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Houston Clean City Commission

QUARTERLY REPORT Q2 2024; POST-CONSUMER POLYPROPYLENE

OVERVIEW

In accordance with the City's Code of Ordinances Chapter 39 Article III, the Houston Clean City Commission is to direct and oversee a comprehensive litter control program for the purpose of reducing and controlling to an acceptable level the concentration of litter in the city and to bring about a long-term improvement in the attitudes and trash handling habits of citizens. The ordinance in Section 39-37 further directs the Commission to "each quarter, during the months of January, April, July and October submit a written report to the mayor and city council summarizing the status of the clean city program." Through a study completed in 2022, the Commission determined that the regional trash handling habit change which will most greatly impact Houston's ability to effectively compete in a future, more-circular economy is to improve the volume and quality of waste materials flowing directly from waste generators to local facilities engaged in related materials reclamation and to support the development of additional local reclamation capability. With this in mind, each of the Commission's Quarterly reports will focus on how a specific waste type is generated and managed in greater Houston and note opportunities for improvement, if identified. Reports will be kept to two pages, submitted in writing to the City and shared at an upcoming public City Council meeting.

Our Q2 2024 report focuses on post-consumer polypropylene.

HOUSTON CLEAN CITY COMMISSION REPORTS COMMITTEE

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- Joe Machado, Commissioner - Mayor Nominated Position 8
- Mark Wilfalk, Commissioner - Director of Solid Waste Management
- Johana Clark, Commissioner - Director of Public Works designee
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- Drew Yearwood, Commissioner - Mayor Nominated Position 30
- Shavonnah Roberts, Commissioner - Mayor Nominated Position 13

HOUSTON CLEAN CITY COMMISSION CHAIR

- Alan Steinberg, Commissioner - Mayor Nominated Position 22

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- The Waste Management, Inc. team in Houston, TX (doing business as WM)
- Robert Dishman, President, RD Plastics Consulting LLC
- Fernando Cedillo, General Manager, FCC Environmental Services (9172 Ley Rd, Houston)

Houston Clean City Commission Quarterly Report to City Council			
Topic:	Post-consumer polypropylene (#5 plastic)		
Date:	08/27/24	**Committee**:	Comm'rs Tyler, Smith, Machado, Wilfalk, Clark, Boehme, Asaduddin, Gonzalez, Yearwood and Roberts

Overview:

Plastic waste, more than many other waste streams, is composed of a broad range of material types, formats, and compositions. Over half of post-consumer plastic waste is packaging. The majority of consumer-facing rigid packaging is made from polyethylene terephthalate (PET), high-density polyethylene (HDPE), and/or polypropylene (PP). Even with strong education and outreach programs, the public has difficulty distinguishing plastic types and sorting plastic waste into sub-categories. Within the post-consumer plastic waste stream, the highest recycling rates have long been with PET (polyethylene terephthalate – denoted as plastic type #1 in the chasing arrows plastic recycling scheme) and with HDPE (high-density polyethylene – denoted as plastic type #2 in the chasing arrows scheme). Relatively high recycling rates are achieved with PET and HDPE because these materials represent relatively high volumes and also these volumes are concentrated in a few very recognizable applications (ex: PET water/soda bottles or HDPE milk/water jugs and shampoo/cleaning product bottles). The waste stream includes lots of PP but, compared to PET and HDPE, these volumes tend to be divided over a much broader range of shapes, sizes and colors and, accordingly, are more variable in terms of additive packages, modifiers, pigments and other chemical components, and, importantly, melt viscosity (critical to subsequent downstream processing). For this reason, post-consumer PP is more difficult to sort than post-consumer PET or HDPE and has less post-sort value, application potential, and processability.

A critical challenge in preserving the value of recovered plastic waste as an industrial feedstock is to effectively and efficiently sort the waste into different plastic types and to minimize contamination with other plastics and with non-plastics such as paper/cellulose fiber and food/organic material. Industrial and commercial plastic scrap (ex: "back of store" plastic waste in retail/distribution) can frequently bypass a sorting facility and be shipped directly to a recycling facility because the waste stream is generally uniform and minimally contaminated. In contrast, post-consumer plastic waste, including PP, is typically compositionally variable and highly contaminated. It is primarily recovered from the single-stream recycling that flows from residential bins to local materials recovery facilities (MRFs) for sorting, baling, and shipping prior to recycling. This means that almost all of Houston's post-consumer PP recycling relies on the sorting capability of area MRFs. Because PP sorting capability was not originally implemented when most MRFs were designed, this capability must often be added as a retrofit, increasing the cost and complexity of facility operations. PP recovery rates at any MRF are imperfect. PP sorting is typically designed to target the most common polypropylene consumer products (yogurt/cream cheese/margarine tubs and microwavable food containers) while smaller, less common, unusually shaped and/or certain colors of PP products can bypass capture and end up as landfilled residual.

