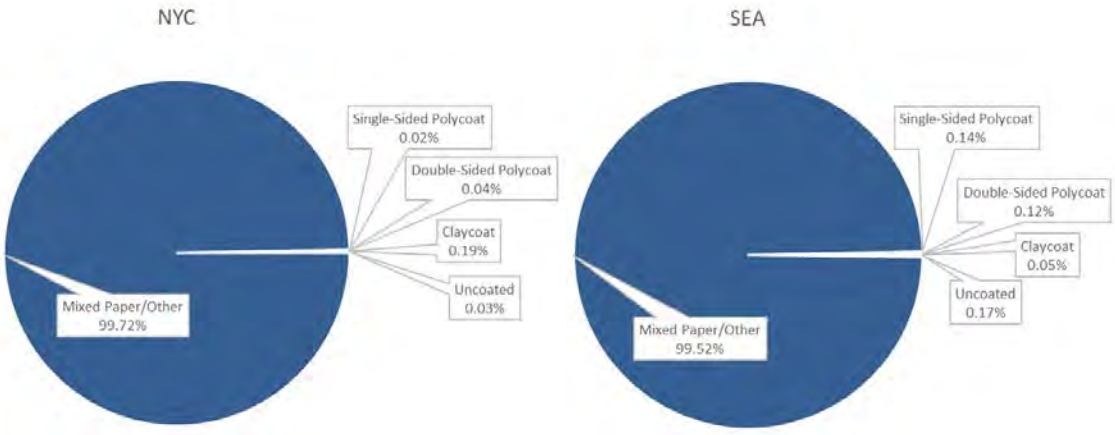


While it is impossible to determine the exact reasons for these differences, some factors contributing to these findings may include:

- different consumption patterns;
- different packaging mix due to local foodservice market shares and regulatory landscapes (polystyrene foam has been banned in Seattle since 2009);
- the availability of composting options in Seattle; and
- different histories of the recycling programs and resident education.

While item type is of interest for resident education and ability to sort at the MRF, the inclusion of coatings (i.e. clay versus single- or double-sided polycoat) will be of greater relevance to end markets.

Foodservice Packaging by Coating type, as Percentage of Bale



Contractor's Conclusions

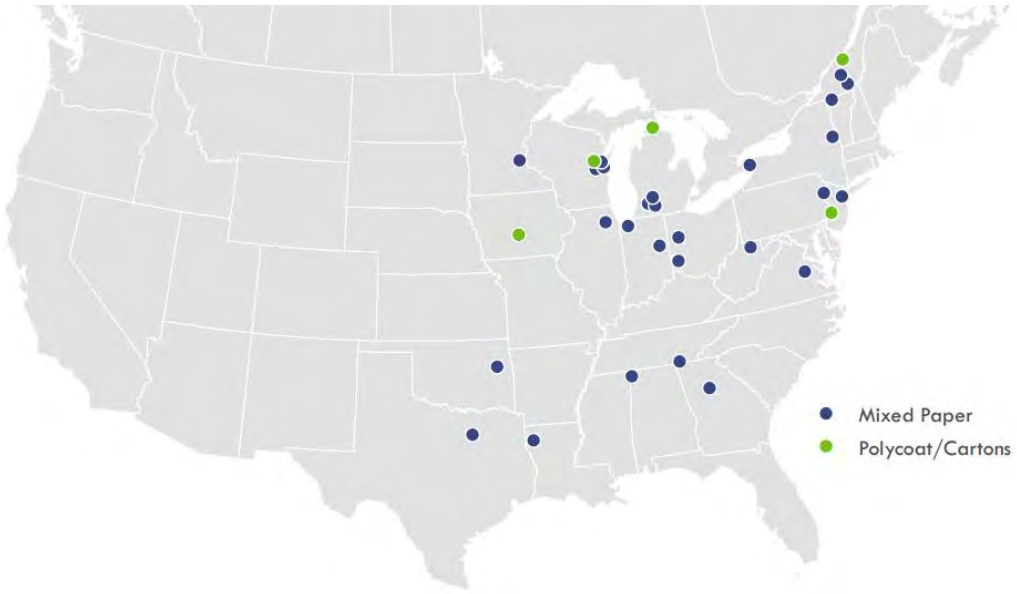
Overall, the bale audits found very low levels of foodservice packaging material in mixed paper – foodservice packaging made up an average of 0.48% in Seattle and 0.28% in New York City. Possible factors contributing to these findings include:

- low recovery rates for foodservice packaging, in general;
- low awareness in New York City that foodservice packaging can be recycled; and
- the composting option for some paper foodservice packaging in Seattle.

FPI would like to thank the City of Seattle, Republic Services, Paper Fibres Corp., and Recycle Ann Arbor for participating in the study.

More information on FPI's recovery projects may be found at www.fpi.org/stewardship.

End Markets for Post-Consumer Paper Cups



FPI has assembled a list of US and Canadian end markets that have confirmed their acceptance of post-consumer poly-coated (i.e. PE-coated or PLA-coated) paper cups in commonly traded commodity bales. This listing is provided for reference only. Generators should contact end markets directly or via their broker to determine specifications and terms.

Mixed Paper Markets

The following mills purchase residential mixed paper bales containing paper cups. Some also accept other paper foodservice packaging.

Cascades, Ashland, VA (operational Q1 2023)
Cascades, Kingsey Falls, QC
Cascades, Niagara Falls, NY
Essity, Barton, AL
Essity, Menasha, WI
Essity, Middletown, OH
Essity, South Glens Falls, NY
Georgia-Pacific, Green Bay, WI
Georgia-Pacific, Muskogee, OK
Graphic Packaging International, Battle Creek, MI
Graphic Packaging International, East Angus, QC
Graphic Packaging International, Middletown, OH
Graphic Packaging International, Kalamazoo, MI
Green Bay Packaging, Green Bay, WI
ND Paper (sourcing via ACN), Fairmont, WV
Pratt, Conyers, GA
Pratt, Shreveport, LA
Pratt, Staten Island, NY
Pratt, Valparaiso, IN
Pratt, Wapakoneta, OH
WestRock, Aurora, IL
WestRock, Battle Creek, MI
WestRock, Chattanooga, TN
WestRock, Dallas, TX
WestRock, Eaton, IN
WestRock, Missisquoi, VT
WestRock, St. Paul, MN
WestRock, Stroudsburg, PA

If you would like to suggest an additional end market for addition to this list, please contact recyclefsp@fpi.org. An interactive map of end markets for other commodities, and additional resources on recovery of foodservice packaging are available at: www.recycleFSP.org.

January 2022

End Markets for Post-Consumer Paper Cups

Polycoat / Carton Markets

The following mills purchase bales containing paper cups along with aseptic and gabletop cartons.

Continuus, Des Moines, IA
Continuus, Philadelphia, PA
Great Lakes Tissue, Cheboygan, MI
Sustana (Breakey Fiber), Levis, QC
Sustana (Fox River Fiber), DePere, WI

If you would like to suggest an additional end market for addition to this list, please contact recyclefsp@fpi.org. An interactive map of end markets for other commodities, and additional resources on recovery of foodservice packaging are available at: www.recycleFSP.org.

January 2022

RRS

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MRF MATERIAL FLOW STUDY

FINAL REPORT | APRIL 2015

COMISSIONED BY

Carton Council RecycleCartons.com

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NAPCOR

APR

FPI FOODSERVICE PACKAGING INSTITUTE

PREPARED BY RRS IN CONJUNCTION WITH:

Reclay StewardEdge Product Stewardship Solutions

MOORE RECYCLING ASSOCIATES INC.

INTRODUCTION

The famous Greek philosopher Heraclitus captured the essence of the recycling industry over 2,500 years ago when he penned the phrase, "Nothing endures but change." The march of packaging innovation and technology, and the persistently changing habits of consumers continue to dictate the changing mix of materials that enters a material recovery facility (MRF). Over the past decade, there has been a continual decline in the once dominant materials including newspaper, glass and metal cans. At the same time, a host of other packaging types have emerged, presenting new recovery opportunities. Recycling programs throughout the country have responded by expanding the list of materials accepted for recycling, notably including a wide range of plastics and cartons. For the MRFs that receive the material, it is not always easy to keep sorting technologies and techniques on pace with this expanding mix.

STUDY OVERVIEW

Packaging companies have an interest in ensuring that the packages they produce or sell their products in have the opportunity to be recycled. The ability to recycle the package can be a consumer's deciding factor in the purchase of a particular product. This, and the desire to minimalize environmental footprints, are the drivers behind the recently completed MRF Material Flow Study.

MRFs are the intersection between consumers, residents and the industrial infrastructure that creates the products and packaging we use every day. To better understand the recyclability of their packaging, five diverse associations – the Carton Council, Foodservice Packaging Institute (FPI), American Chemistry Council (ACC), National Association for PET Container Resources (NAPCOR) and the Association of Postconsumer Plastics Reprocessors (APR) – joined together to study how numerous materials flowed through the MRF. They contracted with RRS, Reclay StewardEdge (RSE) and Moore Recycling Associates to develop a standard methodology and execute it at five MRFs.

KEY CONCLUSIONS

In studying the performance of specific materials through different MRF environments, a number of general takeaways became clear. These conclusions could help to serve as guidelines to improve recovery across the recovery value chain – from residents and municipalities to packaging designers and MRF operators and engineers, and everyone else in between.

AUDIENCE	KEY TAKEAWAYS
Packaging Designers	• Form, material and rigidity have a significant effect on a product's "sortability" in the MRF • Light-weighting of plastics can decrease recovery in a single stream MRF due to loss to the paper streams
MRF Operators	• More equipment steps (disc screen decks or other separation equipment) can improve accuracy of splitting two-dimensional from three-dimensional materials • Properly maintaining the disc screens (cleaning and replacing discs) can significantly reduce loss of containers to the paper stream • Minimizing compaction to maintain the form/shape of incoming material improves separation • Continually training sorters to recognize a wide range of acceptable packaging is of growing importance
MRF Equipment Designers	• Further research and development is needed to improve consistency of behavior of non-bottle plastics in the MRF • Further testing and refining of optical sorter programming is needed to effectively optically sort a wider range of packaging
Municipalities	• Regular communications with local MRFs is critical to understanding behavior of materials currently accepted and identifying additional materials that could be added • As the list of acceptable materials grows, continual education for residents is essential to keeping contamination to a minimum • For single stream programs, education to the consumer to not crush materials can improve their recovery
Recycling Industry	• Continually evaluate and match MRF product quality and end market capabilities to ensure true recovery

ABOUT THIS REPORT

This study examined the behavior of numerous individual products in the MRF, yielding data on cups, clamshells, containers, domes/trays, bottles, tubs, lids, gable-top and aseptic cartons, and other materials. Funders of this study have gained a greater awareness of the opportunities and obstacles regarding the recovery of each of these materials and will apply this new knowledge to increase recovery.

While the detailed data on each material are not presented within this report, key findings regarding material flows, sorting technologies, and other sorting and design related considerations are explained, along with the study's methodology.

STUDY METHODOLOGY

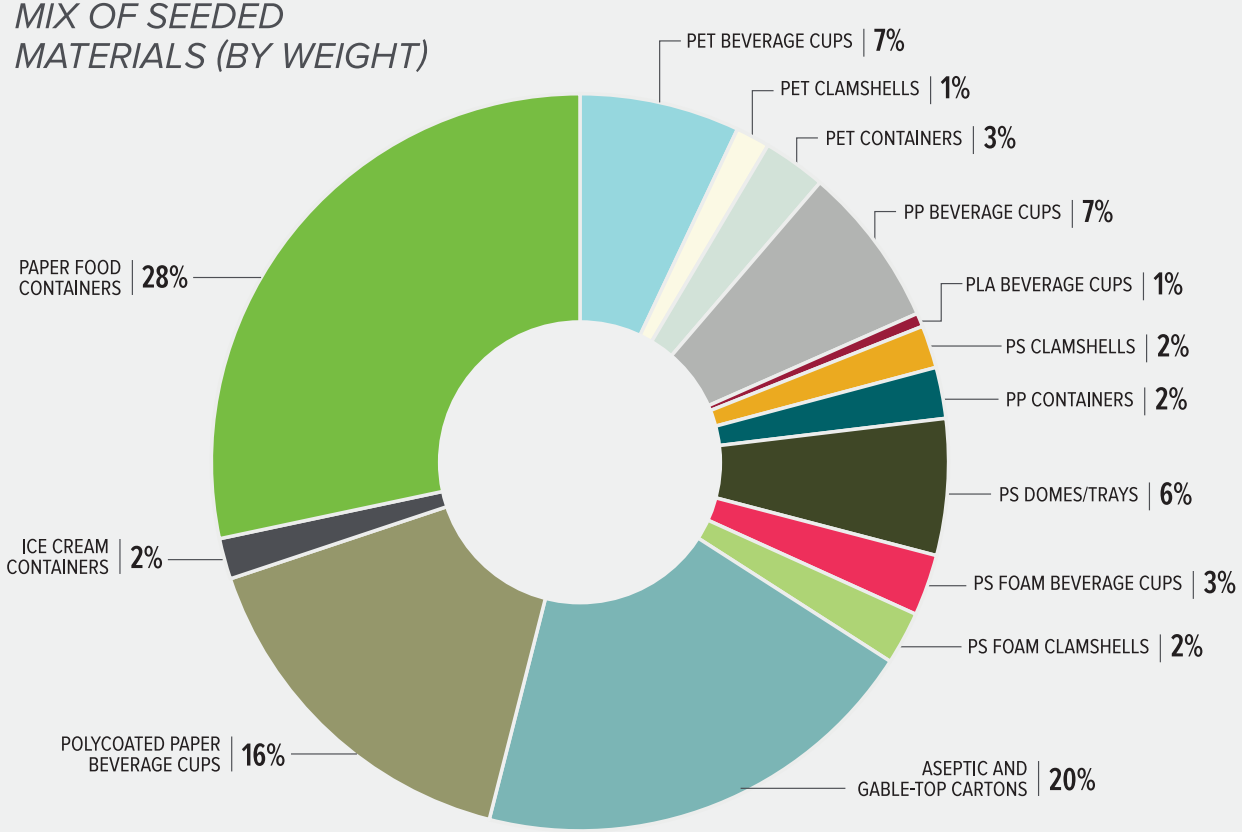
There were three stated goals of the study:

1. Learn how materials similar to the test samples and other study materials would flow through typical MRF environments;
2. Determine which of the study materials, not currently accepted by MRFs, could potentially be recycled using existing MRF infrastructure; and
3. Start to develop an understanding of what sort processes could be modified to allow effective recovery of sample materials

The study focused on a broad range of materials, many that are currently widely accepted and some that are very rarely included in recycling programs. Materials that are not commonly accepted for recycling were brought in and added, or "seeded", to the normal stream received by the MRF. To simulate a realistic recovery scenario, care was taken to add materials at levels that corresponded to their relative prevalence in the marketplace. In other words, more common materials were seeded in larger amounts (by weight) than less common ones.

