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The Art of Advanced Recycling: Reducing Plastic Waste, Cutting Emissions, Growing Economies

Advanced Recycling Technologies (ARTs) are essential to ensuring that plastics stay **out of the environment,** while also creating **new products** and **economic growth** opportunities that benefit society. ARTs can help create a "circular economy" in which materials are repurposed after use rather than disposed.

What is Advanced Recycling?

ARTs is the latest step change in recycling, and refer to a number of technologies in use across the United States that transform hard-to-recycle plastics like plastic film, textiles and building materials that would otherwise end up in the landfill. While mechanical recycling uses processes that retain plastic resin, ART typically alters the physical form of used plastics, either by dissolving them with chemicals or using heat to break them down into their original components.

How do Advanced Recycling Technologies work?

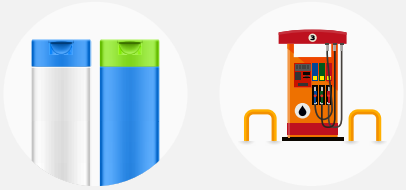
ARTs use various processes to convert post-use plastics into their original building blocks, polymers, and feedstocks. The resulting product is then used to make new plastic materials, fuel or other household products.

Chemical Recycling

Broken EPS Foam ♻ New plastics products

Chemical recycling uses chemicals to break down hard-to-recycle or non-recyclable plastic products like polystyrene or EPS foam into their original monomers so it can be reused to make bottles or other products.

Pyrolysis



Shampoo and conditioner bottles ♻ Gasoline in a car

Pyrolysis uses high temperatures to transform low-density plastics, including polyethylene and polypropylene products like shampoo bottles and take-out food containers, from solid waste into a synthetic oil that can be refined into diesel, gasoline, or heating oil.

Gasification

Take out containers ♻ Electricity

Gasification also uses high temperatures to transform non-recyclable, low-density plastics, like polyethylene and polypropylene containers, into reusable products. Unlike pyrolysis, gasification uses a gasifying agent in addition to heat to produce a gas or syngas that can be used to produce fuel products and generate electricity.

Environmental Benefits

In addition to diverting plastics from landfills, ARTs emit fewer emissions than other traditional recycling methods. Pyrolysis can reduce CO_2 emissions by about **50%** compared to incineration of the same materials. According to a study by Argonne National Laboratory, making ultra-low sulfur diesel fuel from used plastics could decrease the consumption of water by **58%** and the use of traditional energy sources by **96%** compared to producing the product from traditional materials.

Economic Opportunity

In a 2019 report, investment firm Closed Loop Partners found that ARTs could yield up to **$120 billion** in potential revenue based on demand for advanced recycling products. 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. In November 2020, Michelin and Pyrowave announced that they would partner to fast-track the use of chemical recycling technologies in Canada to create an outlet for hard-to-recycle plastics, like flexible plastic packaging.