Plastic recycling is not a standard process. At present, most recycled plastic is collected, cleaned (if necessary), crushed or shredded, and then re-melted into granules that can be used to make new products. This approach is referred to as mechanical recycling or melt recycling. Most mechanically recycled post-consumer plastic is eventually used to make buckets, paint cans, furniture, decking, mats, landscaping supplies and a wide range of other products not intended for food contact. Advanced plastic recycling, also called chemical recycling, refers to a process which splits the plastic's polymer chains (the molecular structure) into simpler molecules that can later be recombined to create recycled products. Alternatively, selective solvation technologies exist (for polypropylene in particular), that preserve the original molecular chain but remove all other contaminants. This is also considered advanced recycling. All advanced recycling is more energy intensive than mechanical recycling and also less sensitive to certain types of contamination. Advanced recycling produces a product suitable for food contact applications in any format. For advanced recycling of PP specifically, the high variability in melt viscosity does not pose any disadvantage as it does in the case of mechanical recycling. In a future which features a much higher rate of plastic recycling, mechanical and advanced plastic recycling are likely complementary, not competing, technical processes.

Current State (system participants, areas of local success, regional/national models to follow)

Despite ongoing, widespread, and well-funded campaigns urging individuals to use less single-use plastic, plastic production rates have continued to increase since the 1950's.While the rate of production increase has slowed in recent decades, more plastic continues to be manufactured every year. Because there is no

indication that demand for plastic will taper near-term, the only way to decouple plastic manufacturing rates from plastic landfilling rates is to drastically increase plastic recycling rates.

Houston is envisioned by many as a future national hub of plastic recycling. Private companies are making or have made significant investments accordingly. Much of the postconsumer PP in greater Houston being recycled now is captured from single stream recycling at either the WM facility at 1200 Brittmoore or the FCC facility at 9172 Ley Rd. The business model of Cyclyx International, an Exxonmobil, Agilyx and LyondellBasell joint venture, is premised on the idea that the factor limiting significant growth in plastics recycling, including postconsumer PP, is sourcing, efficient pre-processing and optimal formulation of plastic waste feedstock for both advanced recycling and mechanical recycling. Cyclyx has launched local plastic landfill diversion programs which include the City of Houston's new all-plastics public drop-off option and has so far collected over 200 tons of post-consumer plastic waste. Exxonmobil's 2022 Baytown plastics recycling facility processed 22,500 tons of material, not necessarily post-consumer, during their first 15 operational months and has announced plans to commission a second operational unit in 2025. While unmet consumer brand-driven demand for higher recycled content in plastic packaging is the driving force behind advanced plastic recycling capacity additions and/or associated investment in collection and/or sorting upgrades, Houston has hosted facilities capable of mechanically recycling commercial/industrial PP, such as Birch Plastics, for decades. Although not all of it is PP, Birch Plastics alone processes over 10,000 tons of scrap plastic per year.

Challenges and Opportunities

1) **Progress towards managing recycling stream contaminants is being made and efforts should continue.** At the materials recovery facility (MRF) that receives single-stream residential recycling from the City of Houston, easier-to-sort materials are removed first, leaving behind an increasingly contaminated stream from which other materials must be accurately separated. Although contamination negatively impacts recovery efficiency generally, PP recovery efficiency is disproportionately hindered because recovering PP is one of the last processing steps. Yard waste stands out as a prevalent and problematic contaminant for this facility. Recent SWMD efforts to increase yard waste program participation through more inclusive and accessible curbside placement options will help long-term. Including an image of yard waste properly set out for curbside pickup on SWD's widely shared card placement graphic and updating the "Yes! Put these in your cart" icon associated with plastic to include a picture of a common item made from PP and re-labeling this same icon "Empty rigid plastic containers" is recommended. Help that can be offered to SWMD to expedite implementing these changes and similar updates is requested. Leveraging communication channels beyond direct SWMD outreach could help the benefits of ongoing program improvements be realized more quickly.

2) **Use higher-resolution recycling access metrics:** Whether an individual has access to recycling is sometimes defined as whether there is a single-stream recycling bin available at that individual's place of residence. This metric is too simple to usefully signal where program improvement and public education should focus or as an indicator of recycling service quality. Access should be assessed on a yes/no basis for every class of materials (ex: cardboard, glass, PP) and yes/no assessments should take into account the degree to which receiving facilities have the capacity to sort or process those material classes once received.

3) **Acknowledge the pros and cons of becoming a leader in plastic recycling:** If Houston transitions to become a national hub of plastic recycling with plastic recycling rates tripling or more, additional capacity will be required. New capacity, whether sorting, pre-processing or processing, will impact how waste plastic flows around the region and a diversity of collection programs, which may include single-stream collection, dedicated collection program(s) and/or public and private dropoff options, will be needed to achieve consistently high plastic recycling rates long-term. Balanced awareness and acknowledgement of both the benefits and drawbacks of scaling up regional capacity will be necessary to develop and maintain public support.

4) **Promote packaging efficiency**: Incorporate encouraging "packaging efficiency" into ongoing recycling education campaigns, with packaging efficiency meaning the quantity of product delivered relative to the size and/or reusability or recyclability of the package used to contain the product. In addition to larger plastic containers more efficiently containerizing products, larger containers have higher recycling rates because they are easier for MRFs to sort. Individual or sample size containers are highly likely to fall through the screens and end up as landfilled residual. This is relevant to PP but applicable for all types of packaging.

5) **Focal point:** A designated person to monitor progress towards Commission recommendations is needed.