The plastic materials studied included cups, clamshells, domes/trays, bottles, tubs, lids and other containers. Each was classified by resin identification code and in some categories including containers and tubs, by size as well. The paper products studied included cups, ice cream containers, gable-top and aseptic cartons, and take-out food containers. Figure 1 shows the representative mix of materials that was seeded.

FIGURE 1
MIX OF SEEDED MATERIALS (BY WEIGHT)



In each of the five MRFs that served as test sites for this study, a standard methodology was applied to analyze the flow of materials. This methodology was, in essence, quite simple and could be replicated for other materials or repeated in other MRFs.

- The MRF set aside enough inbound recyclable material to run their facility for 3 hours (between 30 and 100 tons). This represented the average material that the facility processes on a day to day basis.
- The study team worked with the MRF staff to mix the seeded packaging into the inbound material. In each facility, the seeded materials represented about 1% of the incoming stream by weight.
- Sort staff was trained on how to handle the seeded materials. In general, the materials were allowed to flow where they naturally did within the facility and sorters were instructed to not pick and dispose of the seeded materials as residue. However, each seeded package was given one or more target commodity streams and if, for example paper beverage cups flowed to the container line, the sorters were directed to positively sort them to the carton bale and if they flowed to the paper line they were allowed to stay in the mixed paper bale. Seeded materials therefore flowed to existing MRF products – new product grades were not produced for the seeded materials.
- The facility processed the material for 3 hours. During the processing, video cameras were set up to monitor the flow of materials and the actions of the sorters.
- Random samples of the main products were taken either as loose samples or from random bales. The target sample weight was about 600 pounds for each of the products and, where possible, multiple samples were taken of each product or the majority of the product was sorted.
- Each of the samples was sorted into 104 categories. The plastic sort categories were chosen to match other studies commissioned by ACC, APR, NAPCOR, and others.

Ideally, tests were run during a time that the facility was not planning to operate, so as not to hinder normal operations. MRFs operate on extremely tight timelines, and without careful scheduling a study could easily create problematic disruptions.

DATA ANALYSIS

Based on the data collected, two analyses were performed. The first was characterizations of each of the product streams. These were completed for each of the samples of a single product and then averaged to get the product characterization. Product characterizations showed how much of that stream was composed of each sort category. An example is shown in Figure 2. The product characterizations are important for end

The MRFs at which this study was conducted were chosen to represent the wide diversity of facilities that currently process recyclables nationwide. Here are some of their key descriptors and differentiators:

- 1 dual stream and 4 single stream facilities
- Throughput range (tons per hour): 10 tph – 35 tph
- Four different equipment manufacturers
- Number of optical sorters ranged from 0 – 5
- Varying combinations of disc screens and other mechanical separation equipment

PRODUCT CHARACTERIZATIONS WERE CALCULATED FOR THE FOLLOWING STREAMS:

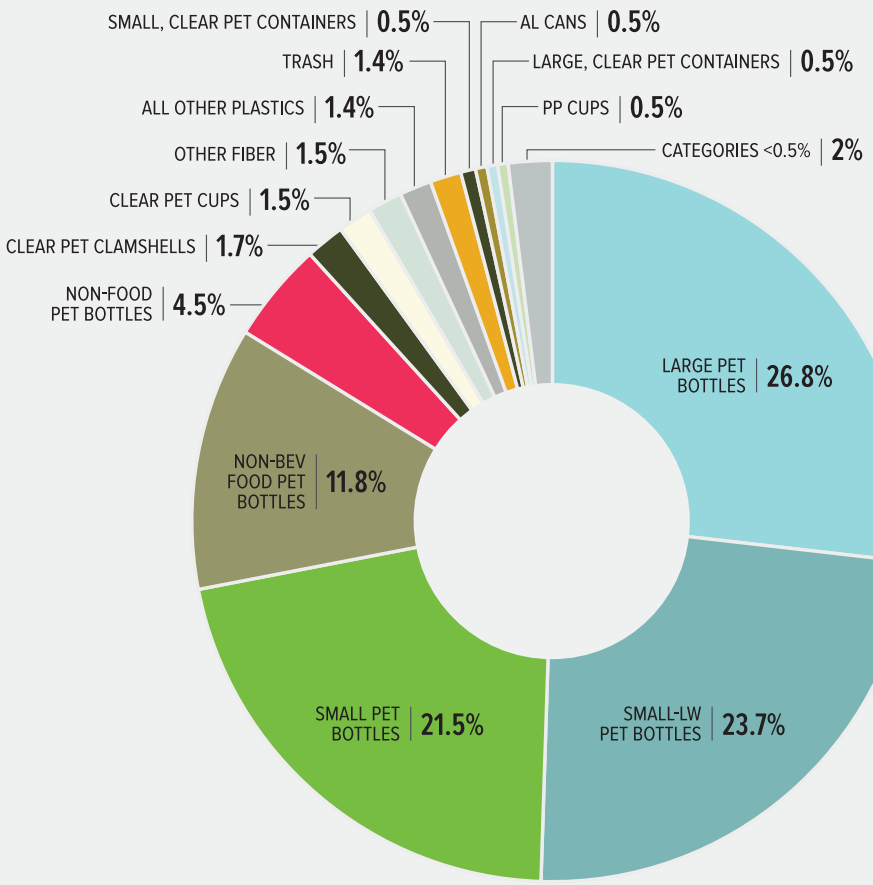
Mixed Paper	Mixed Paper/ Newspaper[1]	cHDPE
Newspaper	PET	nHDPE
Cartons	Mixed Plastics[2]	Residue

1 Some facilities only marketed one grade of paper
2 Also included a HDPE/PP Tubs and Lids grade

markets to understand the quality and composition of a MRFs products. For this study, it was important to see if the addition of seeded materials would increase contamination of existing product streams.

The second analysis used the characterizations to determine the destination of each of the study materials. For example, if 10,000 paper beverage cups were introduced into the MRF, how many would end up in the mixed paper, how many in the carton bale and how many in the residue and other categories. This analysis was the key to understanding how the materials flowed in the MRF environment. Examples of this analysis are shown in the Results section.

FIGURE 2
EXAMPLE PRODUCT STREAM CHARACTERIZATION: PET, AVERAGED ACROSS ALL 5 MRFS



RESULTS

While a diverse set of MRFs was chosen for the study, the results presented here are specific to the MRFs studied, as different results can be achieved by modifying equipment layouts, operating protocols and material streams.

Key findings are grouped by type of MRF, type of sortation equipment and material form and prevalence.

DUAL STREAM SYSTEMS

Two types of MRFs were included in the study: one dual stream and four single stream. While only one MRF was dual stream, one comparison about the difference between dual and single stream systems can be made.

Dual stream systems, which are declining nationally in favor of single stream systems, require residents to separate paper materials from metal, glass and plastic containers. As will be highlighted in the next section, dual stream systems offer the advantage of reducing loss of plastics and other containers to the paper streams. On the other hand, as the material mix has expanded to new packaging types, it isn't always well understood to by residents in which stream they should be included. For MRFs, it is more difficult to sort these containers from the paper stream than it is from the container stream, making this a real obstacle.

SINGLE STREAM SYSTEMS

While single stream systems allow for easier communication to consumers about how to recycle (and simplify collection systems), the difficulty in separating the materials is passed

onto the MRF. One of the key observations in this study is that there are wide variations in how effective single stream facilities are in separating paper from the containers. To accomplish this separation, single stream facilities use a series of disc screens and other equipment that all utilize the difference in shape between paper and containers. Flat materials (generally 2-dimensional) will travel to the top of the screen and to one series of conveyors, while bottles and other containers (generally 3-dimensional) will either fall through the screens or tumble to the bottom to a different series of conveyors.

There are numerous factors that affect the ability of single stream equipment to accurately separate the 2D and 3D materials. They include equipment design factors (such as screen design and angle), operation issues (such as overloading the screens, cleaning the screens, and wet material), maintenance issues (such as wear to discs) and collection issues (such as excessive compaction of the material by residents or collection vehicles). Further, the packaging design itself can also affect the flow of individual materials. All of these variables cannot be evaluated in one study, but general conclusions are possible.

BEST PRACTICES FOR ACCURATE 2D/3D SEPARATION IN SINGLE STREAM MRFS:

- Avoid loading screens past their design throughput
- Clean screens of material that are wrapped around the shafts
- Replace worn and damaged discs
- Minimize compaction of material by residents and collection trucks
- Keep material dry

SCREENS

In this study, plastics separation by screens was examined in depth and the analysis can act as a surrogate for other container material types, such as aluminum and steel. The amount of plastics (including bottles, containers, clamshells and cups) lost to the paper stream varied from 3% to 12%. The two MRFs that experienced a 12% loss of plastics to the paper stream were both medium sized single stream facilities (25-30 rated tons per hour (tph)) that had fewer screens than the larger two (35 tph). After seeing the screening effectiveness data from this study, both replaced worn discs in their disc screens and reported a significant improvement in the 2D/3D separation. The facility that experienced a 3% loss of plastic to the paper stream was a large MRF with an adequate number of screens for the incoming volume and material type (note: this facility was the top performer across the entire study). Interestingly, the facility with 8% loss was similar to the 3% facility, but it had two distinct operational issues that were not normal for their facilities: material was wetter than normal due to heavy snow storms, and space constraints on the tip floor caused by equipment failures resulted in handling of the material significantly more than normal (including driving over it with a loader). These results suggest that a well maintained facility with an adequate number of screens for the incoming volume and material mix, operating under normal conditions can achieve very low losses of containers to paper products.

Note: Both large single stream MRFs, which had better success than the medium single stream MRFs at separating the plastic containers from the paper, were equipped with 4 sets of disc screens: an OCC screen for separating cardboard or "old corrugated containers", 2 ONP screens for separating "old newspapers" and a polishing screen for cleaning up the mixed paper stream. The two medium MRFs had 1 less paper screen each. Depending on the facility, this study indicates that the extra screens can help improve the accuracy of the 2D/3D separation in single stream MRFs.

FORM

The form of a package had a strong influence on the loss of packaging to the paper streams. As can be seen in Table 1, the plastic clamshells had a much higher likelihood of flattening and moving with the paper streams. The rounder materials (including bottles, cups and containers) all had much lower loss rates, and less than 5% was lost at the top performing MRFs, Small, lightweight water bottles were more likely than other bottles to move with the paper with a loss rate of 15%. The cups, containers and clamshells still enter the MRFs in much lower quantities than bottles. They made up 11% of the plastics stream, even with the seeded materials. Aseptic and gable-top cartons had a higher average loss rate to the paper

streams, although it is interesting to note it was the only packaging type to have one facility with no loss to the paper stream. In all five MRFs, they marketed a Grade 52 for cartons and pulled them from the container line.

OPTICAL SORTERS

Another piece of equipment in MRFs that can help improve separation of materials are optical sorters. Optical sorters can recognize materials based on what they are made of along with their size and shape. All four single stream facilities had at least one optical sorter, and the two large facilities had 3–4. Optical sorter efficiency was difficult to determine from this study because for each optically sorted commodity there were one or more manual sorters for quality control, both on the material that was positively sorted and what was missed. Therefore a manual sorter could remove a PET cup that was positively sorted by the optical sorter into the PET bale or another could mistakenly sort a PP cup that resembled one from PET into the PET bale. However, there were two interesting cases that are worth noting with the optical sorters.

Many of the materials that were tested as part of this study are light weight, meaning a sorter (either human or optical) needs to handle more pieces in order to sort a ton. At the only single stream facility without an optical sorter for the cartons, the manual sorter who normally sorts cartons was asked to positively sort any paper beverage cups and ice cream containers. With the volume of cups and ice cream containers, the sorter was overwhelmed and the manager chose to add a second sorter to that station. This implies that as more lightweight materials are added to the MRF, either more manual sorters will need to be added or optical sorters may be able to help increase the sorting throughput.

Even for a trained manual sorter, recognizing the resin type for each item as it goes by on a conveyor is very difficult. The PP and PET cups that were seeded for the test were both clear plastic and very similar in style. Averaged across all five facilities, approximately 20% of the PP cups were found in the PET bales. This is likely due to manual sorters positively sorting them to the PET stream because they so closely resembled PET cups. As more diverse packaging, including different sizes, shapes, colors, materials and purposes, continues to enter the MRF, improvements in technology and training to keep bale quality high will likely be necessary.

