

# Advanced Recycling: Reducing Plastic Waste, Cutting Emissions, Growing Economies

Plastics are highly valuable materials that play an important role in the modern economy. Plastics provide sustainability benefits versus alternative materials and will continue to play an important role in helping society mitigate greenhouse gas emissions.

As we move toward a circular economy, there is greater demand to increase plastic recycling as well as recycled content in products. **Advanced recycling is a necessary and essential complement** to mechanical recycling to ensure that plastics stay **out of the environment**, while also creating **new products and economic growth** opportunities that benefit society.

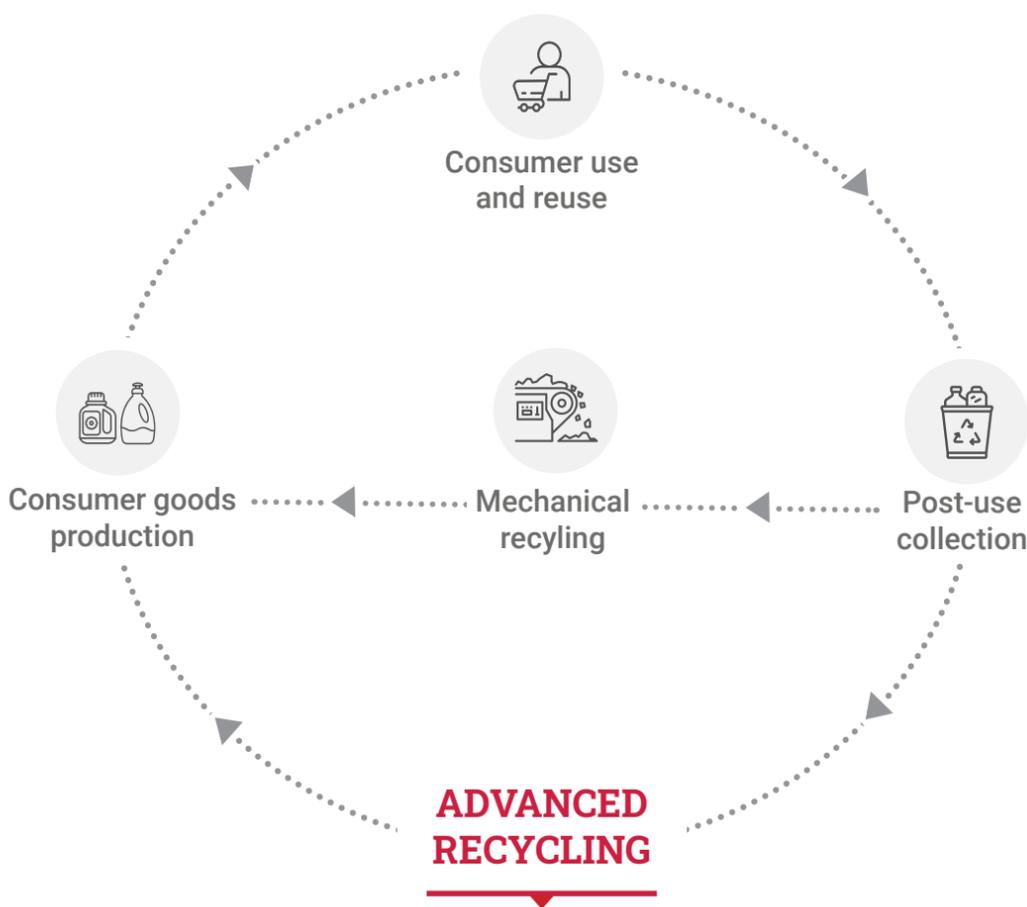
## What is Advanced Recycling?

Advanced recycling, also known as chemical, molecular, tertiary or feedstock recycling, encompasses any technology that converts plastics into a purified form or a feedstock that can be used in the production of new polymers, monomers, intermediates, or other materials. Examples include but are not limited to purification, depolymerization, solvolysis, gasification, and pyrolysis.

## How does Advanced Recycling work?

While mechanical recycling uses physical processes such as grinding, washing, separating, and compounding in which polymers remain intact, advanced recycling typically alters the chemical structure of plastics, by methods such as dissolving with chemicals or using heat to break them down into original components. Advanced recycling produces materials that are indistinguishable from virgin plastic so they can be used to make a wide range of new products.

Advanced recycling is typically broken down into three general categories: purification, depolymerization, and conversion.



### Purification



Yogurt cups and takeout containers

Auto bumpers and engine wiring clips

Purification uses solvents to separate plastic polymers from additives, coloring, odor, and other resins, instead of breaking polymers down, that can then be used to make new plastic products. Purification is the most successful when processing single types of plastic waste.

### Depolymerization

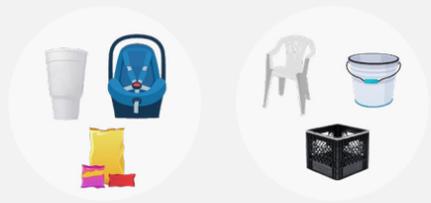


Colored bottles

Clear PET bottles

Depolymerization uses chemicals, instead of heat, to break plastics down into their original monomers, which can then be used to make new plastic products. This technology is best used for more similar types of plastic as opposed to mixed plastic waste.

### Conversion



Mixed materials

Durable plastic products

Conversion uses heat to bring plastics back to their most basic building blocks so that they can be used as raw materials for new plastic products or other materials. Pyrolysis and gasification are two examples of technologies that use thermal conversion to produce recycled plastic, similar to virgin plastic. These types of advanced recycling can process more complex mixtures of plastic and yield the same high-quality recycled polymers.

## Environmental Benefits

In addition to diverting plastics from landfills and ensuring that plastics stay out of the environment, advanced technologies are more environmentally beneficial than the production of virgin plastic from fossil fuels from an emissions standpoint. According to a 2021 report from [Closed Loop Partners](#), purification, depolymerization (decomposition), and conversion technologies require less energy, less water and emit fewer greenhouse gases compared to the production of virgin plastics. These technologies can also help mitigate climate change as they displace the use of virgin plastics and keep valuable materials in circularity.

## Economic Opportunity

In a 2021 report, investment firm [Closed Loop Partners](#) found that advanced recycling could yield up to **\$970 million** in potential revenue based on demand for advanced recycling products and double the amount of plastic packaging recycled in 2019. The development of advanced plastic recycling and recovery facilities also has the potential to support nearly **40,000 new jobs** in the United States alone.

Companies already purchasing the products from advanced recycling or that have announced agreements to do so include Gatorade, H&M, L'Oréal, Procter & Gamble, PepsiCo, and Unilever. Just in the last few years, several industry members have also announced new investments in [advanced recycling facilities](#), like Exxon's new facility in Texas, to ensure that all plastic can and is recycled.