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# IT WILL TAKE A VILLAGE TO BOOST PLASTIC RECYCLING

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Like the old African proverb that "it takes a village to raise a child" it will take constructive policies and key stakeholders along the plastic value chain to nurture and help finance the recycling business as it evolves from its nascent phase. For example, AI sortation technologies are rapidly improving to identify and extract various plastics from waste streams, but those advancements will be in vain unless the plastic industry, government agencies, and the investment community work together to support more advanced recycling projects. Without that support, recycling rates will fall short, resulting in more government policies to reduce plastic consumption and penalize its production.

## Background

There has been a lot of press recently stating that plastic recycling is making little progress. Although the desire is there to reduce plastic waste for all the obvious environmental reasons, overall plastic recycling rates remain stubbornly under 10% in the U.S.<sup>1</sup>. Also, the proportion of recycled plastic content to new plastic content in products is declining, according to a new report by research firm Wood Mackenzie<sup>2</sup>. In a world where immediate results are expected with just a click, there is growing frustration why plastic recycling is languishing, with doubts building whether there are sufficient drivers to spur more recycling.

There are endeavors to eliminate single-use plastics. With plastic recycling rates stalling, several state and federal efforts are underway to reduce or even eliminate the sale and distribution of single-use plastic products and packaging. Private efforts are also ongoing. In fact, the month of July was Plastic Free July<sup>®</sup>, a challenge that began in Western Australia in 2011 to encourage people to reduce single-use plastic. It has now swelled to a global movement in which 140 million people from 190 countries are now taking part.

It remains to be seen how effective and practical these efforts will be in reducing plastic waste. Excessive and strict enforcement may lead to resistance or non-compliance from citizens and there is the simple reality that single-use plastics are everywhere in our daily lives, and they do have benefits.

## The Good, the Bad and the Ugly

Plastics, whether they are single-use or not, play an integral role in improving our quality of life. They prevent our food from spoiling; help us transport goods with less energy and breakage than most other alternatives; make our vehicles lighter and more energy efficient; and they are inexpensive,

<sup>&</sup>lt;sup>1</sup> National Renewable Energy Laboratory Quantification and Evaluation of US Plastic Waste.

<sup>&</sup>lt;sup>2</sup> Wood Mackenzie, Waste to wealth, July 2024.

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durable, and easily formed<sup>3</sup>. Additionally, they have become critical materials in revolutionizing the healthcare industry for over 60 years. Because plastics are benefiting society in many essential applications, plastic consumption will continue to increase as the global population grows and the world becomes more developed and energy efficient.

But plastics are produced from fossil fuels and that is where the problems start. Greenhouse gases are emitted from the extraction of fossil fuels and from the traditional methods of producing plastics. More troubling is that plastics can be a curse if they are not managed properly after their useful life. Depending on their structure, composition and disposal location, plastics can take anywhere between 20 to 500 years to decompose<sup>4</sup>.

So, when they are discarded, plastics can accumulate in the environment. Unmanaged waste in developing economies in Asia is the primary cause for plastic pollution in the world's oceans according to studies<sup>5</sup>. Plastic waste is more managed in the U.S. with over 85% of all plastics in the U.S being landfilled and about 5% being incinerated. But even landfilling and incinerating plastic waste can produce greenhouse gasses and potentially hazardous pollutants. Also, accumulating plastic waste in landfills inhibits these facilities from producing renewable gas.

Plastic recycling is the most effective way to manage plastic waste because circularity can be achieved, thereby reducing plastic waste's harmful effects on the environment. The American Chemistry Council defines circularity as using plastics (or any resource) more efficiently by keeping the material in use for as long as possible, getting the most from the material during its use, and then recovering it to make new products. Some methods of plastic recycling are better at achieving circularity than others, nonetheless, plastic recycling whatever the method is a far better option environmentally than landfilling or incinerating plastic waste.

### It's Complicated

Yet, plastic recycling is struggling to gain a significant foothold in the U.S. because of several factors.

First, plastic recycling is an evolving business with interdependent but fragmented segments such as consumer attitudes about recycling; waste collecting and landfilling; municipal and commercial recycling programs, the sophistication of sortation facilities; the types of recycling methods (mechanical and advanced) and their capabilities to process various plastic wastes; plastic producers, their economics and circularity goals; the logistics of moving plastic waste; societal desires for recycled plastic products; government policies; and funding sources and their risk tolerances.

Second, is the basic fact that plastics are not homogenous commodities. There are seven resin or polymer types based on the polymer's chemical composition and physical properties. Each type has unique properties that affect its color, shape, structure, and melting point. Also, each resin type can

<sup>&</sup>lt;sup>3</sup> McKinsey & Company, Accelerating plastic recovery in the United States

<sup>&</sup>lt;sup>4</sup> Chariot Energy, How long does it take for plastic to decompose.