Similarly at one MRF, the optical sorter was set to sort all HDPE and PP and manual sorters then sorted that stream into nHDPE, cHDPE and a HDPE/PP Tubs and Lids grade. The cHDPE bale at that MRF had a much higher percentage of PP (8%) than the other MRFs (less than 2%). This further emphasizes the sorting challenges facing MRFs.

MATERIAL PREVALENCE

MRFs have been designed to separate bottles and cans from magazines and newspaper. During this study, extensive data was collected on the behavior of specific packaging types in the MRF environment. It shows that MRFs are doing quite well with these prevalent materials, although even these materials are not being correctly sorted at 100%. At best, the study showed a recovery of 93% of an individual package type, with much of the loss to other products and not to residue alone. Similarly for small (<1L), regular weight

TABLE 1

LOSS RATE OF PACKAGING MATERIALS TO THE PAPER STREAMS

FORM	AVERAGE LOSS RATE TO PAPER STREAM	LOSS RATE AT BEST PERFORMING SINGLE STREAM MRF
Plastic Bottles	5%	2%
Plastic Cups	10%	3%
Plastic Containers	12%	2%
Plastic Clamshells	29%	12%
Aseptic and Gable-top Cartons	18%	0%

PET bottles and all size cHDPE bottles, results are shown in Figure 3. Compare those figures to results for small (<10") PET non-bottle containers and cHDPE non-bottle containers as shown in Figure 4. Note that for all results, the data from each of the five MRFs was averaged to form a composite of the behavior across all facilities. According to RRS's database, approximately 50% of the material nationally is processed through the largest 20% of MRFs. Therefore, the larger MRFs were weighted more heavily than the smaller facilities when combining the data.

Why do bottles flow more consistently to the proper bale than tubs and other non-bottle containers? There are many likely reasons for these results. The first, and likely most important, is relative amount of material. During the tests, there were greater than 20 times more regular weight PET bottles than small PET containers (by weight). Including all types of PET bottles and both large and small containers, there were greater than 30 times more bottles (by weight). Although not as pronounced, there were still 8 times as many colored HDPE bottles as containers and tubs. Package types that are more prevalent in the stream are more likely to be targeted by manual sorters if they are missed or misdirected by the optical sorters or disc screens, thereby increasing their recovery. In addition, the equipment is tuned to increase the recovery of the

FIGURE 3

DESTINATION OF SMALL, REGULAR WEIGHT (< 1L) PET BEVERAGE BOTTLES (TOP) AND ALL CHDPE BOTTLES

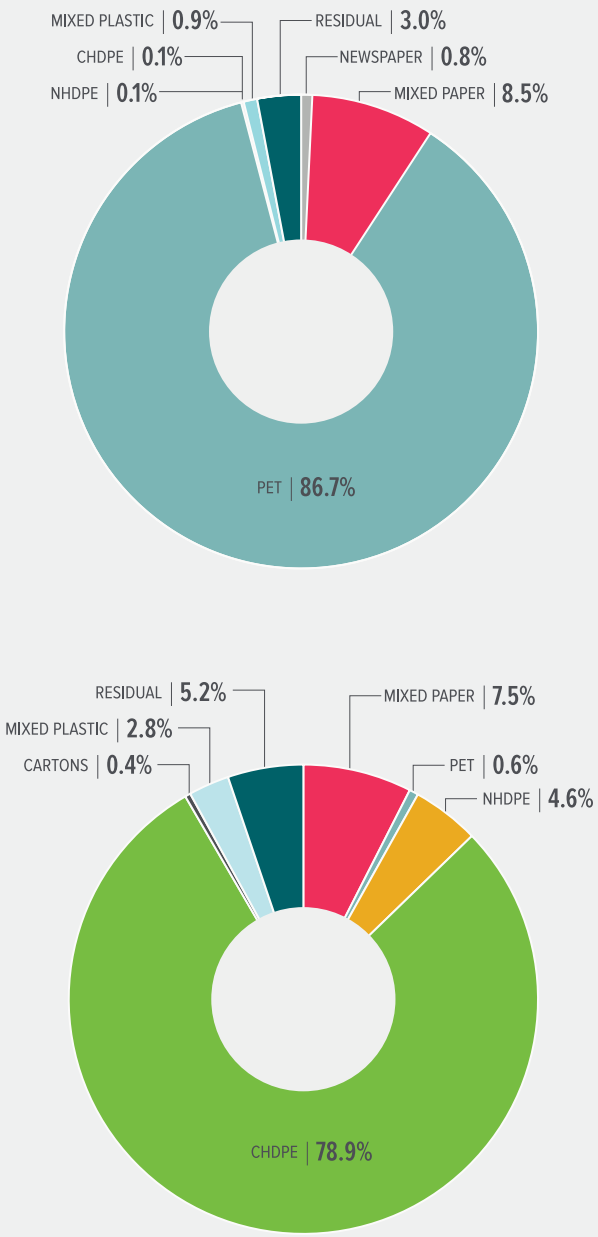


FIGURE 4

DESTINATION OF SMALL PET CONTAINERS (TOP) AND CHDPE CONTAINERS (ALL NON-BOTTLE CONTAINERS & TUBS, < 10" DIAMETER)

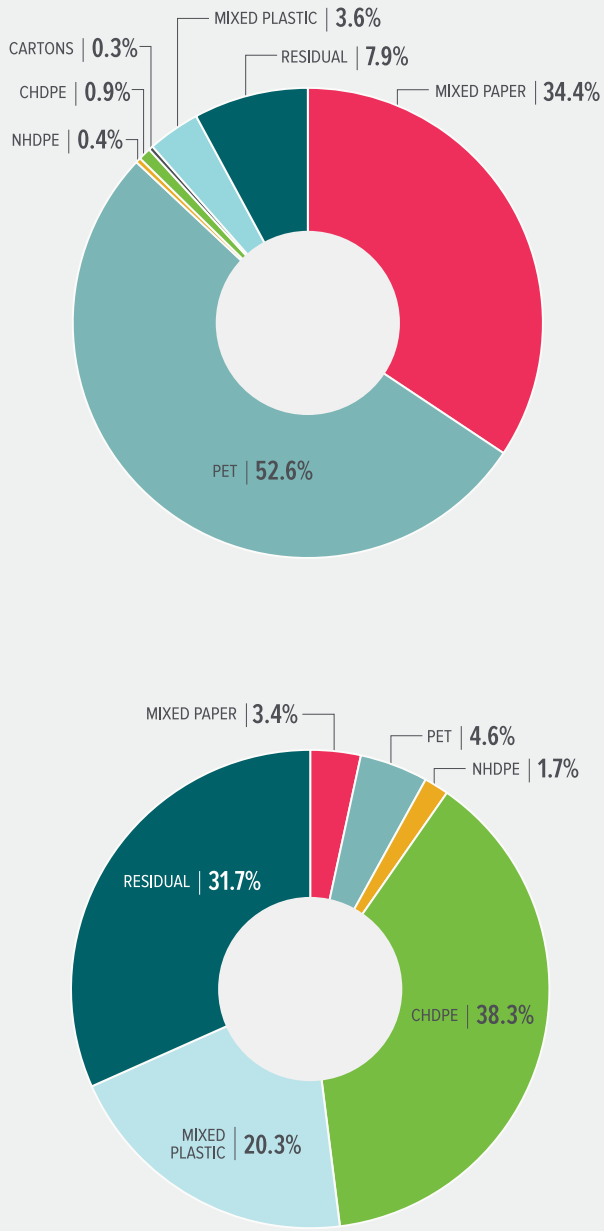
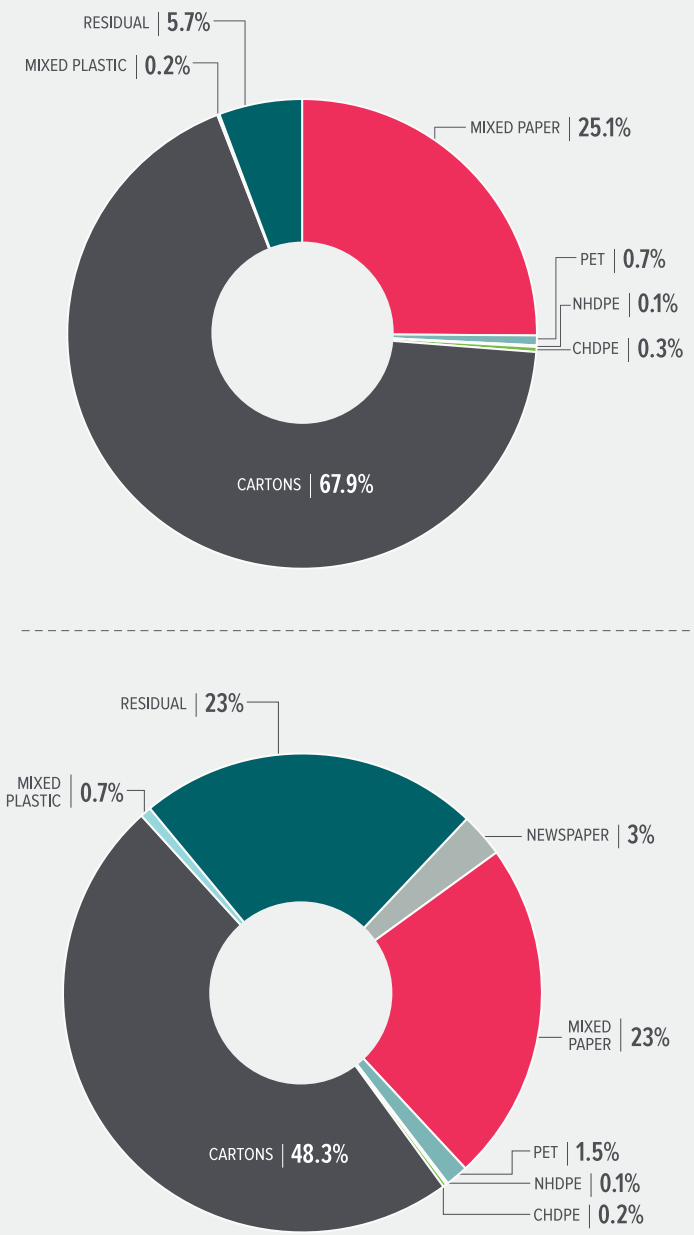


FIGURE 5
DESTINATION OF CARTONS (TOP) AND PAPER BEVERAGE CUPS



most common materials and may not perform as consistently on less common package types.

Secondly, to target the PET and cHDPE non-bottle containers would take two different strategies. The majority of the PET containers not in the PET bale are lost to the paper stream. However, very little of the cHDPE containers were in the paper stream, but most of the loss was to the residue stream, likely because they were not captured from the container line either by the optical or manual sorters. Finally, the size and shape of the containers can be quite varied in comparison to the bottles, with many containers being flatter and having open tops, which reduces the ability to hold the shape during handling and sorting. This will continue to cause less consistency on the disc screens and other equipment.

ADDING NEW MATERIALS

The study also specifically assessed the MRF "sortability" of some packaging materials that are not currently accepted extensively by recycling programs nationwide but are in fact growing in many communities, including: paper beverage cups, ice cream containers and polystyrene foam cups and clamshells. Figure 5 compares the behavior of aseptic and gable-top cartons to paper beverage cups.

As one example, the paper beverage cups had a strong tendency to flow to the container line (similar to cartons and plastic cups). A higher percentage were lost to residue which, based on review of the test setup and sorter training, was most likely from the container line. This could be due to manual sorters being less familiar seeing them or being overwhelmed when the optical sorter didn't catch them. Further study could be done to better understand the effectiveness of optical sorters on different types of cups and if programming could be improved to recognize them.

CONCLUSIONS

This study demonstrates the power of examining a material's inherent behavior in a MRF environment. Understanding how that material will flow allows for informed, operational actions to maximize recovery of that material. It is a useful exercise, as was done here, to look at not only new materials (that aren't currently accepted) to see which MRF end-products they can be a part of, but also to see how currently accepted materials, both prevalent and not, are being recovered. Recycling is a complicated system of consumer behavior, collection programs, sorting at MRFs and end markets. All stages of the value chain need to be similarly examined to create a full picture of recyclability. As shown in this study, examining and solving material processing challenges at the modern MRF is a necessary step in achieving success for the recycling industry of the future.

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FOODSERVICE PACKAGING INSTITUTE

Food Residue Overview

FOOD RESIDUE IN FOODSERVICE PACKAGING RECYCLING: Overview of FPI Food Residue Studies

Background

The Foodservice Packaging Institute's Paper Recovery Alliance and Plastics Recovery Group have been working on overcoming barriers to recovery of foodservice packaging, and one of the often-cited reasons foodservice packaging is not accepted for recycling is the concern about increased levels of food contamination.

The Studies

To address this concern, two studies were conducted, to learn whether foodservice packaging (such as take-out containers or pizza boxes) set out for recycling were more contaminated than food contact packaging (such as peanut butter jars or pasta boxes) that has traditionally been accepted at single stream material recovery facilities (MRFs). DSM Environmental Services, Inc., conducted the studies in Boston, MA (Sept-Oct 2013) and Delaware (July 2014).

