

MAKING SUSTAINABLE CHANGE

AMERICA'S PLASTIC MAKERSSM



Advanced Recycling

Remaking Plastics to Meet Sustainability Goals



Plastic makers are embracing sustainable change and a new way to make plastics.

Advanced recycling creates new top-quality plastics out of used plastics, reducing our reliance on natural resources and allowing us to remake “hard-to-recycle” plastics.

It’s a game changer in the drive toward sustainability and key to meeting circularity goals while keeping plastics out of landfills and our environment.

Plastic makers are embracing sustainable change and a new way to make plastics. Major plastic companies are revising their business models and production processes to take advantage of advanced recycling technologies. We’re committed to recovering and remaking plastics again and again.

Who benefits? Consumers eager to support sustainability. Companies that want to make packaging and products out of recycled materials. And the environment by relying on used plastics instead of natural resources.

Join the movement. It’s time to build a circular economy for plastics.

Advancing the Circular Economy

EPA: "A circular economy... recaptures 'waste' as a resource to manufacture new materials and products." For plastics, that means recovering and reusing plastics as a resource for new plastics. Reuse - don't discard.

To achieve this, America's recycling infrastructure needs a serious refresh. We're doing a decent job recycling boxes, bottles, and cans, but it's difficult to recover all the new types of lightweight plastic packaging, such as plastic film and pouches. As a result, roughly 90% of plastics are not recycled today.



**Advanced recycling technologies can change that...
and create a new life cycle for used plastics.**

A decade ago, technology providers set out to convert hard-to-recycle used plastics into fuel. Technologies and the world have changed since then. Some companies still use advanced technologies to create fuel, but that isn't typically considered "recycling."

Today, these technologies focus on creating a circular economy in which used plastics are remade into new plastics that can be remade again and again. These technologies help create high quality plastics that can even be used in medical, pharmaceutical, and food applications - virtually any plastic product or packaging. Plastics made using these technologies can meet FDA requirements for medical/pharmaceutical/food packaging that traditional, mechanically recycled plastics often cannot.

Advanced recycling uses lower cost raw materials (used plastics) to create higher value products (new plastics) while also improving sustainability.

SCALING ADVANCED RECYCLING TECHNOLOGIES MEANS IMPROVED SUSTAINABILITY



**LOWER-COST USED PLASTICS BECOME
HIGHER-VALUE NEW PLASTICS**

Advanced Recycling: Multiple Innovative Manufacturing Technologies



Innovative Technologies

Although technologies vary, advanced recycling facilities typically use pyrolysis or gasification, technologies that are deployed in other industries. Both technologies heat used plastics in a low/no oxygen environment, which breaks down the solid material into liquid or gaseous raw materials that can be used to remake plastics or products for other industries.

Three Common Advanced Recycling Technologies

Pyrolysis	Gasification	Depolymerization
Used plastics are heated in the absence of oxygen until thermally decomposed, then condensed into valuable materials.	Used plastics are heated in an oxygen-controlled atmosphere and converted into syngas that is then converted into valuable materials.	Used plastics are broken into smaller molecules (such as monomers) that can be used to make multiple valuable products. Includes solvolysis, methanolysis, and glycolysis technologies.



Comparable/Reduced Air Emissions

Advanced recycling facilities are subject to the Clean Air Act and state and local authorities. They also need to obtain operating permits and continue to monitor and report various air emissions as they operate. Like other manufacturing, these facilities are subject to fines and closure if they exceed air emission limits.

A recent review of air emissions from advanced recycling facilities that use pyrolysis found emissions to be about equal to or lower than those from similar facilities such as food or auto making and institutions such as hospitals and colleges. No measurable lead or dioxin emissions were identified. Advanced recycling facilities that use pyrolysis can operate efficiently under existing air quality regulations designed to protect the air we breathe.

Air Emissions

Review of Average-sized Pyrolysis Facility Compared to Familiar Facilities

VOCs (volatile organic compounds) ≈ small food processing facility

Particulates ≈ small food processing facility

SO₂ (sulfur dioxide) ≈ small hospital

NO_x (nitrogen oxide) ≈ large university

CO (carbon monoxide) ≈ large car making facility



Not Incineration

If you hear someone claiming advanced recycling facilities set out to burn or incinerate plastics, you should tell them to learn the science. The claim is silly. These technologies purposefully operate with little/no oxygen, unlike incineration which requires *lots* of oxygen. Claims to the contrary ignore the laws of thermodynamics.

Frankly, if the used plastics actually were combusted, these facilities would not have products to sell.

Myth
Advanced recycling is just burning plastic waste.

Fact
These processes use low or no oxygen. No oxygen means no burning.

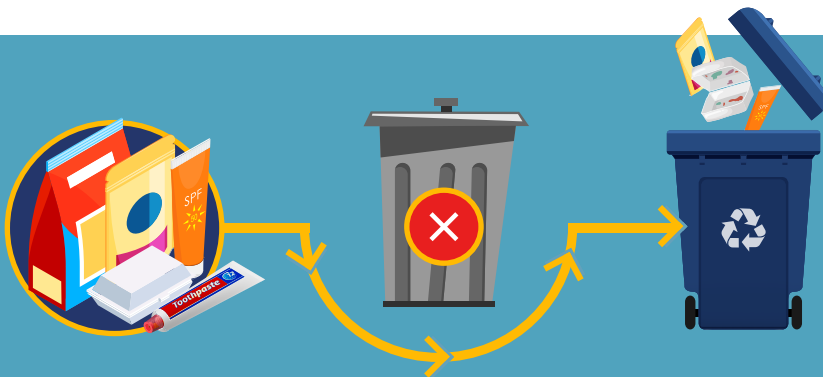
Who's Doing It?

