Avery Dennison®

Compostable and Biodegradable materials

Frequently Asked Questions

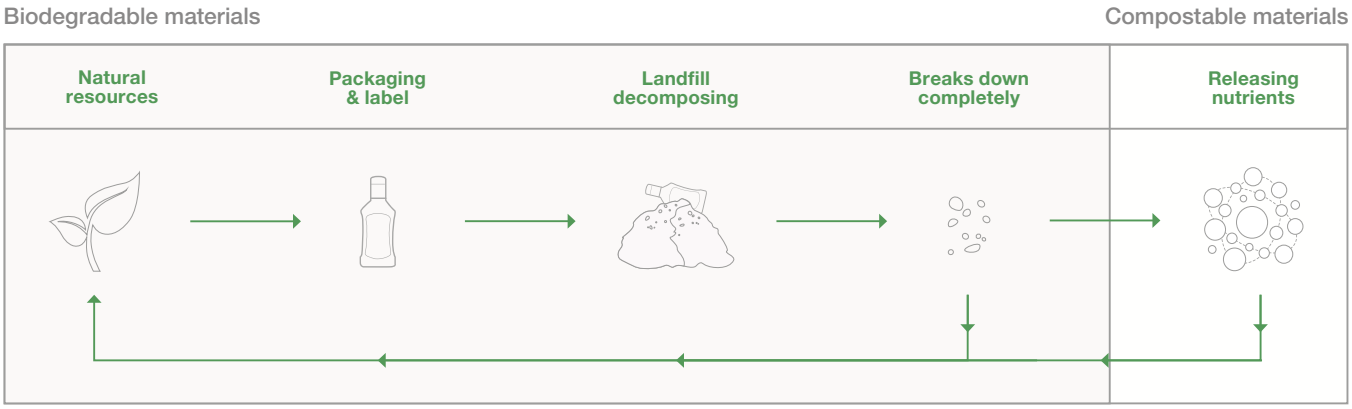
Terms such as 'biodegradable' and 'compostable' are often used loosely, when in fact they have very precise meanings. This guide highlights the differences and explains what can be used in different applications.

Q What's the difference between biodegradable and compostable materials?

A A biodegradable material is defined as one that will completely break down and return to nature within a reasonably short period of time after customary disposal. Biodegradable packaging products must break down completely, and decompose into natural elements, reasonably soon after disposal (typically a year or less). Within landfill sites, this helps to reduce waste buildup and contributes to a safer, cleaner and healthier environment.

Compostable materials are similar, in that they are also designed to return to the earth safely. However, they go one step further by releasing actual nutrients and becoming usable compost (for example, soil-conditioning material or mulch) after breaking down. These materials are designed to be added to industrial or home compost piles (industrial has specific conditions including for example a control of humidity and temperature). For a material to be compostable, it should break down into usable compost in approximately the same time as the materials with which it is composted.

Biodegradable materials break down within landfills, whereas compostable materials require special composting conditions. Of course there is a lot more to understand in terms of different types of degradability, as explored below.



Q Can you give some examples of biodegradable and compostable materials?