The process for each study included a sampling of materials between approximately 2,600 and 4,700 pounds of randomly selected residential curbside recyclables collected in different areas of the selected locations. For all recycling samples, corrugated, mixed paper, plastic tubs and lids, aluminum cans and foils/pans, were sorted into two categories, foodservice packaging or other packaging in contact with food (e.g. jars, tubs, cans, and boxes from prepackaged grocery items). The sort team then used a visual rating system to assess and record how much food residue was present on the selected categories, ranking all materials from 1 (clean) to 5 (highly contaminated, containing uneaten food remnants in addition to residue).

The Results

In both Boston and Delaware, the majority of the samples of foodservice packaging was rated as low-residue (1-2). In the Boston study, there was no appreciable difference in contamination rates between foodservice and food contact packaging. The overwhelming

majority of the samples were extremely clean. In the Delaware study, the proportion of foodservice packaging in high residue levels (4-5) was small and virtually identical to that of food contact packaging. Accordingly, the total proportion of items rated low and middle residue levels (1-3) was essentially the same among foodservice and food contact packaging and formed the majority, however some of the foodservice packaging material types showed a slight shift from the low (1-2) to the middle rating (3) when compared to the food contact packaging. While tolerance for food residue will vary by material and market, the levels ranked 1-3 are believed to be consistent with what markets are generally accepting today as part of the mix of commodities process by MRFs.

The studies yielded some additional observations that help to place this analysis in perspective.

1. Recyclables at the Boston study were exceptionally clean overall, which led the sort team to conclude that while the study was representative of the Boston area, it may not be representative of recycling set outs in other cities. In contrast, the Delaware study samples contained a higher proportion of commingled refuse and appeared to have more soiling from compaction and cross-contamination with refuse in the trucks. As a result, it was challenging in some cases to determine if the surface contamination on the items originated in the recycling truck or if it was food residue from the original packaging contents. (For the purposes of the sort, residue on the exterior was assumed to be contamination from the truck, and residue on the interior was assumed to be food residue.)

2. The most meaningful comparison associated with both sorts was probably the plastic tubs, cups and clamshells category. The sample size in both studies was robust, and covered a broad range of contamination levels for both food contact and foodservice packaging. Neither the Boston nor the Delaware study found an appreciable difference between food residue levels in foodservice and food contact packaging in this category.

Contractor's Conclusions

Based on the findings of these two studies, it appears that overall, the mix of foodservice packaging items recycled at curbside has comparable levels of food residue to that found in food contact packaging. Commingling with refuse seems to have a significant impact on the cleanliness of recyclables, regardless of how clean the recyclables were the consumer placed them in the recycling cart.

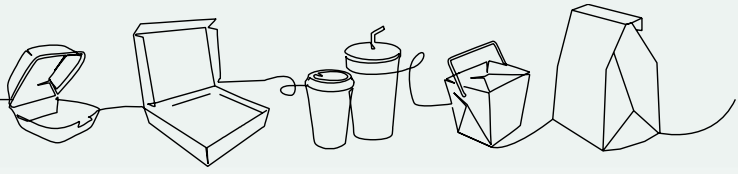
The studies at Boston and Delaware presented great opportunities to gather useful data on the issue of adding foodservice packaging to recycling programs. FPI would like to thank the City of Boston, Casella, the Delaware Solid Waste Authority, and ReCommunity for participating in the study. *More information on FPI's recovery projects may be found at www.fpi.org/stewardship.*

COMMUNITY PARTNERSHIP PROGRAM: INTRODUCTION AND RESULTS

The goal of FPI's Community Partnership Program is to add foodservice packaging – paper and plastic cups, take-out containers, pizza boxes and paper carryout bags – to residential recycling and/or composting programs in communities throughout the U.S. and Canada, diverting valuable materials from landfills into higher and better uses.

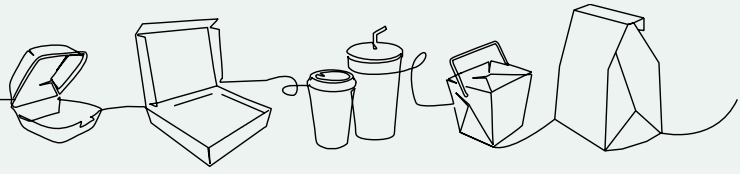
In 2017, FPI launched the Community Partnership Program, which screens and assists partner communities in adding foodservice packaging as an accepted material in residential recycling or composting programs. The process involves engaging stakeholders throughout the recovery value chain to identify the available end markets and confirm how these materials will flow through the materials recovery facility (MRF). Once a partner community has been selected, FPI works closely with the MRF and community on operational aspects and outreach efforts to make adding foodservice packaging a success. Selected partner communities are also eligible for grant funding to assist with educating residents on the additions to the program, providing a great opportunity to remind them what should be recycled and/or composted and discourage contamination.

On the following pages, check out the successes that FPI's Community Partners have had when adding foodservice packaging to their city's recycling programs.



COMMUNITY PARTNERSHIP PROGRAM: INTRODUCTION AND RESULTS

Community Partner	Number of Households	Foodservice Packaging Accepted	MRF Audit Results	Engagement
Chattanooga, TN Launched September 2017	178,000	**FSP Added:** • Paper cups • Paper take-out containers • Molded fiber carriers/take-out containers • Molded fiber egg cartons • Pizza boxes • Plastic take-out containers **FSP Already Accepted:** • Paper bags • Plastic cups	• Contamination decreased from 14% to 8% • Increase in proportion of fiber collected from 62% to 73%	• Increased traffic to city's recycling webpage by 116% • 46% increase in cart or bin requests from residents
Louisville, KY Launched October 2017	106,000	**FSP Added:** • Paper cups **FSP Already Accepted:** • Paper take-out containers • Paper bags • Molded fiber carriers/take-out containers • Molded fiber egg cartons • Pizza boxes • Plastic cups • Plastic take-out containers • Aluminum foil containers	• Contamination decreased from 17% to 16% • Fiber increased from 61% to 65%	• Increased traffic to city's website by 45% • 33% increase in cart requests by residents • Social media engagements increased by 234%



COMMUNITY PARTNERSHIP PROGRAM: INTRODUCTION AND RESULTS

Community Partner	Number of Households	Foodservice Packaging Accepted	MRF Audit Results	Engagement
Washington, D.C. Launched October 2017	105,000	**FSP Added:** • Paper cups • Paper take-out containers • Paper plates • Plastic cups • Plastic take-out containers • Plastic lids • Plastic plates **FSP Already Accepted:** • Paper bags • Molded fiber egg cartons • Pizza boxes • Aluminum foil containers	• Contamination decreased from 33% to 26% • Mixed paper increased from 9% to 20%	• Outreach video on recycling FSP viewed 140,000 more times than expected • Roughly 9 to 10 million impressions using bus/rail ads
Denver, CO Launched November 2018	240,000	**FSP Added:** • Paper cups **FSP Already Accepted:** • Aluminum foil containers • Paper bags • Molded fiber egg cartons • Pizza boxes • Plastic cups • Plastic take-out containers	Paper cups have increased the volume of the poly-coat/carton bale by 15-20% resulting in faster generation of commodity truckloads.	• City-wide promotional mailer sent via postcard • Mailer launched to 141,000 HH included link to recycling survey • 55% of survey respondents became aware recycling paper cups after the initial launch announcement • 45% were already recycling paper cups

COMMUNITY PARTNERSHIP PROGRAM: INTRODUCTION AND RESULTS

Community Partner	Number of Households	Foodservice Packaging Accepted	MRF Audit Results	Engagement
Millennium Recycling: Sioux Falls, SD Launched February 2019	200,000	**FSP Added:** • Paper cups **FSP Already Accepted:** • Aluminum foil containers • Paper take-out containers • Paper bags • Molded fiber carriers/take-out containers • Molded fiber egg cartons • Pizza boxes	The Millennium MRF sends truckloads of mixed paper bales to a paper mill in St. Paul, MN. Approximately 40% of inbound material is made up of mixed paper, 0.3% of material is estimated to be paper cups.	• Website updates, press releases and Facebook posts announced acceptance of paper cups • Facebook posts received over 799 clicks and made nearly 8,500 impressions
Kent County, MI Launched October 2019 Paper Cups November 2020	309,000	**FSP Added:** • Plastic cups • Plastic tubs/containers/trays • Rigid plastic cups • Rigid plastic clamshells/ containers • Aluminum foil containers/ pans/trays • Paper cups (Nov 2020) **FSP Already Accepted:** • Aluminum foil • Paper bags • Pizza boxes • Molded fiber egg cartons • Molded fiber carriers/take-out containers	• Benchmark MRF residue measured at 12% • Paper FSP (cups & containers) measured at .02% of inbound composition during benchmark audit	• Residential recycling survey received more than 1,200 responses • Drop off center signage placed • Ad reached 17K residents

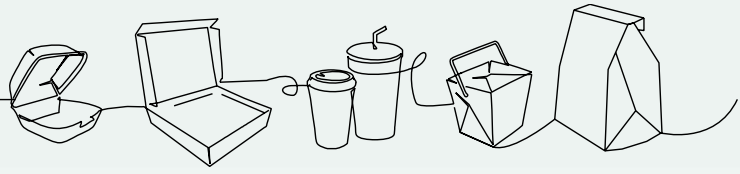
COMMUNITY PARTNERSHIP PROGRAM: INTRODUCTION AND RESULTS

Community Partner	Number of Households	Foodservice Packaging Accepted	MRF Audit Results	Engagement
Clark County, IN Launched November 2019	110,000	**FSP Added:** • Paper cups • Paper take-out clamshells/ containers/trays • Paper bags • Pizza boxes • Molded fiber carriers/ containers • Molded fiber egg cartons • Plastic cups • Plastic clamshells/containers • Rigid plastic cups • Rigid plastic clamshells/ containers	Nearly six months after the launch, monthly recycling tonnage delivered to the MRF increased 10-13%.	• County saw increased website traffic after their initial partnership launch: - Pre-launch: Average of 1,855 monthly visits - Post-launch: Average of 12,057 monthly visits
St. Lucie County, FL Launched December 2020	234,000	**FSP Added:** • Paper cups **FSP Already Accepted:** • Paper bags • Pizza boxes • Molded fiber carriers/take-out containers • Molded fiber egg cartons • Aluminum foil containers/ pans/trays • Plastic cups • Plastic clamshells/containers • Rigid plastic cups • Rigid plastic clamshells/ containers	Results Pending	• Campaign rolled out to 234,000 HHs • 742 recycling survey respondents • FB ad received 70K impressions and 3K clicks • PRA/PRG Community Partnership to promote additional suite of FSP

COMMUNITY PARTNERSHIP PROGRAM: INTRODUCTION AND RESULTS

Community Partner	Number of Households	Foodservice Packaging Accepted	MRF Audit Results	Engagement
Athens-Clarke County, GA Launched January 2021	47,000	**FSP Added:** • Paper cups • Paper take-out containers **FSP Already Accepted:** • Paper bags • Pizza boxes • Molded fiber carriers/take-out containers • Molded fiber egg cartons • Aluminum foil containers/ pans/trays • Plastic cups • Plastic clamshells/containers • Rigid plastic cups • Rigid plastic clamshells/ containers	Results Pending	• Three local media placements • Facebook ad campaign received 5,227 engagements; 325 clicks • Video received 4,800 plays • 3 truck wraps (co-sponsor opportunity) • Window clings for restaurants • 50+ attendees drive-thru coffee media day

Interested in learning more about how to become a Community Partner? Please visit www.recyclefsp.org or email info@fpi.org.



Inclusion of Fiber Cups on Oregon's Recycling List

Request for Information: Section 22 of Oregon's Plastic Pollution and Recycling Modernization Act (Senate Bill 582)

3.18.2022

Introduction

This letter is a submission to a Request for Information (dated February 3, 2022) issued by the Oregon Department of Environmental Quality to solicit information to evaluate the inclusion (or exclusion) of new materials on statewide Oregon recycling lists. These lists are being developed in accordance with Section 22 of Oregon's Plastic Pollution and Recycling Modernization Act (Senate Bill 582).

The NextGen Consortium, a program of the Center for the Circular Economy at Closed Loop Partners with founding partners Starbucks and McDonald's, offers this letter to provide evidence that supports the inclusion of fiber cups on Oregon's recycling lists – which we understand will be revised on July 1, 2025. Fiber cups generally contain a thin polyethylene barrier – on the inside for hot cups and on both sides for cold cups. As we write below, the liner is increasingly not an impediment to recycling fiber cups and accessing the high-quality fiber contained in them.

Support for Including Fiber Cups

Formed in 2018, the NextGen Consortium is a multi-year, global consortium that aims to address single-use foodservice packaging waste by advancing the design, commercialization, and recovery of packaging alternatives. The Consortium works across the value chain – with brands, municipalities, material recovery facilities (MRFs), and manufacturers – to ensure we provide viable market solutions that scale throughout the supply chain and bring value to recovery systems. More information about the Consortium can be found here: www.closedlooppartners.com/nextgen.

Since the Consortium's inception, we have been working to increase the number of cities, MRFs, and paper mills that accept and process cups. Through this, we have spoken with dozens of subject matter experts across the recycling value chain and can offer the following perspectives:

- **A growing number of US cities and counties are adding cups to their lists of acceptable recycling items**. A number of major US cities Atlanta, Detroit, Seattle, San Francisco, Denver, New York, Louisville, and Washington, DC, among others, accept cups, and this list will continue to grow as cities see that MRFs and mills want and can process cups. As an example, in February 2022, Rumpke, one of the nation's largest privately-owned recycling firms, announced it would accept fiber cups in its curbside and drop box programs across Indiana, Kentucky, and Ohio.

- **The fiber in cups is high quality.** From our discussions with paper mills, and in public statements, we know that the fiber in cups is high quality and can help offset declining volumes of other paper types.

