# Advanced Recycling: **A Breakthrough in Plastic Sustainability**

*Dealing with plastic waste is a top priority for AFPM and the larger petrochemical industry. We are working with partners from the plastics industry, government, non-profits and the public to improve waste management and increase both traditional and advanced recycling.*

*Chemists, material scientists and engineers at AFPM member companies are focusing on the molecular composition of plastics and the potential of chemical reactions to open up a new world of plastic recycling potential—well beyond the traditional mechanical recycling many of us already know.*

**Mechanical recycling**—where certain plastics are shredded, melted, formed into pellets and remolded into recycled plastic products—has long been a feature of society-wide sustainability efforts. But mechanical recycling has some limitations. For example:

**Not every plastic can be mechanically recycled.**

**There are restrictions around uses for mechanically recycled plastics.**

**Plastics can only be melted down and reassembled so many times before losing structural integrity.**

Advanced recycling, also known as chemical or molecular recycling, doesn't face the same barriers, but it is much more complex.

## What is Advanced Recycling?

Advanced recycling (also known as chemical or molecular recycling) is a scientific process where heat and various catalysts are used to initiate chemical reactions that return plastics to their original monomer building blocks, identical in structure to the original virgin feedstocks. Returning plastics to monomer form is the key feature of advanced recycling. Once plastics are chemically converted back to monomer form, there are a range of options for recycling and reuse. Chemically recycled plastics can be used in the manufacture of brand new, food-grade plastics and health care equipment (something that's not an option for mechanically recycled plastics). The monomers can also be refined into fuel used by diesel cars and trucks.

## Is Advanced Recycling advancing?

Yes. There have been exciting breakthroughs in advanced recycling as a result of petrochemical industry investments. AFPM members have announced recently that large-scale, commercial chemical recycling options exist for polyethylene, one of the most ubiquitous plastics used in packaging film, trash and grocery bags, water bottles, toys, housewares, and even modern combat helmets. Because polyethylene is so widely used, the availability of chemical recycling for this plastic can be instrumental in cutting global plastic waste.

## What does the future hold for recycling?

All plastics are not created equal, and different types of plastics present different challenges when it comes to advance recycling. This is an area where the petrochemical industry, with their deep bench of expertise, comes into play. Teams of scientists and chemists at AFPM member companies are leading massive research and development projects to open up new possibilities for advanced recycling and petrochemical sustainability. Over the past year, companies like **Dow**, **Chevron Philips Chemical**, **Eastman**, **ExxonMobil** and **INEOS** have made major announcements about advanced recycling initiatives.

Scaling and commercializing advanced recycling and achieving breakthroughs for the various types of plastics is an expensive endeavor. Government policy to encourage development in this field and strengthen the market for both post-consumer and post-industrial recycled plastics can be instrumental in furthering the potential of advanced recycling.

# Advanced Recycling: **A Breakthrough in Plastic Sustainability** *continued*

*Plastic is essential in health care, technology, and the food supply chain, but waste is inexcusable. The petrochemical industry is serious about plastic waste and committed to being part of the solution to this global problem. Together, mechanical and advanced recycling have potential to increase overall recycling rates and meaningfully cut down on plastic waste in the environment.*

## Molecular recycling: putting plastic waste to continuous use