

What is “advanced recycling”?

BACKGROUNDER

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environmental
defence



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“Advanced recycling” is an umbrella term, promoted by the petrochemical industry to apply to a wide variety of processes, including plastic incineration and speculative technologies.¹ While largely unproven, these technologies are touted as a solution to plastic waste and pollution. In fact, they are a dangerous distraction from real solutions to reduce plastic pollution.

It is more expensive and energy-intensive than mechanical recycling² and is therefore promoted by the plastics industry³ as a solution for “difficult to recycle” materials such as multi-material flexible plastics, films and contaminated waste.

It is an industry-engineered escape valve to allow continued:

- extraction of fossil-based resources that are the main building blocks for plastics;
- production of single-use waste plastics that cannot be conventionally recycled; and
- ineffective collection and recovery systems that promote cross-contamination of discarded materials.

There is no consistent definition of recycling in the various federal, provincial and municipal jurisdictions across Canada. A paper for the Canadian Standards Association proposes the following definition: *Recycling is the reclamation of materials in such a manner that they can be used to displace the primary or raw materials they were produced from.*⁴

“Advanced recycling” can be distinguished from mechanical recycling in that it destroys the product or packaging material to extract some chemicals that may or may not – and much more likely not – be turned back into the same or similar products, and/or low-quality fuel that might be burned to power the process itself or sold for other uses.

“Advanced recycling:”

- Employs some combination of heat, pressure, controlled oxygen and catalysts and/or solvents, to break down plastic and other waste. These processes produce

¹ Environmental law groups told the US Environmental Protection Agency in December 2021 that gasification and pyrolysis must be regulated under the *Clean Air Act* as incineration.

² Hann S. and Connock, T. Chemical Recycling: State of Play, Chem Trust/Eunomia, December 2020.

³<https://www.americanchemistry.com/chemistry-in-america/news-trends/blog-post/2021/what-is-advanced-recycling-and-why-is-it-so-important-for-meeting-the-growing-demand-for-recycled-plastics>

⁴ Valiante, U., Gies, G., Moreside, E. (2021). Defining Recycling in the Context of Plastics. A Principled and Practical Approach. Canadian Standards Association, Toronto, ON; available at

<https://www.csagroup.org/article/research/defining-recycling-in-the-context-of-plastics/>

chemicals, fuels and other waste byproducts (including slag, tar and/or ash) fit for disposal.⁵

- Remains experimental for plastics recycling⁶ – the most common forms are pyrolysis and gasification that turn waste into fuel.
- Requires more energy inputs and generates more greenhouse gas emissions than mechanical recycling.
- Has the potential to produce new chemicals – including carcinogenic dioxins and furans – that are released in the air, water and embedded in the solid waste byproducts and fuel products.⁷

Terms commonly by the industry include

“Advanced recycling,” “Chemical recycling,” “Molecular Recycling”

These umbrella terms can refer to a range of processes that remain experimental for treating plastic waste, including:

Pyrolysis, gasification, solvolysis, depolymerization, purification, conversion, waste-to-fuel, waste-to-polymer, waste-to-energy, hydrothermal liquefaction

- **Infographic:** [The Problem with Plastic Recycling](#)

Circular economy policy and plastics

- ◆ Eliminate unnecessary single-use plastics
- ◆ Ensure plastic products and packaging can be repaired and/or reused multiple times
- ◆ Eliminate harmful additives in plastics that pose a threat to health and the environment during manufacturing, use, recycling and/or disposal
- ◆ Eliminate plastic packaging that cannot be processed through mechanical recycling
- ◆ Improve collection and sorting processes to make mechanical recycling more efficient (eg. deposit-return, single-material collection)

⁵ GAIA, Technical Briefing, 2020: https://www.no-burn.org/wp-content/uploads/CR-Briefing_June-2020.pdf

⁶ In a recent study of 37 “advanced recycling” proposals submitted in the US since the early 2000s, only three are in operation and none of them recycles waste plastic back into plastic: https://www.no-burn.org/wp-content/uploads/2021/11/All-Talk-and-No-Recycling_July-28-1.pdf,

⁷ Takada, H. and Bell, L. Plastic Waste Management Hazards. International Pollutants Elimination Network (IPEN), June 2021.