- **A growing number of paper mills can process fiber cups.** According to the Foodservice Packaging Institute (FPI), as of January 2022, there were 28 mills that accept cups in bales of mixed paper (mills that represent more than 75% of mixed paper demand) and five that accept cups in bales of aseptic and gable top cartons,. These mills can separate the polyethylene liner so that the valuable fiber can be captured at high rates (above 85% of the fiber). As one can see on the FPI map, there are no mills in Oregon or on the West coast that currently accept cups. However, based on recent conversations, we anticipate that there will be mills/end markets on the West coast that accept cups in the near future (well before July 2025).

- **Cups can be effectively captured by MRFs**. The Consortium has partnered with several MRFs to conduct flow studies to better understand how cups flow through a MRF environment. Based on this work, we know that cups can be diverted to mixed paper or polycoated bales through technology (e.g. optical sorters, robotic sorters, etc.) or manual effort.

- **Contamination is generally not an issue.** While some stakeholders have voiced concerns about fiber cups introducing contamination such as liquids and food into MRFs and mills, our discussions and tests with MRFs and mills indicate that contamination is not a significant challenge. Liquids typically drain from cups along the journey from consumer to MRF, and while some consumers might put waste into a cup (e.g. plastic wrappers), this does not cause an issue for reprocessing at the mills. This issue was raised in a recent report on cup recycling by FPI.

- **Fiber cups are a relatively small percentage of waste and recycling streams in the United States and Oregon**. According to a 2014 waste characterization study in Seattle and New York, food service packaging (including hot and cold cups) represented less than 0.5% of mixed paper bales in each city. Cups alone (hot and cold) were roughly 0.25% of the stream in Seattle and 0.04% in New York. According to a 2016/17 waste characterization study in Oregon, "other polycoated paper", which includes cups along with other formats including foodservice packaging and frozen food boxes, represented 1.08% of the total waste stream.

Recommendation on Fiber Cups

Based on our experience, which we have summarized above, we recommend that fiber cups are considered for inclusion on Oregon's uniform statewide collection list.

While cups will remain a small percentage of waste overall, they are a visible sign of waste for consumers. There are also a growing number of food and beverage brands and retailers that are motivated to find recycling solutions for the single use cup.

We would be happy to speak with the DEQ to answer any questions you might have about our experience. Contact information follows.

Contact Information

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The Center for the Circular Economy at Closed Loop Partners
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The Recycling Partnership
SOLVING FOR CIRCULARITY

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Falls Church, VA 22046

RECYCLINGPARTNERSHIP.ORG

Response to Request for Information: Oregon Statewide Material Recycling Collection List

The Recycling Partnership
3/18/2022

The Recycling Partnership is pleased to submit this response to Oregon DEQ's Request for Information (https://www.oregon.gov/deq/recycling/Documents/MaterialList-RfI.pdf) regarding a statewide material recycling collection list. This response provides detailed information on polypropylene packaging and additional general input on three other materials: PET thermoform packaging, pizza boxes, and paper cups.

Thank you for the opportunity to submit this information. Any questions or needed clarifications regarding The Recycling Partnership's input can be addressed to Scott Mouw at smouw@recyclingpartnership.org or Liz Bedard at ebedard@recyclingpartnership.org

Material Focus: Polypropylene

Based on the technical criteria submitted below, The Recycling Partnership urges Oregon DEQ to include polypropylene container packaging on its statewide recycling collection list. Polypropylene (PP) is an established and growing packaging material used in a variety of formats. PP containers are generated at levels comparable to other common recyclables and are proven to be sortable at MRFs. PP also has proven domestic markets, which will be further strengthened by the market dynamics of brand company content goals and state-level content requirements. Our technical input for Section 22 criteria is presented below:

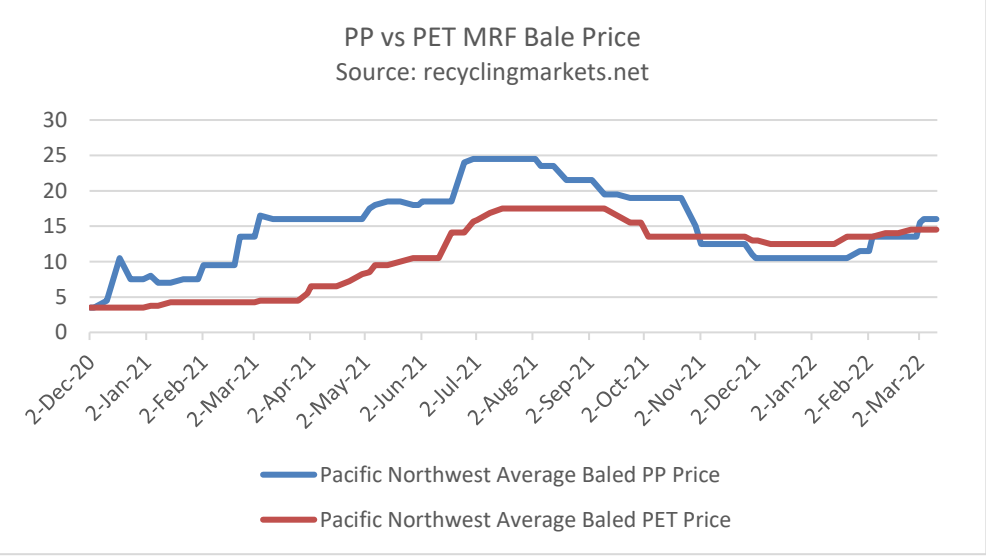
(a) The stability, maturity, accessibility, and viability of responsible end markets

Market price data is an important indicator of a material's recyclability status. Price data from recyclingmarkets.net displays a notable and sustained rise in pricing for sorted and baled PP since December 2020. Although West Coast pricing lags stronger pricing for other regions, Pacific Northwest regional pricing provides solid evidence of market demand.

Figure 1 below compares PP pricing with PET for the Pacific Northwest. We recognize that much of PET is collected through deposit in Oregon, but for the PET that does go through MRF processing, PP prices track positively with this established commodity, in most months exceeding PET pricing. It is important to bear in mind that recyclingmarkets.net reports prices as "picked up" (freight-on-board at MRFs) so it encompasses the price effects of freight. PP has enjoyed an average market price $300/ton over the last 14 months, well exceeding typical MRF processing costs of around $90/ton and providing a robust return-on-investment case for the sortation of this material.

As with all recyclable commodities, PP could see price swings over the coming years. However, long-term market fundamentals, in particular regarding brand commitment to recycled content in PP packaging (discussed further below), provide a foundation of market value for PP.

Figure 1: Pacific Northwest PP vs PET MRF Bale Price



Oregon does not have in-state PP reclamation capacity and in general West Coast domestic recycling capacity for PP is not currently as well developed as it is in other parts of the U.S. However, that could change as PP becomes a mainstream acceptable plastic on par with PET and HDPE and as supply grows that in turn spurs and justifies PP reclamation investment. Some West Coast reclaimers for PP are indicating plans to add equipment to accommodate more PP feedstock and other recent developments demonstrate additions of reclamation capacity in Western states.[1] If PP feedstock is not available because of exclusion from Oregon or other West Coast collection lists, it could undermine potential reclamation development.

It is important to also note that PP is a commodity with established national market specifications. The Institute of Scrap Recycling Industries (ISRI) includes a marketable commodity standard for PP that incorporates quality considerations in its Scrap Specifications Circular: http://www.scrap2.org/specs/40/

(b) Environmental health and safety considerations

The Recycling Partnership has no technical input on this criteria.

(c) The anticipated yield loss for the material during the recycling process

As with any other material, PP can be lost in MRF processing when it is not targeted as a sortable commodity. However, applicant submittals to The Recycling Partnership's Polypropylene Recycling Coalition grant program show that PP yield loss to residue or to lower value mixed plastics can be effectively addressed.[2] Figure 2 displays data on four of the first PP Recycling Coalition grant recipients that provides strong evidence of success in establishing PP as a specific sorted material.

Figure 2: Creation of Sorted PP Tonnage by Polypropylene Recycling Coalition Grant Recipients

MRF	PP Loss Pre-Grant Project	Technology/Approach Deployed to Address PP Loss	Annualized tonnage of new PP capture
MRF 1	PP not formally accepted; 40% of incidental PP sorted to low value mixed plastic and 60% lost to disposal	PP now formally accepted; Robotics applied on new plastic conveyor line	564 tons per year of sorted PP
MRF 2	PP sorted to low value mixed plastic	Optical sorter dedicated to PP sortation	563 tons per year of sorted PP
MRF 3	PP not formally accepted; incidental PP lost to disposal	PP formally accepted; Robotics applied on retrofitted conveyor	447 tons per year of sorted PP
MRF 5	PP treated as a contaminant and discarded in residue	Optical sorter dedicated to PP sortation	260 tons per year of sorted PP

[1] An indication of positive momentum in olefin reclamation investment in the West is found in the announcement of a Polymer Center by Republic Services, which also operates the MRF in Bend, OR: https://resource-recycling.com/plastics/2022/03/01/republic-services-moves-to-vertically-integrate-in-plastics/

[2] The Polypropylene Recycling Coalition is an industry collaboration bringing together stakeholders across the polypropylene (PP) value chain – resin suppliers, manufacturers, consumer packaged goods, and recycling processors – to improve polypropylene recovery and recycling in the United States and further develop the end-market of high-quality recycled polypropylene. The Coalition has released $5.33 million in total funding committed to date in 17 grants covering 18 MRFs, with a projected increase in national PP recycling access rate of 6.4%.

The PP Recycling Coalition continues to offer grants to facilitate MRF PP sortation. To date, 18 facilities have received funding and projects are underway. We anticipate grantee reports will continue to demonstrate that investment in PP sortation equipment can effectively address MRF yield loss and deliver solid economic returns.

Little data is available on reclaimer yield loss. As with PET, reclaimers received commodity bales that contain materials that will not be converted to a final "pure" flake or pellet. Private estimates indicate reclamation bale yield loss for PP to be around 33%, which is comparable to PET. It must be noted that maximizing yield is in the business interest of reclaimers and even with this yield loss, the recycling of PP is economically proven.

(d) The material's compatibility with existing (Oregon) recycling infrastructure

A review of Web-posted information by Oregon-based MRFs reveals mixed results for PP acceptability currently. One Portland area MRF accepts "plastic containers" that includes "#5 – Plastics – Dairy tubs." Indirectly, community acceptance lists indicate MRF acceptance of PP in the Bend/Deschutes County area. Although most other Oregon-based MRFs focus acceptance on "bottles only" or "bottles and jugs," acceptance by two MRFs indicates strong potential for broader PP acceptance, which is reinforced by PP acceptance at the MRF in West Vancouver, WA (significantly, 80% of Washington state MRFs show PP acceptance).

These data points demonstrate a baseline level of compatibility for PP with existing recycling infrastructure in Oregon and the Pacific Northwest. As The Recycling Partnership has found with its PP Recycling Coalition grant program, compatibility is dynamic and can be built through capital interventions in MRFs that did not previously have PP sortation capability. PP was largely incompatible with the State of Ohio's recycling infrastructure until Coalition granting created a change in MRF sorting capacity that now makes PP accepted across the majority of households in the state.

The Recycling Partnership has created a Web-search platform that tracks and characterizes material acceptance in recycling programs across the U.S. A review of the information in this database indicates that PP is already accepted in geographic areas covering 60 percent of single family Oregon households. While there is little reference to PP or #5 plastics specifically, formats described in text and imagery demonstrate that main PP formats are accepted. This is another indicator of baseline compatibility for PP with Oregon's recycling infrastructure. A review of the database for the State of Washington reveals 72 percent PP acceptance for single family homes, a clear sign of regional compatibility. With this level of baseline acceptance, failure to add PP to the state list will confuse consumers who are already enjoying access, potentially undermining public trust in the recycling system.

(e) The amount of the material available

The Recycling Partnership conducts capture studies examining parallel samples of waste and recycling streams that allow us to project commodity-specific household material generation. PP is a common consumer packaging material that is present in household generation at levels comparable to or exceeding other plastic materials commonly accepted for recycling.

Figure 3 provides the overall averages from capture study data ranking plastic containers in single family households on a per household basis. The Figure further uses this data to extrapolate tonnage for Oregon based on the state's single family household numbers. It shows that PP packaging ranks second among common plastic recyclables in pounds/household and in projected tonnage for the State of Oregon. It ranks highest of materials

not typically covered by deposit and is generated at rates 69% higher than HDPE natural bottle and 26% higher than colored HDPE bottles.

Figure 3: National Average Single Family Household PP Generation Rates Compared to PET and HDPE

Material	Average Pounds/Household/Year	Extrapolated Tonnage for Oregon Single Family Households
PET Bottles	54.8	33,839
Polypropylene Packaging	19.8	12,226
HDPE Colored Bottles & Jars	15.7	9,695
Non-bottle PET packaging	11.7	7,225
HDPE Natural Bottles & Jars	11.7	7,225

If half of the estimated PP were captured and marketed as bales from Oregon MRFs, using 15 cents/pound a base price, it would equate to $1.83 million in MRF commodity revenue per year.

In 2019, The Recycling Partnership supported a capture study for the Portland Metro area that included detailed sortation of PP packaging types. Figure 4 presents this data, showing a per household number smaller than indicated above but still within range, comparing favorably to HDPE bottle plastics and in line with PP and HDPE ratios in Figure 3.