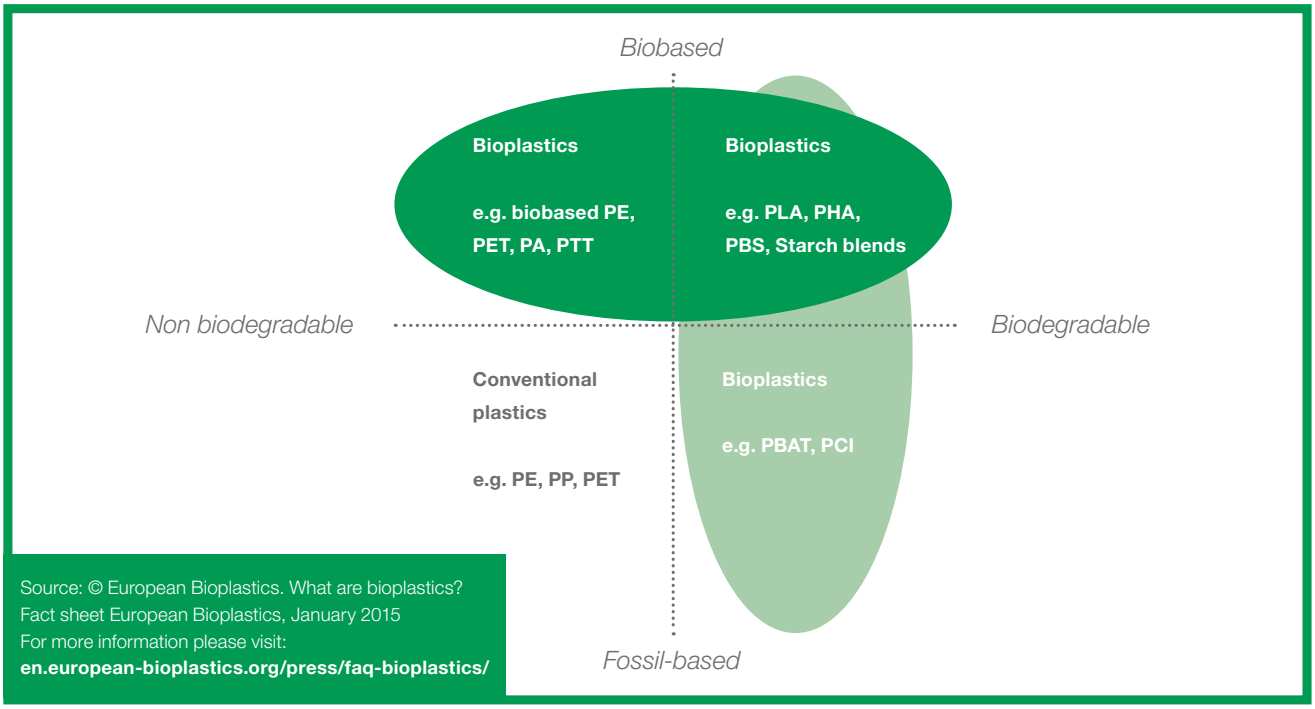
A Biodegradable materials include corrugated cardboard and a limited number of plastics. Compostable plastic packaging materials from Avery Dennison include starch or cellulose based products such as PLA or Natureflex. Most plastics are not biodegradable, and remain on the planet as waste for decades.

Q What are the main applications?

A Fresh food packaging is the dominant segment for biodegradable and compostable materials, where compliant labelling allows packaging to be disposed of in its entirety, including any food that might remain inside the packaging. The main applications involve fruit and vegetables, but also the compostable bags used to self-weigh produce in the supermarket. Increasingly, compostable materials are being used for agricultural munching film. Packaging for coffee capsules is also being explored actively. Cost has been an issue in the food segment, and one of the benefits of Avery Dennison's S9500N adhesive is that it reduces the price of biodegradable and compostable labelling materials significantly.

Q What is bio-based plastic?

A Bioplastics are defined as plastics made from renewable biomass sources. These sources include corn starch, fats and oils from crops and microorganisms. Agricultural by-products such as sugar-cane waste can also be used. This contrasts with conventional plastics, which are made from fossil resources (and which are typically less sustainable). A plastic such as polyethylene can be a conventional plastic or a bioplastic depending on how it is sourced. Note that not all bioplastics are also biodegradable, an example is the bio-based Avery Dennison PE85 material. Unlike polyethylene (PE), the longer-chain polypropylene (PP) is not yet available from biosourced materials, because of higher costs.



Source: © European Bioplastics. What are bioplastics? Fact sheet European Bioplastics, January 2015
For more information please visit:
en.european-bioplastics.org/press/faq-bioplastics/

Q What determines if a product is compostable?

A To ensure common criteria across Europe, there is a harmonized standard for compostable and biodegradable packaging (EN 13432:2000). "Packaging: requirements for packaging recoverable through composting and biodegradation" was introduced by the EU in 2000, following the EU Directive on Packaging and Packaging Waste (94/62/EC).

