



## Confused by the terms Biodegradable & Biobased

Many are confused by the terms “biodegradable” and “biobased”. While both incorporate the phrase “*bio*”, **they do not mean the same thing and can not be used interchangeably.**

The fact is that not all materials, which come from renewable or biobased feedstocks are biodegradable. Manufacturers and others need to use the appropriate ASTM Tests to pinpoint the percentage of a product which comes from biobased resources. Also, they need to use the correct ASTM Specifications to determine if they are biodegradable or compostable.

### Here is why

Words, like *biobased* and *renewable* refer to the sources of the raw materials for products. Wood, corn, soybeans and grasses are all forms of renewable or biobased feedstocks. The agricultural crops like corn and soybeans are harvested every year and are **annually renewable**. Through photosynthesis, they convert the energy from the sun into carbon chains, which can be processed into products, such as plastics and paper. These feedstocks “renew” themselves on a predictable timeframe, ranging from annually in the case of grains or grasses to as long as a human lifespan, when talking about lumber from sustainably managed forests. Think of these products as **biologically** based.

The American Society for Testing and Materials (ASTM) defines a biobased material as *a material is an organic material in which carbon is derived from a renewable resource via biological processes. Biobased materials include all plant and animal mass derived from CO<sub>2</sub> recently fixed via photosynthesis, per definition of a renewable resource.*

Today, the US Department of Agriculture, manufacturers and packagers are trying to increase the usage of biobased products, as a way of reducing North America’s dependence

on oil and gas from overseas sources. Just because a product is labeled “biobased” or contains “renewable resources” does not mean that it is based entirely on renewable resources. Rather, many of these products combine both petroleum based materials with naturally based ones, in order to provide the properties that consumers desire. And at the same time reducing the overall amount of synthetic polymers contained in the product.

Today, the USDA is defining the percentage of a product that is needed in order to carry the term “biobased”. *ASTM D6866 “Standard Test Methods for Determining the Biobased Content of Natural Range Materials Using Radiocarbon and Isotope Ratio Mass Spectrometry Analysis”* is a test method which accurately determines the percentage of the product that comes from renewable resources. Consumers and users should ask suppliers to provide the necessary information in order to be able to understand the amount of materials that come from naturally based feedstocks. Conversely, both oil and gas are considered a “non-renewable” resource, as they do not readily replenish themselves.

### Does Biobased equal Biodegradable- NO!

A product that contains 100% annually renewable raw materials MAY or MAY NOT be biodegradable/compostable. It all depends on the molecular structure of the material itself. You need to ask the supplier if he has tested the products for biodegradability and compostability according to ASTM D6400 or ASTM D6868.

## What is a biodegradable material?

It is where under the right conditions the microbes in the environment can break down the material and use it as a food source.

Biodegradation is a process that can take place in many environments including soils, compost sites, water treatment facilities, in marine environments and even in the human body.

This is the process that converts carbon into energy and maintains life. Not all materials are “biodegradable” under all conditions. Some are susceptible to the microbes found in a wastewater treatment plant, while others need the conditions and microbes found in a compost pile or in the soils.

In order for plastics to “biodegrade” they go through a 2 step process. First the long polymer chains are shortened or “cut” at the carbon-carbon bonds. This process can be started by heat, moisture, microbial enzymes, or other environmental conditions, depending upon the polymer. This is called “degradation” and you know it is taking place because the plastics become weak and easily fragment. This first step IS NOT a sign of biodegradation! See Figure 1 below.

