Biodegradable plastics fact sheet

Version July 2017

Key elements

- Biodegradable polymers can be made from both renewable and/or fossil resources

- Biodegradable plastics provide unique properties in specific applications and can offer certain additional advantages during use and/or waste management

- Similar to other plastics, biodegradable plastics are suitable for several recovery options when such products come to its end of life

- Biodegradable plastics can be composted and/or digested anaerobically, additionally to material recovery (= recycling) and to energy recovery

- Improved awareness and education on the proper use and waste management of all plastics including bio-degradable plastics should be supported and promoted.

Characteristics of biodegradable plastics

The aim of the European plastics manufacturing industry is to provide sustainable products for every application by taking account of the whole life cycle. Thereby product functionality as well as product safety is continuously optimized and, in addition, contributions for solutions of an eco-efficient recovery at the end of life shall be provided.

The European plastics manufacturing industry assumes its product responsibility and offers its expertise and willingness to any issue associated with biodegradable plastics.

- **Production, application and usage**

Most commercial biodegradable plastics are currently based on polymers of bio-based and/or fossil origin.

Biodegradable plastics are developed for specific applications which offer certain additional advantages during use and/or recovery.

This can be demonstrated by some typical examples:

- Biodegradable plastics can be used as biodegradable kitchen-waste bags for the collection of food waste, which can be composted together with its biodegradable content. This simplifies and makes separate collection of food waste more effective providing a hygienic solution and ease of handling for its recovery[1].

- In agriculture, they can be used as e.g. mulch films, which completely biodegrade in the soil while functioning as a soil conditioner, leaving biomass. Mulch-films assist in the growth of plants by minimizing water loss and use of fertilizers/pesticides and also have a positive effect on weed control. The usage of biodegradable films eliminates the need for mechanical removal and thus damage to plants is avoided. After their use, biodegradable mulch films can be ploughed back into the soil where they biodegrade[2].

- **Waste management**

At first instance, end-user waste should have to be recovered rather than landfilled. Generally, plastics waste as part of municipal solid waste streams needs to be recovered eco-efficiently. Biodegradable plastics waste is mainly treated by composting (aerobic degradation) or digestion (anaerobic degradation).

[1] European Standard EN 13432 on „Requirements for packaging recoverable through composting and biodegradation – Test scheme and evaluation criteria for the final acceptance of packaging“

[2] A European Standrad EN 17033 is expected in 2017 which will specify requirements

In addition biodegradable plastic waste can be treated through mechanical recycling, feedstock recycling and energy recovery. In other words, recovery options should be accessible and considered in order to achieve an ecologically sensible and economically feasible, i.e. eco-efficient, use of the biodegradable plastics waste stream.

Separate collection is an adequate mean to provide clean streams of those plastic waste which are collected for recycling; biodegradable plastics should be properly managed within the waste infrastructure for collection and treatment.

Biological treatment together with bio-waste is a sensible option when a consistent use of biodegradable plastics is possible such as in the example of compostable kitchen-waste bags explained above. Like other plastics waste, biodegradable plastics waste can be recycled or reworked by the converter: When post-consumer plastics waste does not fulfil such quality criteria, other recovery routes must be considered.

Education and information about proper use of plastics is important. Correct information about plastic waste management and the importance of separate collection to achieve the best efficiency in recycling have to be emphasized in any communication program. This should be supported by the respective stakeholders by the administration and in the value chain.

- **Standardization and certification**

Biological treatment, e.g. composting or digestion, is an important recovery route for the management of biodegradable plastics waste. International standardization institutes have developed, or are in the process of developing, standard test methods to confirm the biodegradability or the compostability of materials and of products (e.g. EN 13432 for compostable packaging). In this context, concepts for characterization, labelling and identification are being developed.

Biodegradable plastics meet stringent standards with regards to their complete biodegradability, compost quality and product safety. Conformity with a standard can be declared by self-assessment or by third party certification.

The European plastics manufacturing industry is of the opinion that both biodegradable materials and the resulting compost product should comply with appropriate standards.

PlasticsEurope represents the polymer-producing industry at European level. Its membership today includes more than 100 companies producing over 90 % of all polymers across the EU28 member states plus Norway, Switzerland and Turkey. Combined with the European polymer converting industry – represented by EuPC and the machinery manufacturers – represented by EUROMAP, the plastics industry represents a major contributor to Europe’s economic strength employing more than 1.45 million people in about 62.000 companies to create a turnover in excess of 350 bn EUR per year.

Glossary: Terms and definitions

1) Degradation

Irreversible modification of initial properties caused by breaking chemical bonds of the macromolecules which degrade or disintegrate a polymeric material; independently of the mechanism of such a breaking **[ref. CEN TR 15351]**

- A “degradable plastic”[3] is a material designed to undergo a significant change in its chemical structure under specific environmental conditions. The resulting loss of material properties can be measured by standard test methods. This position paper refers to biodegradable plastics only and not to degradable plastics.

- When degradation is caused by biological activity, especially by enzymatic action, it is called “biodegradation”[4] .If the biodegradation process is sufficient to mineralise organic matter into carbon dioxide (aerobic) or methane (anaerobic), water and biomass, the material is termed “biodegradable”. A material is “compostable” when it is biodegradable under composting conditions.

2) Biodegradable in different environments (e.g. soil, water, …)

The “biodegradability” of plastics is dependent on the chemical structure of the material, on the constitution of the final product and the conditions of degradation, but not on the resources used for its production. Biodegradability is determined both scientifically and technically; therefore, no distinction should be made based on the source of the raw material used in their manufacture.

According to the European standardisation EN 13432, biodegradable and compostable packaging wastes are only applicable for industrial composting, leaving an open space with regard to standardization for home compostability and biodegradation in other environments, like soil, fresh water and marine water.

3) Biodegradable plastics in composting – equal to compostable plastics

Industrial compostability is defined and regulated by recognized international standards: ISO 17088, EN 13432. EN 14995, ASTM D6400 and GreenPla.

[3] Definition ISO/CD 15315
[4] Definition ISO/CD 16929

Accordingly, with these standards, a compostable material:

- is biodegradable in composting;

- completely dissolves in the treatment process; it does not release heavy metals into the compost which is produced at the end of the process;

Note 1)
Plastics which undergoes a degradation through a biological process through a composting process producing carbon dioxide, water, inorganic products and biomass, at a reaction rate similar to the one of other known compostable materials: the process has not to leave any visible and toxic residue**. [ISO 17088]**

Note 2)
The goods made by compostable materials cannot be automatically defined compostable. The use of other substances in final goods (e.g. dyestuffs) and also the thickness and the form of final goods could require additional analysis to find out whether the plastic good could be eventually defined as compostable.

- **Composting**
  Aerobic process for the production of compost **[ISO 17088]**

- **Compost**
  Organic amendments or soil improvers which are obtained through a biodegradation of a mixture of vegetable residues and of other organic materials with a limited amount of minerals. **[ISO 17088]**

- **Anaerobic Digestion**
  Enzymatic reaction, where the substrate is digested by biological activity.

- **Mineralization**
  The breakdown of a chemical substance or organic matter by microorganisms in the presence of oxygen to carbon dioxide, water and mineral salts of any other elements present. **[OECD** Test No. 309]