The standard focuses on compostability and anaerobic digestibility, and includes a range of criteria such as disintegration after 12 weeks, extent of microbial conversion, adverse effects on composting, heavy metal content and impacts on overall compost chemistry such as pH. Independent laboratory tests are used to assess strict pass/fail limits, and materials must pass every test category to be proved 'compostable'. (1)

(1) Source: http://www.bpf.co.uk/topics/standards_for_compostability.aspx

Similar standards include:

> American Society for Testing and Materials	ASTM-6400-99
> International Standards Organization	ISO14855 (only for biodegradation)
> German Institute for Standardization	DIN V49000

The ASTM, EN and DIN standards specify the criteria for biodegradation, disintegration and eco-toxicity for a plastic to be called industrial compostable.

> Biodegradability is determined by measuring the amount of CO_2 produced over a certain time period by the biodegrading plastic. The standards require 60% conversion of carbon into carbon dioxide within 180 days for resins made from single polymer and 90% conversion of carbon into carbon dioxide for co-polymers or polymer mixes.
> Disintegration is measured by sieving the material to determine the biodegraded size and less than 10% should remain on a 2mm screen within 120 days.
> Eco toxicity is measured by having concentrations of heavy metals below the limits set by the standards and by testing plant growth by mixing the compost with soil in different concentrations and comparing it with controlled compost.

Q What are other important factors for composting?

A How quickly different biocompostables degrade depends on their composition, the thickness of the material and the composting conditions used. In commercial composting facilities, materials are ground up, and the piles of materials are turned. High temperatures reduce the time needed to compost. Home composting is slower, and depends on how often the materials are turned as well as on materials involved and temperatures reached. Label converters also need to know about the impact of printing ink on compostability, and Avery Dennison regularly supports converters in making compliant ink choices for particular applications.

Q What is the difference between 'compostable' and 'home compostable'?

A The majority of compostable materials are designed to be composted at industrial facilities, where the process of breaking down the material is much faster. There are not yet any specific international standards for 'home compostable' packaging or plastics, but schemes such as the Belgian 'OK Compost Home' are emerging. Test temperatures and durations are different to the mainstream compostable criteria. Unless a material specifically claims 'home compostable', it is designed for industrial composting.

	Industrial Composting: EN 13432	Home Composting: Vincotte Certification Programme
Biodegradation	Test performed at 58°C +/- 2°C, carbon dioxide at least 90% compared with control within 6 months (approx 182 days)	Test performed at ambient temperature (20 - 30°C), carbon dioxide at least 90% compared with control within 365 days
Disintegration	Test performed at whatever temperatures are achieved in vessels, each at least 140 litre capacity. At maximum of 12 weeks (approx 84 days) no more than 10% of original dry weight of test material > 2mm.	Test performed at 20 - 30°C in vessels each at least 140 litre capacity. At maximum of 26 weeks (182 days) no more than 10% of original dry weight of test material > 2mm.

Q What are the steps towards certification?

A Independent certification bodies offer product assessment and certification services, using appropriate laboratories. If a material passes all EN 13432 tests, a unique packaging product 7P certification number and certificate are awarded, and the product can carry the 'compostable' seedling logo (which is licensed to certifying bodies by European Bioplastics). A certificate lasts for three years, and then must be renewed. Samples of the packaging can also be requested by a certification body to check that standards are being maintained.

In the case of packaging, all of the components have to be tested including colorants, intermediate materials and printing inks. Note that some certification bodies such as Din Certco and Vincotte offer a 'positive list' of materials, intermediates and additives to aid the design of compostable packaging products.

A list of certification institutes can be found on the website of OK Compost:

http://www.okcompost.be/data/pdf-document/okc-labe.pdf

Q What are the certificates available for composting?

A After obtaining positive results for testing against EN 13432, companies can apply to use the following logos in home and industrial applications:

Industrial	Home
OK compost VINÇOTTE INDUSTRIAL COMPOSTABLE DIN Geprüft compostable	HOME OK compost VINÇOTTE HOME COMPOSTABLE DIN Geprüft

Q How much does certification cost?

