

For compostable materials several norms are existing; for example in Europe EN 13432, in the USA ASTM D 6400 and in Australia AS 4736.

The basic requirements of these norms are similar, but there are small differences in the test and sometimes additional tests are required (in Australia for example an additional Earth Worm test).

The norm EN 13432 requires to test the following key parameters:

1. Biodegradation:

Biodegradation means that the organic material is completely decomposed into CO₂, biomaterial and water under the test conditions. Typically biodegradation is tested under aerobic conditions according ISO 14855:1999, ISO 14851:1999 or ISO 14852:1999. The biodegradation must be tested for each relevant organic part which exceeds 1 % dry weight in a packaging material. The sum of all parts of the packaging material for which the biodegradation criteria must not be fulfilled is limited to 5 % dry weight.

The aerobic test requires that within 6 month more than 90 % of the organic C must be degraded into CO₂ or bio material.

2. Disintegration:

Disintegration means that the material is decomposed into small pieces. After 5 weeks 90 % dry weight or the original material must be disintegrated in pieces smaller than 2 mm.

3. Chemical characterisation:

The amount of the following elements is limited in compostable materials: Zn, Cu, Ni, Cd, Pb, Hg, Cr, Mo, Se, As and F. Some compostable labels require additional tests like AOX or some other organic substances.

4. Ecotoxicity

Ecotoxicity is measured by the rate of germination and growth of two plants (usually cress and summer barley). The germination rate and growth of the plants in a standard compost and compost which has been contaminated with the test material are compared. The germination rate and the biomass of the grown plants in the contaminated compost must be higher than 90 % compared to the standard compost.

In Europe typically two composting labels are used - the "Seedling" label and the "OK Compost" label. The "OK Compost" label is also existing in an "OK Home Compost" version.

Many compostable materials (for example PLA) are fulfilling the criteria only under the conditions of an industrial composting plant. They usually require temperatures of about 60 °C during the process. Such conditions cannot be reached in nature or in a private composting system. For materials which are also decomposing under normal conditions the "OK Home Compost" label can be used (for example cellulose based packaging films).

Certified compostable materials may contain up to 5 % dry weight in sum of components which are not biodegradable. Each individual non-biodegradable component is limited to 1 % dry weight of the material. Such components in a packaging material can be for example adhesives, inks, closing systems etc. Independent on the missing biodegradation of such components all the other criteria (disintegration, chemical characterisation, ecotoxicity) must be fulfilled however.

Dry printing ink layers usually contain about 30-50 % organic pigments. As such pigments under normal conditions need to be resistant to many environmental conditions they are considered to be not biodegradable. Hence, dry ink film layers will most likely not fulfil the criteria of 90 % aerobic biodegradation of the organic material. Printing ink layers are considered as a typical non-biodegradable component in a printed compostable packaging material. Each ink layer is considered as one component.

If a 50 g/m² compostable film is printed with CMYK and each colour is applied with 0,4 g/m dry, than each colour is applied with 0,8 % (less than the 1 % limit) and the total ink amount is 1,6 g/m², or 3,2 % dry weight. If there is no additional non- biodegradable component present (for example adhesive) than the printed material can be considered to be compostable. However, if there is additional a white ink layer printed with 1 g/m² dry the total ink amount is 2,6 g/m² or 5,2 % dry weight, i.e. exceeding the 5 % limit for the sum of all non-biodegradable components and the printed materials is not compliant with the criteria of the EN 13432.

Due to the very thin ink layer thickness the disintegration of a compostable material is not affected by the ink layer and also the elements limits and the ecotoxicity tests can be passed if the correct inks are used.

To get a printed compostable material certified with the “Seedling” or “OK Compost” label several options are possible.

- The final printed and converted packaging material can be tested according all criteria's No 1-4. However, this process is expensive, time consuming and needs to be done for each printed design (different chemical composition due to different print designs).
- The packaging material can be produced with certified components. This option requires only one-time testing of each component and is much faster and cost effective.

For option 2 the used certified components must be declared with their test number and the printer must demonstrate that existing limits (for example the 1 % dry weight and 5 % dry weight sum limit for non-biodegradable components) are kept. Some inks may have lower limits than the 1 % for example due to the amount of some limited elements (some elements have much lower limits in compostable materials compared to other food packaging applications).

In order to enable our customers to use this second way to certify their printed material Flint Group will declare the ink composition based on the certified compostable tool box components.

Printing inks are considered in the compostable programs for the “Seedling” and “OK Compost” label as “non-biodegradable additive”. Disintegration, chemical composition and the ecotoxicity of the contaminated compost has been tested. The low limit for Cu cannot be fulfilled with normal cyan and green inks. A special Cu-free blue pigment must be used and green must be mixed with this special blue and yellow, which limits the available shade.

Flint Group can offer solvent based printing inks tested according the “Seedling” and the “OK Compost” label for flexo and gravure printing which are suitable on a wide variety of compostable packaging films and applications.



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