EUPC
EUROPEAN PLASTICS CONVERTERS

BIOPLASTICS & Biodegradability
Questions & Answers

About EuPC - European Plastics Converters

EuPC is the leading EU-level Trade Association, based in Brussels, representing European Plastics Converting Industry. Its powerful European Plastics Network exists to support the beneficial use of plastics worldwide, especially providing plastics converting companies with a voice in the European Institutions.

EuPC now totals about 51 European Plastics Converting national and European industry associations, it represents close to 50,000 companies, producing over 45 millions tonnes of plastic products every year.

The European plastics industry makes a significant contribution to the welfare in Europe by enabling innovation, creating quality of life to citizens and facilitating resource efficiency and climate protection. More than 1.6 million people are working in about 50,000 companies (mainly small and medium sized companies in the converting sector) to create a turnover in excess of 280 billion € per year.

BIOPLASTICS & Biodegradibility
Questions & Answers

This document seeks to answer the most frequently asked questions on a topic which is and will be more and more significant for the plastics converting industry in Europe.

As the representative of the plastics converting industry, EuPC looks at these relatively new raw materials with great interest.

"**Bioplastics**" are generally considered to be a form of plastics derived from natural resources such as wood (cellulose), vegetable oils, sugar or starch.

1. What are bioplastics?

In the minds of many stakeholders the collective term 'bioplastics' is used to describe two different concepts at the same time, often leading to confusion. These two concepts are:

- Functionality , i.e. plastics which are biodegradable/ compostable;
- Material source, i.e. renewable resource-based or biomass -based plastics.

Lately the term 'bioplastics' has almost replaced the term 'biodegradable plastics'. Bioplastics are now generally understood to be either:

- Plastics made from renewable raw materials (converted to biodegradable or non-biodegradable products) or
- Biodegradable plastics made of either renewable or fossil raw materials.

2. Is there an officially recognized standard?

A European-accepted testing scheme (EN 13432) exists which defines the compostability of plastics. It describes test methods to determine the biodegradation of polymers in the timeframe of industrial composting systems. This standard has been widely accepted not only in the European Union but also in the USA and Asia and it is published by the International Standards Organisation (ISO).

Other standards have been developed for testing materials e.g.:

- The ultimate anaerobic biodegradability of plastic materials in digesting sludge (EN-ISO 14853 – 15985);
- The ultimate aerobic biodegradability in soil by measuring the oxygen demand in a respirometer or the amount of carbon dioxide evolved (EN-ISO 17556:2003);
- The ultimate aerobic biodegradability of plastic materials in an aqueous medium (EN-ISO 14851 - 14852);
- The ultimate anaerobic biodegradation of plastic materials in an aqueous medium (EN-ISO 14853).

Based on the above standards:

- Testing according to EN 13432 (for packaging) or ISO14855 -1 (for plastic materials) and the corresponding product certification assures the compostability in industrial/ municipal composting units based on scientific evidence;
- There are petroleum-based and biomass-based plastics which fulfil the test standard;
- To ensure the fitness for use of the products, many commercial recipes are in fact a mix of both types of polymer. Furthermore petrochemical components in the product are often functionally important for the application.

3. What is biodegradation?

This is a process that describes the mineralization of organic structures by micro-organisms. These micro-organisms convert the bioplastics into carbon dioxide, methane, water and bio-mass.

4. Are all plastics biodegradable?

While most bioplastics are biodegradable, some are not, namely the so-called 'durables'.

A traditional plastic based on fossil resources, such as poly-ethylene, is not biodegradable.

Some modified traditional plastics are sometimes called 'degradable'. For example, they may contain an additive which causes the plastic to degrade under conditions of ultra-violet light and oxygen. These are known as 'photodegradable plastics'.
Others may contain an additive which initiates degradation under specific conditions of temperature and humidity. In this case, the plastic is referred to as 'oxo-degradable plastic' but the degradation process is not initiated by microbial action. This degradation process does not comply with the EN 13432 standard.

5. Is there a difference between biodegradable plastics and compostable plastics?

Biodegradable plastics degrade because of cell-mediated phenomena (micro-organisms, enzymes, fungi, bacteria). A material is biodegradable when the degradation is the result of the action of micro-organisms and the material is ultimately converted to water, carbon dioxide, methane and biomass.