Figure 4: PP Household Generation in Portland Metro Region

	Pounds/Household/Year	Extrapolated Tonnage for Oregon Single Family Households
PP (#5) Bottles & Jars (> 6 oz < 2 gals)	0.61	378
PP (#5) Bottles & Jars (<6 oz)	0.62	381
PP Tubs (> 6 oz < 2 gals)	3.20	1,977
PP Tubs (< 6 oz)	1.05	648
PP Other Rigid containers and packaging (< 2gals, >2")	8.93	5,516
PP rigid non-packaging (< 2gals, >2")	0.85	526
TOTAL – ALL PP	**15.26**	**9,425**
HDPE Natural Bottles	6.38	3,940
HDPE Colored Bottles	9.42	5,817

As the data shows, PP is available in quantities almost equal to natural and colored HDPE bottles combined in the Portland Metro region. Attachment A to this document show product examples of PP packaging use, indicating the materials widespread use across a variety of products. These images underscore the established presence of PP packaging in household consumption.

PP use in packaging appears to be growing and will likely benefit from resin replacement for other packaging, especially those that have been deemed problematic and unnecessary by the U.S. Plastics Pact.[3] Moreover, PP has qualities that are not replicable by PET and HDPE, and so can be expected to continue filling key packaging categories for many common consumer products that those resins cannot.

(f) The practicalities of sorting and storing the material

As discussed in the example of PP Recycling Coalition grantees above and as can be found true for many other MRFs across the country, standard MRF optical and robotic equipment available on the market today successfully sorts PP. As a specified material, PP can be sorted into regular truckload quantities and moved quickly to market like any other established commodity at scale. For PP Recycling Coalition grantees to date, dedicated pre-baling storage capacity has been established to manage PP and all are moving baled material into outbound trucks in a manner similar to PET and HDPE.

(g) Contamination

There is no indication that PP packaged products are less cleanable for recycling preparation by households than other plastics packaging. PP packaging also tends not to have extraneous materials or any kind of composite makeup that is substantially different than many common PET and HDPE recyclable formats.

PP can certainly be perceived as an inbound contaminant from the perspective of a MRF with no capacity for PP sortation, but that capacity can be created. MRFs can expect market demand for spec PP bales will be consistent and further supported by the dynamic of brand and statutory content targets.

(h) The ability for waste generators to easily identify and properly prepare the material

In a section above and in Appendix A, we demonstrated the established nature of PP as packaging across a wide array of products and as present in household generation at levels facilitating collection and processing. As a recyclable material specified to households as a tub, cup or container, households and others waste generators can easily comprehend the material is recyclable (especially, as needed, if reference to the #5 Resin Identification Code is included in outreach information).

Basic recycling outreach can convey through words and imagery that PP is recyclable. Appendix B provides examples of outreach materials that describe clearly to households that PP is accepted in its main packaging formats. The examples include one community in the U.S. that recently added PP collection under a PP Coalition Grant, one from the Seattle area, and three from Oregon. The latter are further indication that PP is already a successfully accepted and sorted material in Oregon, which also further shows that MRF acceptance has an established baseline in the state. As we have discussed above, grant and technical interventions can also create sorting and acceptance capacity in MRFs where it is not already in place.

(i) Economic factors

Recycled content commitments by brand companies that package in PP, bolstered by recycled content mandate activity by states, can be expected to spur recycled domestic PP demand (a factor not previously in play when PP

[3] https://usplasticspact.org/problematic-materials/

was typically sorted into mixed plastic bales often reliant on export markets). Commitments to recycled content in packaging is especially important when recognizing that most recycled PP is currently used in established non-packaging products such as automotive and construction products. Although market uses may shift, it is likely that recycled PP packaging demand will be *additive* on top of these current uses.

Activities within U.S. Plastics Pact provides insight into the potential market demand from recycled content commitments.[4] Comparing current baseline content to the Pact's 30% content target by 2025, it is clear that a substantial supply gap needs be closed. Pact Activators with PP bottle and rigid container formats will need an estimated additional 200 million pounds per year of recycled PP to meet the recycled content target, which is equivalent to a 45 percent increase in the current national PP bottle and rigid container recycling rate.

It is important to remember two factors in this analysis: 1) not all brands packaging in PP are members of the Pact and additional r-PP demand will come from non-Pact members, and 2) assuming a 33% yield loss through MRF and reclaimer processing, the actual amount of PP needing to be collected to close the Pact Activator content gap would be 266 million pounds. At typical capture rates, this would be equivalent to the curbside collection of PP from 35 million single family homes, or about 35 percent of all U.S. single family households.

The Ocean Conservancy's recent Recommendations for Recycled Content report shows the interplay of recycled content scenarios and supply.[5] From a baseline estimate of 0% for 2019/2020 in PP packaging recycled content, the report finds that 10% PCR by 2030 is only possible under significant growth in recycling collection and modest technological innovation. A content rate of 15% is feasible only when supply is boosted by national supply-side policy (EPR and Bottle Bill), technical intervention, and design-for-recycling improvements.

Brands are already subject to recycled content targets through publicly stated commitments (in part through the U.S. Plastics Pact) and to incipient State-level requirements. The Ocean Conservancy's report shows that supply side interventions are necessary to make those content levels achievable. This underscores the importance for PP to be included in universal collection. As noted in the report, "…one of the barriers to increased use of recycled plastics is the lack of available supply – there is not enough postconsumer plastic being collected in the recycling system to meet voluntary corporate commitments and industry demand."

(j) Environmental factors from a life cycle perspective

The Recycling Partnership has no technical input on this criteria.

(k) The policy expressed in Oregon Revised Statutes 459.015 (2)(a) to (c), as amended by Section 46 of the Recycling Modernization Act.

The Recycling Partnership has no technical input on this criteria.

Conclusion

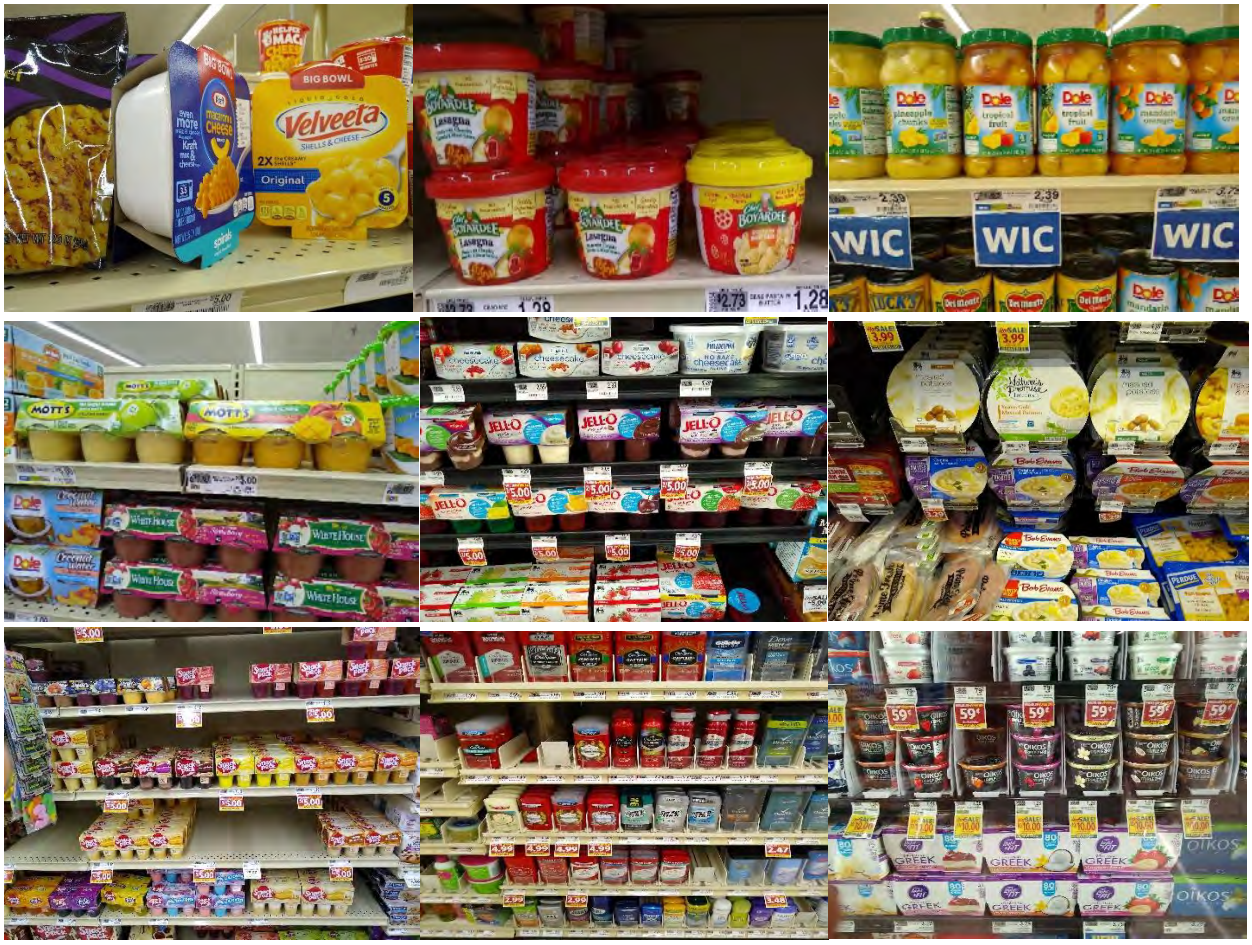
Thank you for the opportunity to submit this technical information. In summary, we believe it presents a compelling case for PP to be included in Oregon's statewide recycling collection list.

[4] The U.S. Plastics Pact Baseline Report displays current levels of PP and other resin recycling content as reported by brand Pact Activators: https://usplasticspact.org/baseline-reader/

[5] https://oceanconservancy.org/blog/2022/02/16/recycled-content-standards/

Appendix A: Imagery of PP Packaging on Store Shelves

PP is used in a wide variety of refrigerated, shelf-stable, microwavable and personal care products consumed in scaled quantities in U.S. households.



Appendix B: Imagery of Outreach Materials Conveying PP Recyclability

In response to the technical criteria regarding the ability for waste generators to easily identify and properly prepare the material, examples below show simple, effective imagery and communications that facilitate understanding of PP recyclability.

Example 1: Generic TRP mailer used in regions served by MRF recipients of PP Coalition Grants where PP was not originally accepted in collection programs

Example 2: WM imagery accessible on-line for areas served by the company's MRFs (including State of Washington). Imagery accompanied by text directions to "Recycle plastics by shape: bottles, jars, jugs and tubs."

Example 3: Imagery on Portland Metro material collection list, accompanied by text directions to recycle: "**Round plastic containers** that can hold 6 ounces or more, with a wider rim than base, and typically contain products such as salsa, margarine, cottage cheese, hummus, etc. (no drink cups)"

Example 4: Imagery on City of Gresham OR material collection list

Example 5: Imagery and wording from Republic Services City of Bend Recycling Guide

Material Focus: PET Thermoforms

In lieu of providing detailed information in step with DEQ's technical criteria, The Recycling Partnership offers general input on PET thermoforms below.

Our National Database indicates a strong base level of acceptance in Oregon for "plastic clamshells," a common surrogate for PET thermoforms, with community collection lists covering 492,671 single family households (nationally, the number is 43.8 million). Many community programs and MRFs are ambiguous regarding their acceptance of thermoforms. In part, this reflects ambiguity in the PET reclamation sector toward thermoforms, with its much higher focus on bottles and a set of yield issues regarding thermoform processing.

However, recent thermoform-specific reclamation investments in the U.S. and Mexico demonstrate that the material has a growing market pathway that is separate from PET bottles (and alongside bottles, as well, in some instances). Secondary processors (often referred to as "PRFs") in some parts of the U.S. are also having success in extracting and marketing thermoforms from mixed MRF plastics. In addition, one entrepreneurial collector in Oregon is producing and marketing thermoform bales. We would further note that ISRI does have a PET thermoform bale specification in its Scrap Specifications Circular: http://www.scrap2.org/specs/40/ . These are signs that thermoforms are emerging as a distinct recyclable commodity and that there is baseline return-on-investment in thermoform reclamation.

The broader context for these developments is the overall shortfall of recycled PET to meet brand and statutory content targets. Greater collection and processing acceptance of thermoforms is seen as one key strategy to address that shortfall.[6]

Relatedly, there is indication that thermoforms are growing faster than bottles in terms of generation. Current Recycling Partnership data indicates a 5:1 ratio of PET bottle to non-bottle PET generation in single family household but industry growth statistics and some key trends could push that ratio to 4:1 by 2030. A number of factors could encourage greater PET thermoform usage and generation, including resin substitution in products like cups, egg packaging, and other packaging that currently uses PS and PVC, which are identified as problematic and unnecessary by the U.S. Plastics Pact. Capture study data indicates non-bottle PET is already generated at levels equal to Natural HDPE (11.7 pounds per household per year) – under universal collection acceptance and strong capture rates, PET thermoforms could produce a quantity of MRF bales similar to HDPE.

In short, PET thermoforms are an established packaging format with recycling market demand that has grown and is expected to grow more. Many industry stakeholders are working to address technical and other issues that pose recycling challenges (e.g., detrimental labels). A pathway for PET thermoform acceptance could help catalyze conversion of non-PET clamshell packaging away other resins and thereby reduce contamination in the recycling system from look-alike materials. With these factors in mind, if PET thermoforms are not included in an initial material acceptance list, we encourage Oregon DEQ to be open to their inclusion in the future.

