EuPIA statement on compatibility of printing inks in the recycling process

Role of Printing Inks in Packaging

Printing inks[i] serve both decorative and functional roles in packaging.

- Branding and Aesthetics – visual and special effects and brand identity
- Communication and Information – Legibility and compliance information.
- Protection and Preservation – Barrier, abrasion & scratch resistance etc.
- Functional Enhancements – Tactile, grip and anti-slip.

Inks themselves are not directly recycled, but the package that is printed on.
The required ink properties are dependent on the type of substrate (fiber-based, plastic film, glass, metal) on which they are printed. For example, inks should adhere well to films, but they should also be easy to wash off during the recycling process without contaminating the film.

The focus lies then on recycling the printed substrate rather than the ink; the starting point for assessing recyclability is the substrate's compatibility with recycling processes.

The key question is: Do inks affect the recyclability of packaging, and how should they be handled in the recycling process?

What Happens to Inks in the Recycling Process?

The recyclability of different materials — such as paper, plastics, glass, and metals — varies depending on the specific recycling processes required for each substrate. While deinking is important for improving the quality of recycled materials, its role differs across materials and recycling processes.
For instance, glass recycling involves melting, which typically burns off inks, while metal recycling relies on smelting, where inks and coatings are removed at high temperatures. Similarly, the recycling of plastics and paper depends on processes like washing, mechanical separation, and deinking.
These variations highlight that no single recycling approach works for all materials.

A. Recycling Processes for Fibre-Based Packaging

There are three primary recycling methods for fibre-based packaging:

1. Standard Recycling Mills
   - The packaging is repulped, screened, and cleaned, but ink particles are not separated from the fibres. Most cardboard recycling follows this process.
2. Flotation Deinking* Mills
   - Ink particles are separated from the fibres through flotation. This process is common for graphic paper (newspaper, magazines), but plays only a minor role for fibre-based packaging .
3. Specialized Recycling Mills
   - These mills handle complex fibre-based packaging, such as food and beverage cartons or coated paper cups. Ink removal is not part of this process.

**Deinking is the process of separating ink from paper fibres to create clean recycled pulp. This is typically done through a flotation process. Water and additives are used to swell the paper fibers which causes the ink layer to disintegrate into smaller particles. These ink particles are lifted to the surface using air bubbles and then skimmed off. Washing or a combination of both methods may also be used. The European Paper Recycling Council (EPRC), which includes EuPIA, has developed a deinkability scorecard.*

It is important to clarify that a poor deinkability score does not necessarily mean that the printed product in question is non-recyclable. Rather, it indicates that the recycled material may retain more (grey) colour, which can reduce its value and limit its potential applications.
A broader concern with recycling wood pulp is that the fibres degrade with each recycling cycle. After being recycled several times, the fibres may become too short and weak to be reused effectively.
For graphic paper recycling, deinking technologies are widely deployed nowadays.
All inks — whether water-based, solvent-based, or UV, offset, flexo, gravure, screen, or digital printing are fully compatible with the fibre-based recycling processes and do not impede recyclability.

B. Recycling Processes for Plastic Packaging

Currently two primary recycling methods exist:

1. Mechanical separation: Ink is removed through label detachment or washing (common in rigid plastic containers).
2. Incorporation into recyclate: Ink remains in the recycled material (common in flexible packaging).

Effective management of inks in the plastic recycling process is essential for producing high-quality recycled materials.

With rising demand for recycled materials due to the proposed Packaging and Packaging Waste Regulation (PPWR) and increasing consumer pressure on the packaging sector, major cross-industry initiatives have started developing Design-for-Recycling (D4R) Guidelines. These guidelines, which are expected to be referenced in the PPWR, aim to improve the recyclability of plastic packaging. Currently, the D4R testing methodologies for plastic packaging consider only the two above mentioned pathways for inks and coatings during recycling.

Inks designed to facilitate the recycling process are typically:

- easily removable during recycling, preventing contamination of recycled material.
- compatible with deinking technologies and less likely to interfere with plastic reprocessing.

C. Recycling Waste residues

The disposal of deinking material, also known as deinking sludge or residues, is a key part of the recycling process. Deinking material is the byproduct produced during the removal of ink from substrates and typically consists of ink particles, fillers, and coating residues — though a large portion of it is water.
The handling and disposal of deinking sludge depend on local waste regulations and the material's composition. Common disposal methods include landfilling, incineration with energy recovery, composting, or repurposing in industrial applications, such as cement or brick manufacturing.

Relationship Between the EuPIA Exclusion Policy and Recycling

The EuPIA Exclusion Policy (EP) was introduced in 1996 to protect the health and safety of workers in the ink and printing industries, as well as end users of printed materials. It addresses the potential health risks associated with exposure to hazardous substances in both natural and synthetic products to humans. Environmental hazards or risks are not at all in its scope.

While the Exclusion Policy was not designed with recycling in mind and has no direct connection to the recycling process, it indirectly supports recycling efforts by limiting the use of harmful substances.

It needs to be reminded that

- the EP is a voluntary initiative covering over 90% of all printing inks manufactured in Europe
- it does not list any inks, but refers to the exclusion of individual substances which might be used during the manufacturing process
- raw materials excluded by the EP, and which must therefore be avoided in the formulation of printing inks, are those substances or mixtures classified in one or more of the CLP hazard classes/categories listed in the EP[ii]
- a number of explicitly listed substances are excluded for intentional use irrespective of their hazard classification
- environmental hazards or risks are not at all in its scope

Conclusion

Recyclability depends on the entire product, not just the ink. Effective recycling relies on:

- compatibility between inks and substrates
- recycling infrastructure and processes
- collaboration across the value chain.

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[i] *There is no legally binding definition of printing inks, however, the definition developed by the Packaging Ink Joint Industry Taskforce (PIJITF), is widely accepted in the value chain.*
Printing inks are:

a) Mixtures of colourants with other substances which are applied on materials to form a graphic or decorative design together with or without
b) Other coloured or uncoloured overprint varnishes/ coatings or primers which are normally applied in combination with a) in order to enable the printed design to achieve specific functions such as ink adhesion, rub resistance, gloss, slip/friction, durability, etc.

Printing inks do not include coatings which are applied with the prime objective of enabling the material or article to achieve a technical function such as heat sealing, barrier, corrosion resistance etc., as opposed to a graphic effect, even though they may be coloured.

[ii] Ed8_EP_final.pdf