<sup>&</sup>lt;sup>5</sup> World Economic Forum, Asia's plastic problem is chocking the world's oceans.

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be formulated for multiple single-use and/or durable applications which can dictate the methods of collection, sortation, and recycling.

Depending on the type of plastic, how it is combined with other materials, and even its shape and degree of flexibility can have an impact on a particular plastic's recycling rate. A McKinsey study<sup>6</sup> cites that 30% of plastic packaging is difficult to sort such as film, bags, lids and pouches because these plastic items can get tangled in the sorters. As such, these materials are typically not accepted by sortation companies, and they eventually end up at a landfill or at an incinerator.

### The Case for Advanced Recycling

Fortunately, AI-sortation technology companies are making remarkable progress in extracting flexible plastics from single recyclable streams collected curbside and from municipal solid waste; so, in the near future, difficult-to-sort plastics instead of heading to the landfill should be available for recycling. On the demand side, consumer desires for sustainable plastic products is increasing and consumer packaging companies along with plastic producers have lofty goals to achieve circularity.

But advancements in sortation technologies and the ardent desire for sustainable products are not sufficient to boost recycling rates. It is going to take the means to convert all types of waste plastics, from rigids to flexibles, to usable plastic products.

This last point is important because mechanical recycling has its benefits, but it is limited by a small supply pool of high-quality, relatively clean-sorted waste plastics and by the degradation that occurs when mechanically recycled materials are recycled multiple times. To truly achieve circularity and boost recycling rates, advanced recycling is needed as it can process a wider range of plastic types to produce products to be reconverted to virgin plastics.

Advanced recycling includes technologies such as pyrolysis, depolymerization, and solvent purification. And, because advanced recycling provides the means to achieve a high degree of circularity, uses plastic waste rather than fossil-based feedstocks for polymer production, and diverts plastic waste from landfills and incineration, it should generate greater sustainability benefits than mechanical recycling.

### The Chicken and Egg Problem

To encourage more advanced recycling, all the factors along the waste plastic value chain including government policies and funding sources must be aligned, and sadly they are not, currently. Not surprising given that advanced plastic recycling is still evolving.

The reasons for misalignment can vary among stakeholders along the plastic value chain. For instance, some investors, waste plastic aggregators and product offtakers have expressed concerns that certain advanced recycling technologies are relatively new and have not been commercially

<sup>&</sup>lt;sup>6</sup> McKinsey & Company, Accelerating plastic recovery in the United States



proven. So, there is reluctance to do early-stage investments, to move forward on supply projects or to make final commitments on product offtake.

But to become commercially proven, you need suppliers, product offtakers and investors to support a project and help mitigate risks; hence, the "chicken and egg" problem. No matter the advancements in waste plastic aggregation and sorting, unless there is more support for advanced recycling projects, more plastics will end up in the landfill and the circularity goals by plastic producers and users will fall short.

Being an advanced plastic recycling company developing a four hundred metric ton per day pyrolysis plant using the Lummus Green Circle technology, 245Recycle is witnessing firsthand the challenges and the complexities that reside within the evolving world of plastic recycling. Our interactions with government officials, plastic waste suppliers, AI-sortation companies, pyrolysis product offtakers, logistic companies, engineering firms, and funding sources convinces us that recycling rates can increase if strategic partnerships can be forged between these key stakeholders to resolve the "chicken and egg" problem existing in the recycling business.

#### It Will Take a Village

Notably, constructive policies have been enacted by twenty-five states as of April of this year, recognizing advanced recycling as a manufacturing process. This recognition allows advanced recycling to be decoupled from solid waste regulations which are more onerous than those governing traditional plastics recycling. The exclusion from solid waste regulations also allows advanced recycling facilities to receive certain state financial incentives.<sup>7</sup> But it would also be helpful if more states and the federal government enacted tax credits for the purchase of machinery and equipment used in advanced recycling.

Unfortunately, constructive government policies, although extremely helpful, will not be enough. Key participants along the plastic value chain from process technology firms to consumer packaging companies need to play a vital role as strategic partners to help jump-start advanced recycling companies like 245Recycle. If these strategic partnerships are not forged in a timely manner to boost recycling rates, it is likely more regulations will be enacted to limit plastic use, require plastic manufacturers to pay a waste fee, and mandate recycled plastic content in plastic products.

It would be far better for the key stakeholders in the plastic industry to take a more active role in determining the destiny of plastic recycling than letting government regulations and producer penalties solve the plastic waste problem.

<sup>&</sup>lt;sup>7</sup> Plastics and Advanced Recycling: Legislation to Watch in 2024, Feb. 20, 2024, Matt Crawley