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[6] From NAPCOR 2020 PET Recycling Report, p.23, emphasis added by The Recycling Partnership: "As noted in a December 2020 report by Foodservice Packaging Institute (prepared by Resource Recycling Systems), some PET reclaimers will accept PET thermoforms as part of a curbside PET bale, but acceptance is capped at approximately 10 percent of bale weight. NAPCOR has found that this upper limit varies; *given the tight supply of RPET in the market, tolerance for thermoforms in bottle bales has increased by necessity in 2021*."

Material Focus: Pizza Boxes

In lieu of providing detailed information in step with DEQ's technical criteria, The Recycling Partnership offers general input on Pizza Boxes.

Data from The Recycling Partnership's National Database of community program material acceptance indicates that pizza boxes are already included in program collection lists covering 76 percent of Oregon single family households. Pizza boxes are a readily identifiable discard for generators, who can be successfully instructed on how to prepare the boxes for recycling by excluding food or other extraneous materials. The Recycling Partnership provides resources to help communities communicate effectively about pizza boxes: https://recyclingpartnership.org/pizzaboxes/

Pizza boxes sort effectively in MRFs into corrugated cardboard or mixed paper commodity bales. Paper industry acceptance of pizza boxes is well documented by industry sources (for example, see https://www.afandpa.org/news/2020/afpa-and-industry-partners-aim-set-record-straight-pizza-boxes-are-recyclable-grease-and)

In sum, with no market or sortation barriers, and with the ability of recycling programs and haulers to effectively communicate about pizza box acceptance and how to avoid contamination, we urge Oregon DEQ to include the material on its statewide collection list.

Material Focus: Paper Cups

In lieu of providing detailed information in step with DEQ's technical criteria, The Recycling Partnership offers general input on Paper Cups.

Our review of publicly available MRF information and data from our National Database of community program material acceptance does not indicate a clear picture for paper cup acceptance in Oregon. However, industry sources show growing mill acceptance of paper cups and work continues to expand overall MRF and community program acceptance: https://www.recyclefsp.org/paper-cup-alliance. As documented in a recent white paper, paper cups are allowed in four different paper grades, all associated with substantial mill capacity and demand in the U.S.: https://static1.squarespace.com/static/5e8221dbc8b11929c3f7eef7/t/61fd9d504264206ae6406d4e/1644010833194/The+State+of+Paper+Cup+Recycling+-+Moore+and+Associates+2022.pdf

As a sign of general regional acceptance and a demonstration of how generators can easily be instructed that paper cups are recyclable, see the City of Seattle's information: http://www.seattle.gov/utilities/your-services/collection-and-disposal/where-does-it-go#/item/paper-cup In similar regional vein and again, indicative of the status of regional market and mill acceptance, British Columbia's program also accepts paper cups and communicates clearly how generators should prepare the materials: https://www.crd.bc.ca/service/waste-recycling/recycle/myrecyclopedia/products/paper-cups#:~:text=Residential%20paper%20cups%20are%20accepted,accepted%20in%20the%20blue%20bag

In short, paper cups are showing signs of steady progress in mill, MRF, and community acceptance, with the backing of industry stakeholders helping to improve cup recyclability. This progress provides compelling evidence that paper cups are beyond just "technical recyclability" and are now experiencing practical success as communities, MRFs, and mills find alignment and as perceived barriers to cup recycling are overcome. If paper cups are not included in an initial statewide acceptance list, we encourage Oregon DEQ to be open to their inclusion in the future. Paper cups contain valuable fiber which should ideally not be lost to landfill disposal.

March 18, 2022

David Allaway
Senior Policy Analyst
Oregon Department of Environmental Quality
Materials Management Program
701 NE Multnomah Avenue, Suite 600
Portland, OR 97232

Subject: Response to the request for information for Oregon statewide recycling collection list

Dear Mr. Allaway:

Sonoco is committed to creating sustainable products, services and programs for our customers, employees, and communities. A $5.6 billion company with more than 300 operations in 32 countries and 25,000 employees, Sonoco produces rigid and flexible paper and plastics consumer products, metal consumer products, healthcare and protective packaging and industrial wood and paper products. See Picture 1 for examples of Sonoco products today.

As a top10 domestic recycler and as one of the country's largest consumers of recovered paper, Sonoco appreciates the challenges faced by today's recycling systems. We are supportive of the transparent process Oregon has created to help define their statewide recycling collection list. In the following pages is 1) a description of Sonoco's Paper Can with Steel Bottom, 2) a general summary of the pathways to recyclability and 3) specific responses to the statutory criteria listed in the Request For Information for Oregon statewide recycling collections list. By providing this information, Sonoco seeks to have the paper can with steel bottom included on the Oregon statewide recycling collection list of materials.

Package Description – Paper Can with Steel Bottom

The paper can, feature in Picture 2 below, is an assembled package comprised of a multi-layer can body, metal bottom, top closure with removable panel, and a plastic lid for reclose. At the time of collection for recycling, both the top closure's removable panel and the plastic lid will have been removed by the consumer for separate recycling so only the can body, bottom end and top closure ring will remain assembled together. See Picture 3 below.

The multi-layer can body is made of paperboard with 100% recycled fiber, an inner barrier liner and a printed outer paper label. That entire multi-layer can body is approximately 90% fiber, and the bottom end and top ring are both 100% steel with 10% recycled content today.

Picture 2

Picture 3

Pathways to Recyclability

There are two pathways to recycling paper cans with steel bottoms: cans may be recycled 1) through the steel stream or 2) through the paper fiber stream. In the steel stream, the steel bottoms and steel top closure rings are recovered and recycled, and the can body is consumed as a source of energy for the high energy steel recycling process. Alternatively, when recycling the paper can through the fiber stream, the fiber is recycled in the pulping process, and the steel components and inner barrier liner are recovered for further processing and recycling.

Sonoco began increasing the recycling rates of paper cans with the launch of their Recyclability Program in 2021. The program uses trial data, technical partnerships, and communication to prove the paper can is able to be processed through the steel streams and the paper recycling streams across North America. This program has shown that up to 135,000 tons of paper containers with steel bottoms could be diverted from landfill. Recycling the paper container with steel bottom in the steel and/or paper stream has a lower climate change impact compared to landfilling at end of life, and recycling steel and/or paper contributes to reductions in greenhouse gas emissions across the affected industries.

Responses to the Statutory Criteria as stated in the RFI

Climate Impact

The paper can is currently a product of the recycling system with a can body comprised of paperboard produced from 100% recycled fiber and with 10% of the steel end composed of post-consumer recycled steel. By ensuring the paper can packages are collected in the recycling stream and not sent to landfill, Oregon can help reduce its carbon impact on the climate and support circularity.

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There is a 46% reduction in GHG emissions when using recycled steel versus virgin steel. Additionally, a third party European PIQET analysis[1] shown in Figure 1 shows the paper can has the lowest GHG emissions when compared to alternative rigid packaging material formats. Finally, the extended shelf life provided by these paper cans for food products results in a minimization of food waste and related CO_2 emissions.

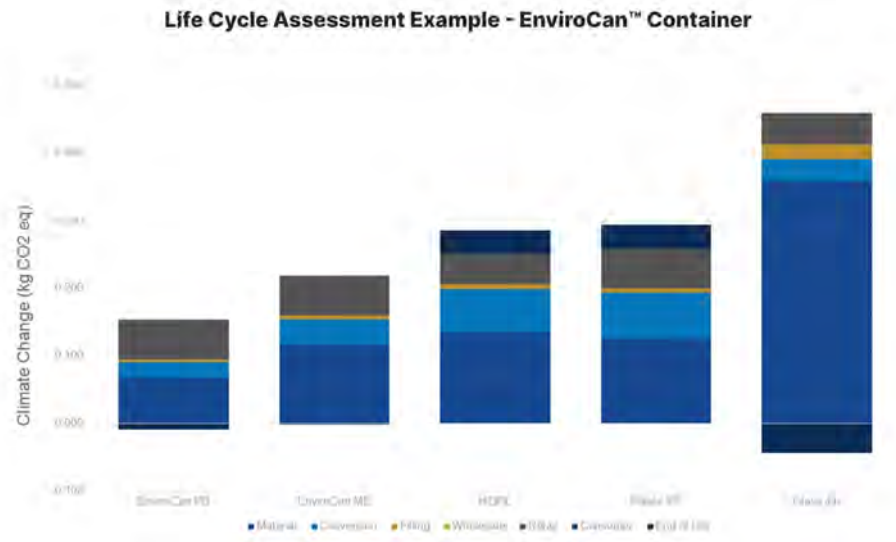


Figure 1: (EnviroCan PB is paper can with paper bottom. EnviroCan ME is paper can with metal end.)

Stability, Maturity, Accessibility and Viability of Responsible End Markets: Steel Mill Recycling

As mentioned earlier, both the paper and steel material streams support the recycling of the paper can with steel bottoms. Recycling of paper cans in steel mills is a decades-long practice that could be leveraged in any mills that currently process steel cans. On a national scale, Sonoco has received letters from major steel recyclers in the US, some who operate in the state of Oregon. See Pictures 4 and 5 showing steel can bales with paper cans baled today.

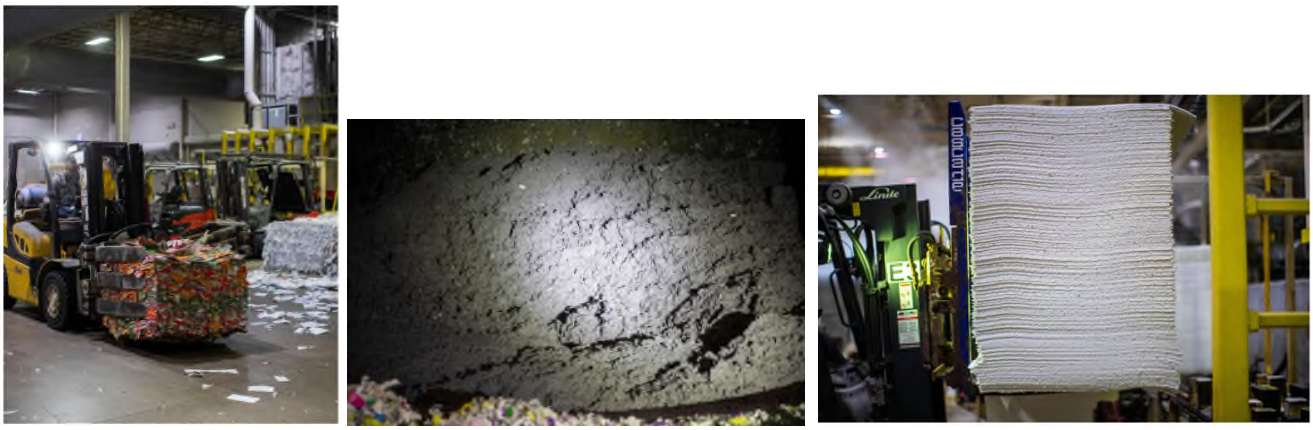
Picture 4

To support the recycling of the paper can in Oregon, there are four (4) major steel mills in Oregon, Washington, and northern California. They are Enraz Oregon Steel, Cascade Steel, USS Posco, Nucor Steel, and SteelScape. Bales of steel cans with a percentage of steel bottom paper cans are recycled by following the normal steps of shredding, media separation, melting and reshaping. Recycled steel can be used for the same applications as steel produced from virgin material. Products that are made of recycled steel include: electrical appliances, automobiles and other vehicles, office supplies, hardware, construction materials, and containers[2] and steel ends for cans. By using the tonnage of paper cans produced today, steel cans recycled today and steel composition in the paper can, an estimate of the composition of the steel can bale is calculated. Sonoco estimates that less than 1% of any steel can bale will contain non-steel components from the paper can.

Stability, Maturity, Accessibility and Viability of Responsible End Markets: Paper Mill Recycling

Recycling at paper mills is also a viable pathway to recyclability. There are several paper mills that source recycled content in Oregon or surrounding areas such as Willamette Falls, Georgia Pacific, and Norpac Paper. After several mill trials in 2021, Sonoco has announced that ten (10) Sonoco paper mills throughout the US will accept paper cans in the mixed paper bales including the Sumner mill in Washington and City of Industry mill in California.[3]

These are long standing operations with stable markets and products. The paper can is able to be repulped successfully where fiber is recovered and easily separated from the non-fiber components of the can. Furthermore, the barrier layer and the steel ends are recaptured by screens that exist in today's facilities. From there, new recycled paper products of high quality are produced, the steel components can be recycled at steel mills and as advanced chemical recycling technologies continue to scale up, the barrier liner material is available for recycling into new products. A video is provided in the accompanying materials to show an actual pulping trial with paper cans that was conducted in December 2021 at the Sustana paper mill in Wisconsin. See picture below from the Sustana paper mill trial showing a bale of paper cans being process with other paper products and used to product high quality paper sheets.



Picture 5

Environmental Health and Safety Considerations – N/A

There are no associated hazards in collecting, sorting, or processing the paper cans.

The Anticipated Yield Loss for the Material During the Recycling Process

Paper cans are 40-60% steel are collected by magnet for steel can baling. Steel maintains its structural integrity during the recycling process and can be recycled infinitely. When recycled, steel components yield 99.9% material.[4]

Alternative, cans with up to 80% fiber are collecting for processing in the paper mills and the steel ends are recyclable downstream. Repulpability and recyclability tests show that more than 85% of the can body structure is recovered during pulping and converted into new paper products. The third-party repulpability report is enclosed.

The Material's Compatibility with Existing (Oregon) Infrastructure & The Practicalities of Sorting and Storing the Material

No adjustments to the existing Oregon infrastructure are required to recycle the paper can. The can is collected today in residential curbside programs by being placed in standard bins. The MRFs sort the paper cans either into the steel can bin or with paper products. In addition, to the magnet recovery of the cans, Sonoco has verified that the paper cans is identified by Near Infrared (NIR) technology and robotic technologies such as AMP Robotics as well. The paper cans flow to these types of equipment and sort on par with poly coated paperboard materials. See link to press release

speaking to Sonoco's progress in recycling by partnering with the technology leaders.