A There are many variables to consider for testing against EN13432 and all independent test facilities have different rates for testing biodegradation, disintegration and eco-toxicity. A rough indication for cost is around €10k - €15k for testing, along with a €1.5k fee for the 3-year certificate. These costs are for each individual material rather than product group - so a change of facestock, for example, will require new tests.

Q What labels do you have available with a OK Compost certificate?

A Avery Dennison has obtained the EN13432 for MC Primecoat FSC and Thermal Eco BPA Free, in combination with the S9500N adhesive ('OK Compost' is pending).

Q How does printing impact the composting?

A The various components that make up a printing ink will, potentially, not be compostable. The OK Compost certificate always specifies levels of use for certified inks. Any non-certified inks have to undergo checks for heavy metals and/or ecotoxicity, because all additives and printing inks can combine to give unacceptable overall levels. In general, low migration water-based inks should be used. The Vincotte website publishes a list of OK Compost certified materials [1], including printing inks. Suppliers of OK Compost certified inks can provide additional guidance, including advice on ink colours (for example, red may give different results to yellow).

For end-users requiring OK Compost certified packaging, a test against EN13432 needs to be conducted with the final packaging and printed label (all components making up the packaging). If the packaging and other components are already certified, as is the case with some Avery Dennison materials, it may be that only disintegration testing is required. This substantially reduced the time and costs of certification.

Q How big is the market?

A The 2016 European Bioplastics market update shows rapid growth in many applications for biobased and biodegradable plastics. They estimate that total production of biodegradable bioplastics will rise from over 900,000 tonnes in 2016 to more than 1.2 million tonnes in 2021. [2] Consumer pressure for more sustainable materials is likely to continue, and a key focus for Avery Dennison is providing materials that convert well and offer parity of performance in applications.

A 2015 report from the Foodservice Packaging Institute (FPI) described sustainability as driving foodservice packaging. President Lynn Dyer cited 'the overwhelming number of mentions related to compostable packaging'. Changes in national regulations are also a driver for increased adoption – for example, the ban on disposable point-of-sale plastic carrier bags in France, which took effect in July 2016. [3]

Q How much material is allowed to remain intact after composting?

A More than 90% of a material has to break down into pieces smaller than 2mm for it to pass the disintegration test and be considered compostable. Final chemical breakdown of materials into CO_2, water and minerals should also be greater than 90% within 6 months. The reason for strict requirements is obvious – if there was too much plastic contamination remaining in compost, and this compost was used in a garden each year, the level of contamination would gradually build up as the organic matter biodegraded further, leaving plastic behind.

Q Does composting create greenhouse gases?

A Industrial composting facilities use carefully controlled, aerobic conditions to avoid methane production (methane is an important greenhouse gas), and there may be reductions in CO_2 emissions with the use of some bioplastics. As with all measurements of sustainability, however, a proper life cycle assessment is needed to understand the performance of a particular material.

(1) Source: http://www.okcompost.be/data/pdf-document/okc-mate.pdf
(2) Source: http://www.european-bioplastics.org/bioplastics/materials/biodegradable/
(3) Source: http://www.foodbev.com/news/compostable-packagings-overwhelming-number-of-mentions-in-new-foodservice-packaging-report/

Q What are oxo-degradable materials?

A Plastics described as ‘oxo-degradable‘ or ‘oxo-biodegradable’ use conventional plastics (often polyethylene) along with additives that mimic biodegradation. In fact, such a material simply breaks down into smaller particles, and so waste stays in the environment. These plastics do not meet compostability standards and are not considered to be bioplastics. Oxo-degradable plastics have the additional drawback that they can contaminate a conventional plastic waste stream, and cause problems for recycling companies.

> Contact us for more information on Compostable Adhesives

Sources:

> British Plastics Federation
> Foodservice Packaging Institute (as reported in Foodbev Media)
> European Bioplastics

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