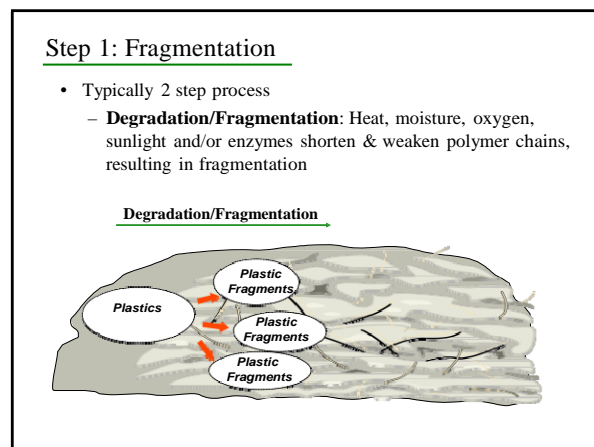


Figure 1

The second step takes place when the shorter carbon chains pass through the cell walls of the microbes and used as an energy source. This is biodegradation-when the carbon chains are used as a food source and are converted into

water, biomass, carbon dioxide or methane (depending upon process takes place under aerobic or anaerobic conditions). See Figure 2 below.

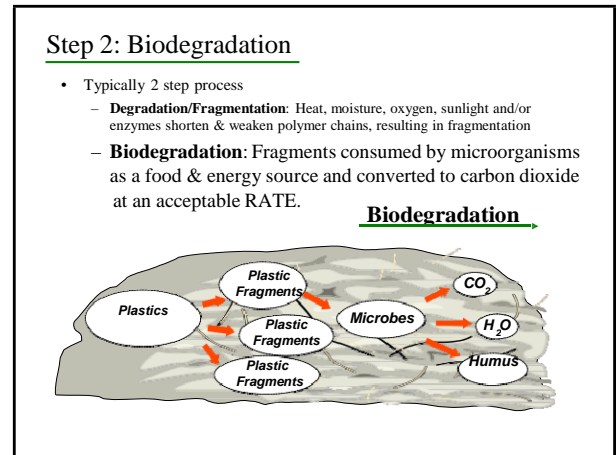


Figure 2

If you think of a long string of popcorn on a thread as a “plastic polymer” chain, then step one (fragmentation) is when the thread is cut randomly between the popcorn kernels and you have a shorter chains of popcorn. The second step “biodegradation”, occurs get short enough for you to eat the popcorn and use it as a food.

## What is a compostable material?

When the products are designed to be composted, they should meet ASTM Standards D6400 (for Compostable Plastics) or ASTM D6868 (for Compostable Packaging). Products that meet the requirements in these two specifications will

- Disintegrate Rapidly During the composting process (so that there are no large plastic fragments will wind up on the composters screens when the process is finished)
- Biodegrade quickly under the composting conditions.
- Not reduce the value or utility of the finished compost. The humus

manufactured during the composting process will support plant life.

- Not contain high amounts of regulated metals.

How to tell if a product is “compostable”

Today, there are a growing number of products that meet these ASTM D6400 or ASTM D6868. And many of these carry the BPI’s certification symbol. This means that the product has been tested in an approved third party laboratory for conformance to the ASTM Standards. And these results have been confirmed in a independent scientific analysis. You don’t need to rely only on a manufacturer’s claims, anymore.

### **Where confusion exists**

Some consumers and manufacturers believe that just because a material is based on an “renewable resource”, then it must be “biodegradable” and “compostable”. This is not true. Some natural materials do not biodegrade, for example some forms of cellulose are not biodegradable. The only way to know if the material or product is biodegradable or compostable is if it meets the ASTM Specifications D6400 or D6868.

Conversely, people incorrectly believe that materials based on petroleum will not biodegrade or compost. Again this is not the case. Today there are synthetically based plastic resins that will biodegrade and compost, just like paper and yard trimmings. All these materials meet ASTM D6400 and D6868.

A ready source of products that meet the ASTM requirements can find a growing list of products that meet these requirements based on testing in third party labs on the BPI website ([www.bpiworld.org](http://www.bpiworld.org)). These products have supplied their data to independent scientific verification and carry this symbol.

If you have questions, email the BPI at [info@bpiworld.org](mailto:info@bpiworld.org) or visit the website: [www.bpiworld.org](http://www.bpiworld.org)



**COMPOSTABLE**  
IN INDUSTRIAL FACILITIES

Check locally, as these do not exist in many communities. **Not suitable for backyard composting.** CERT # SAMPLE