The Amount of the Material Available

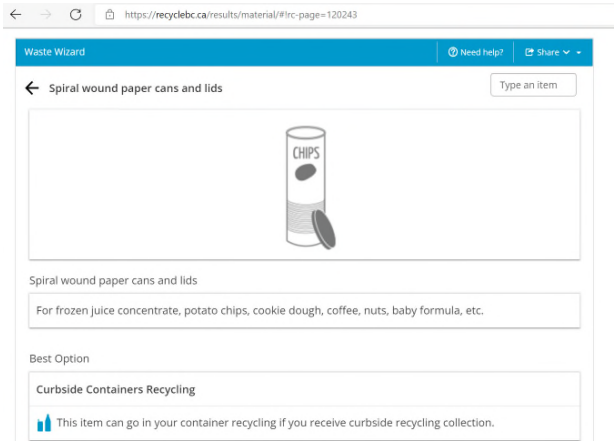
The estimated amount of paper cans available for recycling in Oregon is 1,700 - 1800 tons. This estimate is based on Oregon population relative to the US and Sonoco's national distribution of paper cans.

Contamination

Paper cans are predominately used to package dry products and therefore there are little to no issues with contamination from the paper cans or the residual product inside the can. The repulpability and recyclability tests performed by Sonoco have shown they are appropriate for the paper recycling process where high quality paper products were produced from the pulp which included paper cans. The previously mentioned repulpability report which is enclosed speaks directly to the quality of the paperboard produces from recycled cans. That report showed adequate board strength, visual appearance and moisture content.

The Ability for Waste Generators to Easily Identify and Properly Prepare the Material

As stated above, paper cans are predominately used to package dry products. In addition, paper cans are easily identified with the use of specific graphics or descriptions on municipal material collection sites. The paper can is a program material for RecycleBC with instructions to be placed in curbside recycling collection[6]. (See Picture 6 below.) The paper can is also accepted in Multi-Material Stewardship Manitoba programs[7] as well as programs in Stewardship Ontario,[8] including Toronto.



Picture 6

Additionally, for ease and simplicity of communication from the MRF or municipality to the residential consumer, sample text and graphics to describe the paper can package to consumers on list for accepted items to recycle are provided by Sonoco. Below is an example how Sonoco supports the municipalities for increased recyclability and collection with flyers and website content:

A paper canister with steel bottom, also known as a spiral wound container, cardboard can, and paperboard canister, is a multilayer paper canister commonly used to package coffee, dough, snacks, nuts, powdered drinks, and supplements.

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Graphic 1

Economic Factors

By adding paper cans to the MRF collection, additional revenue is available for the increased material flow into recycling streams. There is no disruption to the steel or paper recycling processes. The steel recycling process is up to 74% more energy-efficient than virgin steel production. The demand for recycled steel far exceeds supply, making it a highly valuable material that is very cost-effective to collect and recycle.[9] Recycling paper products also has energy-related cost savings with that recycling process requiring 45% less energy.[10]

Environmental Factors from a Life Cycle Perspective

Steel components can be recycled indefinitely without losing any of its properties. Recycling 1 ton of steel helps to save 1.8 barrels of oil, 10.9 million BTUs of energy, 642 kWh of energy, and 2.3 m^3 of landfill space.[11] Additionally, for every ton of steel recycled, 2500 pounds of iron ore, 1400 pounds of coal and 120 pounds of limestone are conserved.[12] Making a food can from recycled steel means 75 percent less greenhouse gas emissions and energy use compared to using virgin steel.[13]

Utilizing PIQET Life Cycle Analysis software Sonoco compared recycling a paper can to landfilling a paper can. As seen below, there is a 45% reduction in GHG gases when the paper can is recycled instead of landfilled.

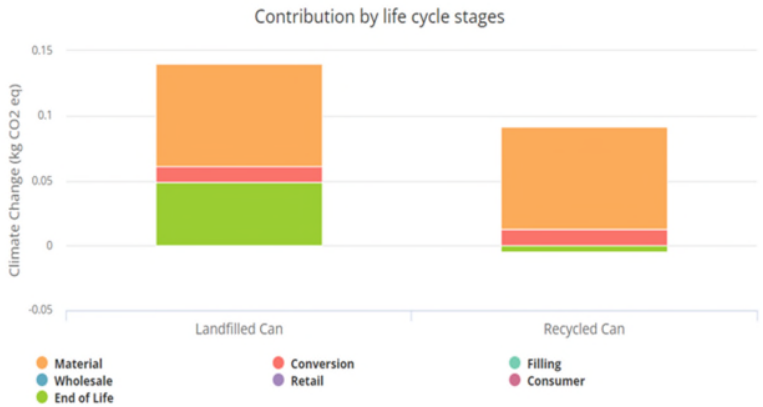

Figure 2:

And, as mentioned earlier, the environmental benefits of paper cans compared to other rigid packaging formats is significant.

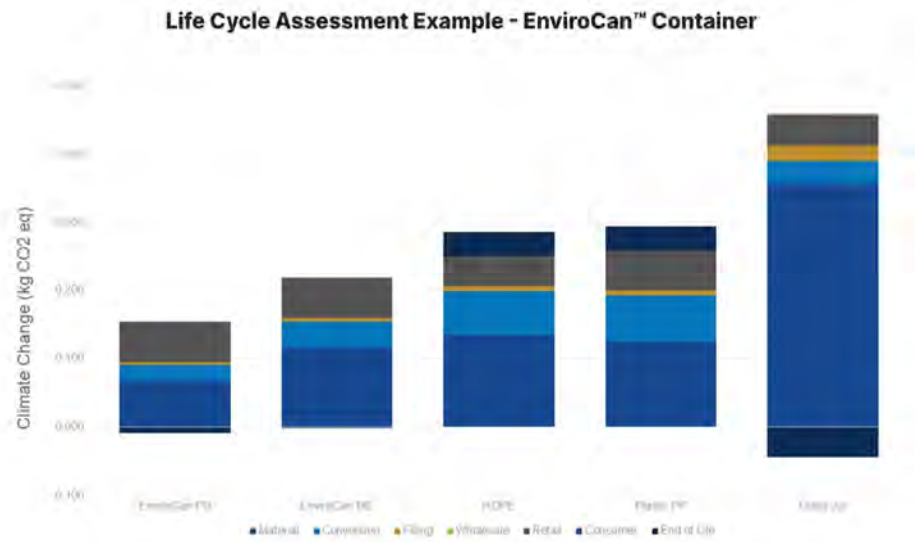

Figure 3: (EnviroCan PB is paper can with paper bottom. EnviroCan ME is paper can with metal end.)

Policy expressed in Oregon Revised Statutes 459.015 (2)(a) to (c), as amended by Section 46 of the Recycling Modernization Act

Recycling the rigid paper can fulfills the policy expressed in Oregon Revised Statutes 459.015 (2)(a) to (c). The paper can is a packaging format that utilizes a high percentage of post-consumer recycled content, which lowers its life cycle impact on human health and the environment.[14] The paper can also utilizes less materials when compared to alternatives.[15]

While the paper can is not designed to be reused, it is a packaging format that can be recycled utilizing infrastructure available in nearly all MRFs. Sonoco is dedicated to educating the recycling value chain about the benefits of recovering the paper can and will continue to invest in both lowering the environmental impact of the package and ensuring positive end of life outcomes.

Summary

Sonoco is committed to advancing the recycling of all packaging and especially paper cans. Although this package has multiple components, the existing infrastructure is suitable for recycling the can effectively efficiently with significant positive impacts on the environment. Sonoco has used and will continue to use its integration with material recovery facilities and paper mills and steel can manufacturing to support circularity in paper and steel streams.

We look forward to answering any questions you may have around the viability of including the paper can with steel bottom on the Oregon Statewide Recycling Collection list. Please feel free to reach out to me at sabrina.dixon-ridges@sonoco.com with any questions. I look forward to hearing from you. Thank you.

Sincerely,

Sabrina Dixon-Ridges

Sabrina Dixon-Ridges
Global Sustainability Manager

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Sources

[1] Third party validate European PIQET analysis
[2] Material Science | News | Materials Engineering | News (azom.com)
[3] Sonoco Expanding Residential Recycling of Iconic Paper Containers in the U.S. | Sonoco
[4] Recycling & Sustainability - Can Manufacturers Institute | Washington, DC (cancentral.com)
[5] Sonoco Partners with AMP Robotics to Enhance Paper Can Recycling — AMP Robotics
[6] Material Search » Recycle BC - Making a difference together.
[7] Recyclepedia | Simply Recycle.ca
[8] What Goes in the Blue Bin (Recycling)? – City of Toronto
[9] Is Recycling Worth It? Costs and Benefits of Recycling | RTS
[10] The Costs of Recycling (stanford.edu)
[11] Steel Recycling Principles and Practice (azom.com)
[12] How Steel is Recycled (berecycled.org)
[13] Home page - worldsteel.org
[14] Third party validate European PIQET analysis
[15] Third party validate European PIQET analysis

~~Start here~~

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Sonoco also submitted a link to a video:

Recyclability in steel mills EnviroCan™ | Sonoco Products Company

From:	Joel Baxter
To:	RethinkRecycling * DEQ
Subject:	Comments on Implementation of Section 22 of Oregon's Plastic Pollution and Recycling Modernization Act
Date:	Saturday, March 19, 2022 1:10:55 PM
Attachments:	image001.png

March 18, 2022

David Allaway
Senior Policy Analyst
Oregon Department of Environmental Quality
Materials Management Program
700 NE Multnomah Ave., Ste. 600
Portland, OR 97232

RE: Comments on Implementation of Section 22 of Oregon's Plastic Pollution and Recycling Modernization Act

Dear Mr. Allaway:

On behalf of WestRock, I am writing to provide our comments in response to the Oregon Department of Environmental Quality's implementation of Section 22 of Oregon's Plastic Pollution and Recycling Modernization Act.

WestRock is a global leader in delivering sustainable, fiber-based paper and packaging solutions. We are a highly integrated manufacturer with over 320 locations worldwide, including a corrugated container converting facility and a materials recovery facility (MRF) that sorts residential single stream curbside recycling in Portland. In Oregon alone, we invest over $100 million annually through salary, taxes, energy, and supplier costs.

Portland is one of WestRock's 18 MRFs and is an integral supplier of recovered fiber to WestRock's Washington containerboard mills in Longview and Tacoma. WestRock operates one of North America's largest recycling networks, managing roughly 7.5 million tons of fiber each year. Paper recycling in the United States is a success story thanks to the many billions of dollars in industry infrastructure investments.

Further elaborated in the American Forest & Paper Association (AF&PA) comments submitted to DEQ's Request for Information on this topic, the nationwide paper recycling rates exceed 68% in municipal solid waste streams. That is nearly double the rate of the next closest material type. The paper recycling rate has grown over decades, and remained consistently high, meeting or exceeding 63 percent since 2009.

Our business relies on a robust recycling ecosystem to support our paper mills and box plants. So, it is the hope of WestRock that this rulemaking process strengthens this ecosystem, without reducing the existing supply of recycled fiber products that our company and customers need.

Materials of Interest for Recycling
Oregon has one of the most successful recycling programs in the nation with 85.7% of Oregonians having access to community curbside recycling programs. Passage of the Plastic Pollution and Recycling Modernization Act will improve access, public education and inclusion of under-collected products in Oregon's statewide collection recycling list will continue to improve recycling rates.

WestRock supports the use of packaging materials to educate consumers — such as a printed recycling sign on boxes with a recommendation to check local guidelines. To make this step easier, Performance Food Group, for example, uses WestRock's Scan.Learn.Recycle. QR code on its packaging to make it easy for consumers to learn more about their local recycling program.

Education is an essential part of integrating new product types into recycling streams. Any product that is 100% fiber should be accepted at MRFs and delivered to end markets for recycling. This includes materials like those sent from our Portland MRF to our Washington mills, including OCC, paper board and paper bags, all of which have curbside access rates over 80% and over 90% percent for drop-off access. However, additional fiber-based products that should be recycled are still going to landfills when they should be diverted to MRFs, recycled and sold.

Pizza Boxes
In 2019, WestRock, conducted a grease and cheese study to determine to what degree these two elements affected the quality of the fibers in the paper. We found that grease and cheese had minimal impact on fiber and therefore did not hinder its ability to be recycled. To get the word out about these findings, we've partnered with Domino's to launch the www.recycling.dominos.com website to share the facts about pizza box recycling.

In the United States, an estimated 3 billion pizzas delivered in corrugated pizza boxes are consumed each year. Considering the average weight and size of a standard box, that's about 600,000 tons of corrugated cardboard going into national circulation annually that must be diverted from landfills and made into new recycled products.

Paper-padded Mailers
AF&PA's comments previously submitted to this process cite a 2021 AF&PA surveyed its members on the recyclability of paper-padded mailers. AF&PA members, including WestRock, overwhelmingly agreed that the mailers can be recycled in mixed paper bales.

Conclusion
WestRock requests that all paper and 100% paper-based packaging products be recycled in Oregon's statewide collection recycling list.

Thank you for the opportunity to comment and participate in this process. Please contact me at joel.baxter@westrock.com if you have any questions.

Sincerely,

Joel D. Baxter
Regional Manager, Government Relations

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M 360.561.8097
joel.baxter@westrock.com | www.westrock.com
