

STUDY SUMMARY

As interest in the circular economy grows, an increasing number of companies have been setting goals to increase the recyclability and recycled content of their packaging. AMERIPEN – the American Institute for Packaging and the Environment, a policy-based trade association for the U.S. packaging industry, wanted to understand what the relationship between these goals and domestic packaging supply and reprocessing capacity is, and what, if any, additional policies or program supports could be supported to close potential gaps. Success with company goals for post-consumer recycled (PCR) content will require coordination across this value chain. Understanding where and why challenges may be occurring can provide further insight into effective interventions to ensure success.

When we began this study, we assumed that most goals would be developed for a broad portfolio of packaging formats and variety of materials and that we would be able to drill down into demand and supply curves for all those materials. To our surprise, outside of plastics goals, we found most goals were framed in an either/or context (recyclable or sustainably sourced) or there were no recycled content objectives publicly stated. Since we found very few articulated quantifiable recycled content objectives beyond plastics, AMERIPEN therefore narrowed this study to evaluate the potential of meeting plastic PCR resin goals only.

METHODOLOGY AND ASSUMPTIONS

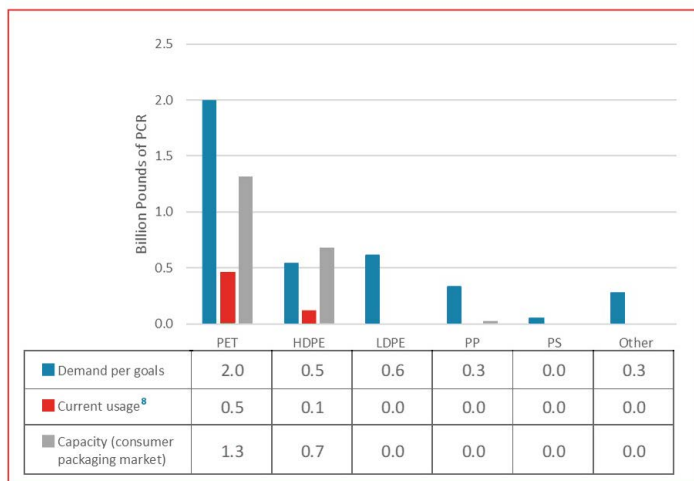
In assessing supply, Circular Matters compiled data from existing public reports on plastics recovery within the U.S.¹ For the purposes of this study we additionally attempted to restrict supply and reprocessing capacity to within the U.S. only. We recognize U.S. manufacturers may rely on imports of PCR resins from Canada and Mexico, for example, which may slightly increase available supply or reprocessing capacity beyond what is noted in this study. Lastly, in calculating an estimate of supply and reprocessing capacity we did not account for fluctuations in demand between competing end use markets. Rather, we assumed we could not draw from other end users to meet increased demand. Nor did we address limitations due to technical and regulatory requirements. While we address this in our discussion around materials-specific challenges, calculating demand based upon other specific challenges and needs was beyond the scope of this study. As a result of these limitations, we caution that the data in **this study should be seen as general trends and not a complete assessment of available supply and reprocessing capacity for packaging-specific applications.**

The existing available data demonstrates that the packaging industry typically consumes less than 50 percent of the market for post-consumer plastic resins. At 50 percent, the packaging industry has the greatest influence on polyethylene terephthalate (PET) resin end markets. It drops to around 40 percent for high density polyethylene (HDPE), and at the time of this study virtually no recycled low density polyethylene (LDPE) was believed to go into consumer

goods packaging. This suggests that any increases in demand by the packaging industry is likely to be met with significant competition from other end users who may have greater influence on demand. Our numbers therefore are based upon the sum of current PCR sales into packaging applications only, plus unused reprocessing capacity that could be used to recycle more collected post-consumer plastics for use as PCR in consumer packaging.

ANALYSIS

FIGURE 2: U.S. Annual Production Capacity, Current Usage, and Future Committed Use (Goals) for Consumer Packaging PCR²



SOURCES: Circular Matters LLC for commitment and PCR capacities, and the following reports for current usage amounts in packaging: <https://www.plasticsnews.com/news/napcor-looks-tweaks-reverse-falling-pet-recycling-rate>, <https://plasticsrecycling.org/images/library/2018-postconsumer-bottle-recycling-report.pdf>, https://www.plasticsmarkets.org/jsfcontent/Non-BottleReport18_jsf_1.pdf, https://www.plasticsmarkets.org/jsfcontent/FilmReport18_jsf_1.pdf.

As one can see from reviewing the results of Figure 2, recycling collection and reclamation quantities for all resins needs to increase over current levels for CPG companies to meet their goals.

HDPE AND PET STRATEGIES

With a focus mainly on PET and HDPE, we note that only HDPE may offer sufficient current reclamation capacity to meet company goals. However, that conclusion is simplified and does not address the additional complications inherent to supply and reprocessing capacity once we consider technical specifications and other packaging design needs. Given these complications, we believe the ability to increase HDPE PCR resin for packaging specific applications may remain restricted without more interventions.

