INK, HEART & SOUL

PRODUCT SAFETY TRANSPARENCY by SIEGWERK

SIEGWERK

Customer Information[1]

Suitability of Siegwerk printing inks for the production of compostable packaging

1. Suitability of printing inks within the present regulatory frame

Under European regulations[2], packaging can only be claimed as compostable and biodegradable when certified in accordance with the criteria of the European standard

EN 13432[3].

This standard covers packaging as a whole. Consequently, printing inks are treated as constituents that cannot be claimed *per se* as compostable. Therefore, "compostability" in relation to printing inks for packaging has in any case to be seen in conjunction with the compostability of the substrate. Any reference to "compostable printing inks" isolated from the combination with the packaging material is therefore meaningless under existing regulations.

In fact, the compostability of printed packaging largely depends on the properties of the substrate. Printing ink layers are very thin (1 to max. 5 µm) and account for only 0,5 to a maximum of 3% of the packaging by weight. With regard to printed layers the principal requirements for compostable packaging - biodegradation, disintegration and compost quality - can be achieved by using selected ink series and ink shades.

Consequently, as a rule, current printing ink technologies and product families are eligible for the production of printed compostable packaging. Under existing regulations, a fundamentally new formulation of printing inks, comprising of biodegradable and/or natural binders and pigments, does not appear necessary.

2. Requirements for packaging recoverable through composting and biodegradation (EN 13432)

Printed packaging may be certified as compostable under European standard EN 13432 when the following criteria are met:

[1] Applicable in Europe. Based on the customer information „Biologische Abbaubarkeit von Druckfarbenschichten, October 2007, German printing ink industry association VdD, www.vdmi.de.
[2] "Understanding the CEN Standards on Packaging and Environment", Europen, February 2006, www.europen.be.
[3] "Packaging - Requirements for packaging recoverable through composting and biodegradation – Test scheme and evaluation criteria for the final acceptance of packaging", EN 13432, September 2000.

A. General Requirements:

Each individual printed package must comply with the specified heavy metal (arsenic, lead, cadmium, chromium, copper, molybdenum, nickel, mercury, selenium, zinc) and fluorine limit values. Since these limits are quite demanding, not only

the printed layers but all constituents of the packaging need to be controlled with respect to heavy metal and fluorine thresholds. Accordingly, it remains within the printer's responsibility (preferably in cooperation with his customer) to specify the resulting tolerable maximum heavy metal and fluorine thresholds in the printing inks and/or restrict the maximum grammage for the intended prints. These tolerances should be derived from the highest intended mass share of the printed ink layers on the whole packaging. The thicker the substrate and the thinner the ink layer and/or the lower the ink coverage and grammage, the higher are the allowable thresholds in the printing inks.

As an example, vivid green shades made with inks based on copper phthalocyanine pigments or copper-zinc metal based gold inks are likely to conflict with the limit values if the substrate is thin and the surface area of the green/gold prints is high.

B. Selection of printing inks as packaging constituents:

In the selection of printing inks as constituents, the manufacturer of compostable packaging has **two options**:

1. First option: to ask for the development of new ink types that can achieve a certification as "**certified constituent**" by a certified body.

This type of "sub-certification" could qualify the ink to be applied **in unlimited percentage** on the final packaging.

However, to obtain the status of a "certified constituent", defined criteria must be met, and compliance has to be demonstrated by a number of demanding tests. For printing inks, the critical requirement is biodegradability:

- Binders, waxes, plasticizers and additives which are natural or biodegradable are basically available. Thus envisaging a reformulation using a much higher percentage of such raw materials is basically possible.

- However, currently used pigments are not biodegradable. The few biodegradable natural pigments able to meet the criteria are unfortunately not suitable for printing inks. In fact, they fail to match with the market demands e.g. on colour shade and light fastness. Since the pigment content in the dry ink films is high (i.e. 30-40%), and reformulation with biodegradable pigments is not a real option, the pigments interfere with the required dry ink film biodegradation rate of > 90%.

Consequently, market requirements are in conflict with the option "development of certifiable inks". Whilst certifiable inks could be produced using specific raw materials, this would lead to serious disadvantages regarding colour shades, fastness properties and printability.

Note that even if such a certification of a printing ink as constituent had been granted, the final ink/packaging combination would have to be certified nevertheless.

2. Second option: to qualify the printing ink as "**non-certified constituent**".

In this case the specific tests mentioned/required under Option 1, in particular the biodegradability tests do not have to be performed for the printing ink constituent.

However, the following rule applies:

Each constituent has to remain < 1% and the sum of all constituents without certification has to remain < 5%

Example: 50 g/m² biodegradable film, 1 g/m² ink grammage

- solid print of 1 colour shade: the ink part is non compliant with EN 13432, as its share is approximately 2%;
- 49 % ink coverage: the ink part is compliant with EN 13432, as its share remains < 1%
- full-surface process print: the ink part is compliant with EN 13432, as the share of each colour is 0,5% and the sum of the four colours is 2%.

3. Finally, note that the respective printing ink type should be tested for eco-toxicity on the compost in accordance with both tests of EN 13432 chapter 8.2 and Annex E. There must be no relevant negative effects on plant growth.

In essence, it can be stated that a certification of printed packages is practicable on the basis of selecting the option of "non-certified inks", provided that the printing ink has been qualified for the absence of ecotoxicity and the individual printing ink remains restricted to max. 1%. Furthermore, the individual printing inks must be specially selected according to the requirements for heavy metal and fluorine concentrations as described under item A.

3. Conclusion

In support of converters, Siegwerk is able to fine-tune and offer a wide range of printing inks and print solutions which allow the production of packaging certified in accordance with standard EN 13432. Basically, this would cover the field of solvent based inks, water based inks and oleoresinous offset inks[4].

In order to meet maximum concentrations of heavy metals, some compromises in the colour shade have to be accepted for gold, blue and green shades. In fact, as a rule, the normal copper phthalocyanine blue and copper phthalocyanine green pigments and the gold bronzes made of copper/zinc metal must be replaced with less bright substitutes in order to meet the thresholds for copper and zinc.

For further information on specific products please contact your Siegwerk representative.

[4] Due to their particular chemical nature as cross-linked and comparatively thick, plastic-like layers that might conflict with disintegration requirements, it is at present uncertain whether UV and EB cured inks are eligible for production of compostable packaging.