In the U.S., major plastic makers are investing in advanced recycling, revising business models and production processes to offer plastics that have been remade using advanced recycling. In addition, multiple entrepreneurial recycling companies are deploying advanced technologies.

Over the past few years, nearly

\$7 BILLION

in advanced recycling investments have been announced.



That investment could potentially divert

21 BILLION POUNDS

of waste from landfills each year.

Advanced recycling can divert hard-to-recycle plastics — such as pouches, tubes, and film — from landfills and our environment. It builds on our nation's existing recycling systems to recover billions of pounds of plastics that are not recycled today. And then remakes them again and again.

Plastic makers are committed to **recovering and remaking** plastics again and again.

Some of the largest companies in the world are remaking plastics in their existing facilities or building new ones.

Multiple smaller companies are remaking plastics in communities around the country.

Numerous similar initiatives are underway in other countries, as well.

Plastic packaging made from advanced recycling technologies is hitting the shelves.

Who's Using It?

Building on their history of using traditional “mechanically” recycled plastics, multiple consumer goods companies are using packaging with plastics that have been certified as remade through advanced recycling. Examples:



Wendy's is transitioning from paper to plastic cups made with plastics from advanced recycling.



P&G's Herbal Essences will use plastics made from advanced recycling in five new hair care bottle collections.



Mondelez International uses “recycled material from innovative advanced recycling technology” in some of its Philadelphia Cream Cheese plastic containers.



Unilever uses “circular polymers” in some of its Magnum ice cream plastic tubs.

Advanced Recycling

One of Our 5 Actions for Sustainable Change



1

REQUIRE PLASTIC PACKAGING IN U.S. TO BE MADE FROM 30% RECYCLED PLASTICS BY 2030.

2

MODERNIZE REGULATIONS TO HELP QUICKLY SCALE ADVANCED RECYCLING AND ACCELERATE A CIRCULAR ECONOMY FOR PLASTICS

3

DEVELOP NATIONAL RECYCLING STANDARDS FOR PLASTICS

4

STUDY THE IMPACT OF GREENHOUSE GAS EMISSIONS FROM ALL MATERIALS TO GUIDE INFORMED POLICY

5

ESTABLISH AN AMERICAN-DESIGNED PRODUCER RESPONSIBILITY SYSTEM

In addition to investing in advanced recycling, America’s plastic makers are calling on Congress to help accelerate progress toward a circular economy for plastics. Among other provisions, our 5 Actions for Sustainable Change calls for creating a modern regulatory system that enables rapid scaling of advanced recycling while continuing to grow mechanical recycling.

The other Actions would require plastic packaging to contain 30% recycled plastics by 2030, create national standards for plastics recycling, use scientific studies to compare the environmental footprint of materials, and raise private funding to update our recycling systems. We’re working with both the House and Senate on this plan to accelerate a circular economy for plastics.

The 5 Actions will help us meet our goal to **reuse, recycle, or recover** all plastic packaging in the U.S. by 2040.



States Are Leading the Way

Multiple states are not waiting for federal policy on Action #2. As of early 2023, 24 states have passed laws to regulate advanced recycling facilities as manufacturing – not solid waste facilities, as some states still do. These modernized regulations can help quickly scale advanced recycling and accelerate a circular economy for plastics.

Why is it “Advanced”?



Creates virgin quality plastic for food, medical and pharmaceutical packaging applications.



Can recycle hard-to-recycle and mixed plastics.



Limits our use of natural resources to create new plastic.



Transitions plastic manufacturing from a linear model to a circular model.



Helps recycle more of the 90% of plastics that aren’t recycled today.

Impact: Game Changer

What's the upshot of advanced plastics recycling? Plastics that once ended up in landfills and incinerators now can be remade and stay in productive use. Films, foams, pouches, tubes, and more can be remade and remain in our economy and out of our environment.

With proper support, these technologies can scale quickly, potentially doubling the plastics recycling rate in the U.S. and Canada by 2030, according to the Closed Loop Fund.



ADVANCED RECYCLING CAN CUT WASTE AND CREATE VALUE.



Companies striving to meet sustainability goals will have access to a greater amount and array of recycled plastics.



Communities around the globe will be able to create value out of used plastics rather than discarding them, as these technologies become widely distributed.



Plastics that once were landfilled or littered can instead be remade to boost local economies, create jobs, and improve sustainability.

Who's Helping Remake Plastics?

The real heroes in plastics recycling are the advanced recycling technology providers, plastic makers who are remaking plastics, and companies who are using recycled plastics in their packaging and products.

Behind the scenes? Multiple sustainability advocates are helping clear a path for a circular economy for plastic, including the three of us. Feel free to contact any of us.



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