PET collection and reprocessing capacity will also need to increase if we have any hope of meeting corporate commitments. Approximately 1.8 billion pounds of PET bottles and 0.1 billion pounds of thermoforms were collected in the U.S. for recycling in 2018 out of more than 6.3 billion pounds of PET bottles sold.³ If the total domestic PET reclamation capacity were to be increased to 3.8 billion pounds

¹ <https://www.plasticsnews.com/news/napcor-looks-tweaks-reverse-falling-pet-recycling-rate>, <https://plasticsrecycling.org/images/library/2018-postconsumer-bottle-recycling-report.pdf>, https://www.plasticsmarkets.org/jsfcontent/Non-BottleReport18_jsf_1.pdf, https://www.plasticsmarkets.org/jsfcontent/FilmReport18_jsf_1.pdf
² Data on current usage taken from 2019 for PET and 2018 for the other resins. Capacity data is from 2020.
³ This underestimates since the amount of PET packaging sold since it excludes PET thermoform quantities for which industry data does not publicly exist. Data were drawn from <https://www.plasticsnews.com/news/napcor-looks-tweaks-reverse-falling-pet-recycling-rate>.

of capacity and that capacity were to be utilized, **collection would need to increase to nearly double current levels** (i.e., the PET bottle recycling rate would need to increase from approximately 29 percent to 56 percent).

The U.S. capacity as of the end of 2020 to recycle PET bottles and post-consumer PET thermoforms to produce PCR for all uses, including non-packaging uses such as fiber, was over 2.6 billion pounds of incoming material per year. To meet the future demand for PCR, the PET reclamation capacity would need to increase to at least 3.8 billion pounds per year, accounting for yield loss from incoming purchased bottles.⁴ **In other words, PET reclamation capacity in the U.S. would, at a minimum, need to increase by 50 percent from current reprocessing capacity to meet CPG company brand commitments for their PET packaging,** assuming that there is no change in demand from other end markets for this material.

Our current data indicates the domestic U.S. supply and capacity for plastic reprocessing is not sufficient to meet the demands outlined through company goals for packaging PCR use. We lack sufficient technologies to leverage some PCR resins (e.g., low density polyethylene– LDPE, polypropylene–PP, or polystyrene–PS) for packaging-specific needs, thus requiring increased emphasis on PET and HDPE as the two resins with the greatest supply potential for increased packaging quality PCR. Yet these two resins, despite their more robust markets, also lack sufficient supply and domestic reprocessing capacity to meet the stated demand.

Given the barriers we are facing in our efforts to meet corporate commitments for PCR plastic resin use, we are going to have to consider new strategies to increase collection, quality, and reprocessing capacity. The following ideas have been generated in hopes we can advance a dialogue amongst stakeholders to lead us towards success in meeting PCR goals.

CONSUMER EDUCATION

Education may include simplifying access for consumers and reducing contamination. Messaging around the value of recycling could also help, with the intention of driving increased consumer participation in recycling programs.

CONTAINER DEPOSIT PROGRAMS

If a comprehensive national beverage container deposit-return program were to be implemented with a ten-cent deposit so that at least 75 percent of all beverage bottles nationwide were collected through the deposit return program, we estimate that as much as an additional 1.6 billion pounds of PET bottles could be collected over 2020 levels, for a total of approximately 3.4 billion pounds of PET bottle collection per year. This approach alone still would fall short to fill the expansion in both collection and reclamation capacity that would be required for CPG companies to meet their future commitments, but it would bring those companies a step closer to meeting their goals.

EXPANDING REPROCESSING TECHNOLOGIES AND TARGETING MARKET DEVELOPMENT

Additional investment and technology development is needed in mechanical recycling, purification, and plastics-to-plastics chemical recycling technologies. The chemical recycling family of technologies offers the promise to produce virgin-equivalent quality in PCR resins, including for those resins that are not PET, especially if mass balance accounting rules are accepted versus actual recycled content.

Chemical recycling of PET can also take post-consumer PET textiles, such as carpet, and upgrade it into packaging resins, which would help with the barrier of needing very high recycling rates for PET packaging to meet company commitments.

EVALUATING HIGHEST AND BEST USE

This study has assumed that the end goal is to increase PCR use in packaging as a response to publicly stated company goals. After evaluating end market demand, quality, and technical constraints, however, we would be remiss if we did not ask whether plastics recycling could drive better environmental outcomes if PCR materials were directed towards alternative end markets. Data to help inform highest and best use strategies may help drive further environmental and economic value.

RECYCLED CONTENT MANDATES

While recycled content mandates may help increase demand, evaluated data encourages caution in defining the parameters of such mandates. Minimum content mandates must consider supply and reprocessing capacity to ensure adequate PCR supply and package integrity.

CONCLUSION

This study sought to understand the relationship between company packaging goals for post-consumer recycled (PCR) content and available supply and current demand. Circular Matters' evaluation of domestic supply and reprocessing capacity for plastic resin concludes that based upon demand stated through public commitments for plastic PCR, the U.S. currently lacks the available supply and, in some cases, domestic reclamation capacity to meet those goals. We need to begin a dialogue to discuss how we can best overcome these challenges to ensure a robust domestic market for plastics reuse.

More details can be found in the complete report.