Compostable plastics are degradable because of biological processes occurring during composting and are converted into carbon dioxide, water, and biomass. There are no toxic side-effects like toxic residue for water, soil, plants or living organisms. They conform to EN 13432. Currently these plastics are based on renewable resources.

Please note that not all biodegradable materials are compostable.

6. How does composting work?

Micro-organisms and enzymes such as fungi bacteria can metabolize biodegradable bioplastics:

- The polymer becomes their source of food and energy;
- The micro-organisms then transform the biodegradable plastic product into carbon dioxide, water and biomass.

A certain level of temperature, heat, water and oxygen is required by active micro-organisms and fungi bacteria for efficient and effective biodegradation. A product is compostable according to EN 13432 only when specific conditions (temperature, humidity level, time) are met in the composting system. These conditions are significantly different in home composting than in industrial/municipal facilities. As a result, many products which meet EN13432 in industrial/ commercial composting facilities will not do so in home composters.

7. What are the raw materials?

Biomass-based plastics are derived from renewable resources. Presently, the most common raw materials used in the production of biomass-based plastics are corn, starch and potatoes.

But sugar cane or other types of renewable raw materials, including the biomass fraction present in waste (from households, municipal waste, dairy industry, paper mills, forestry, etc.) can be used. These raw materials are then converted into plastics in a production unit.

But some specific types of plastics can even be produced directly by certain plants. Some bioplastics, e.g. those derived from corn grown in North America, are based on genetically modified raw materials. But others are not.

8. How do traditional plastics and bioplastics compare?

Bioplastics perform differently than conventional plastics. They do not have the same performance characteristics but are fit-for-purpose in a range of specific applications.

The most common market for bioplastics today is packaging. Existing applications include biodegradable plastic shopping bags, compostable waste collection bags and compostable or biomass-based food trays and food service packaging. Various applications in other sectors are currently under development especially in the automotive and electronic sectors.

9. What benefits do bioplastics offer the plastics converting industry?

The plastics converting industry supports bioplastics innovation that offers to society and to the plastics value chain a range of additional opportunities including:

- Enlargement of the raw material base, at the right quality and price. This will improve competition;
- Use of existing processing technologies;
- New business fields, including niche products;
- Possible fossil carbon reduction over the life cycle of a product, even when recycling or reuse is not feasible;
- Additional benefits for the function of a product through biodegradability where this attribute is practicable;
- Sales promotion for certain products like organic food packed in compostable packaging.

Bioplastics will gradually find their place in the complex world of the plastics industry. We should push, encourage and support this trend and we must not bring about its failure by unjustly demanding the impossible from them. Our industry is willing to work with different partners to make relevant progress on these new challenges. Innovation and diversity are our key strengths and bioplastics offer us new opportunities to demonstrate these to our customers.

10. The consumption of bioplastics in the EU

An economic perspective of bioplastics shows:

- An estimated current market of approx. 110,000 tonnes annually;
- A high growth rate;
- A high investment in research, larger production facilities and new jobs;
- A decreased dependence on fossil feedstock (security of supply, fluctuation of price);
- A very high consumer acceptance (proved by market studies).

11. What are the recycling possibilities?

Biodegradable plastics can be recycled but should not be mixed with traditional plastics. Incompatibility among various different types of bioplastics may require them to be sorted by type before being recycled.

They can also be recycled through biological processes (e.g. composting).

Many studies show that under economic and ecological aspects, there is no general 'best recycling process' for plastics – the same applies to bioplastics as with traditional plastics.

12. Role of agriculture

Bioplastics offer new potentials for the agriculture industry:

- Agricultural feedstock (renewable resources) play an important role in manufacturing bioplastics;
- Bioplastic products find meaningful application areas in agriculture;
- In addition, agriculture obtains a totally new non-food market for its products.

How much land is necessary?
Depending on the type of plant and type of bioplastics, the biomass required for approximately 2 tons of bioplastics can be grown on each hectare. The surface potential depends on the market development.

It has to be noted that there are public concerns about food crops being diverted to non-food applications including bioplastics. It will therefore be important for the agricultural and polymer industries to ensure a well managed and balanced usage of agricultural land.

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