

# End of life of Active and Intelligent Packaging

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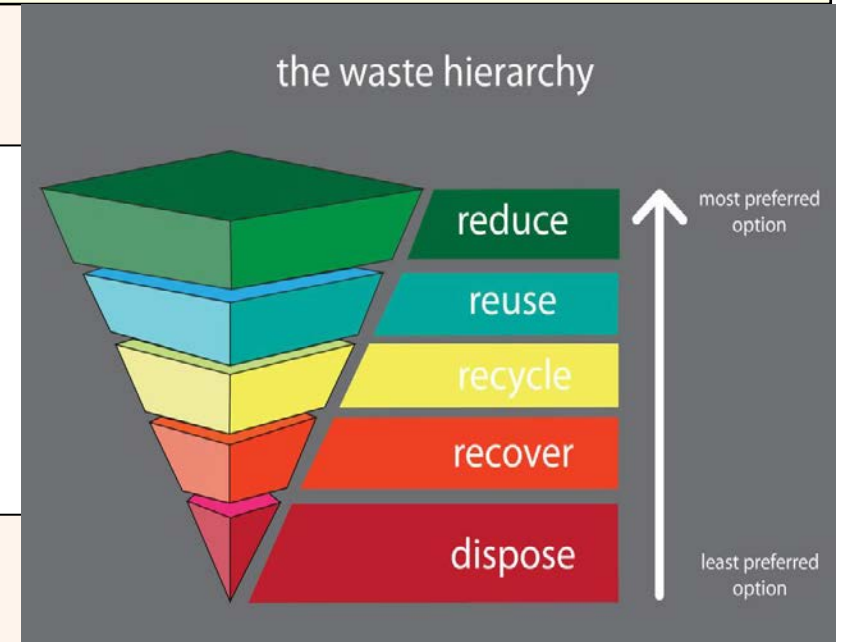
## Introduction

As defined at the Rio conference on climate change a sustainable development shall “meets the needs of the present without compromising the ability of future generations to meet their own needs”.

Sustainable development comprises of three elements - economic, social and environmental - which have to be considered in equal measure during the development of new products. End of life represents a critical factor for environmental sustainability of packaging. The new targets set by the recent revision of the EU Waste Packaging Directive 94/62 as well as the circular economy legislation package pose even more emphasis on extended product responsibility. In this context, also active and intelligent packaging solutions must be developed taking into account their impact on material recyclability and/or organic recyclability (compostability).

## Packaging and Packaging Waste Management

To harmonize national measures concerning the management of packaging and packaging waste and to prevent or reduce its impact on the environment Directive 94/62/EC was adopted. The Directive aims at providing a high level of environmental protection and ensuring the functioning of the internal market by avoiding obstacles to trade and distortion and restriction of competition.



## Material organic recyclability

**EN13432:** Establish general requirements for packaging recoverable through composting and biodegradation:

### • Heavy metals and dangerous substances:

Element	Zn	Cu	Ni	Cd	Pb	Hg	Cr	Mo	Se	As	F
Accepted limits: mg/kg (dry weight of the packaging functional unit)	150	50	25	0.5	50	0.5	50	1	0.75	5	100

### • Biodegradability: pass level 90% within maximum 6 months.

-shall be certified for each significant organic constituent of the packaging material (present at a concentration > 1%, and the total proportion of organic constituents without determined biodegradability shall not exceed 5%.

### • Disintegration in composting process. >90% in 3 months

### • Ecotoxicity: absence of any ecotoxicity effects of the final compost.

### European Compostability labels:

-DIN-CERTCO (D, UK, P, CH, Australia): EN 13432, ASTM D6200, AS 4736

- VINCOTTE – TÜV (Austria): EN 13432 – OK Compost

### Non European Compostability labels (example):

-BPI (Biodegradable Products Institute-United States):

ASTM D6400- D6868 Partnership

## Material recyclability

**EN 13430:** Establish general requirements for packaging recyclability

### Voluntary Environmental Certification Schemes

-Environmental Labels, ISO 14024 (e.g. Ecolabel, Blaue Engel) AND

-Business to Business Self Declaration, ISO 14021 Type II

Require supporting documents to prove recyclability

### Criteria for Good Paper Based Packaging Recyclability:

- Good repulpability in water
- Low amount of non-paper components (low waste rejects)
- Low sticky potential (adhesives removability)

### Methods for Paper Packaging Recyclability assessment:

No international standard, few methods available:

- PTS-RH021/97 – Germany
- Ecopaperloop method 1/2014 - Italy, Germany, Slovenia, Hungary
- Aticelca Method MC 501/17- Italy



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## Which are the problems that the producers of the new packaging solutions have to solve?

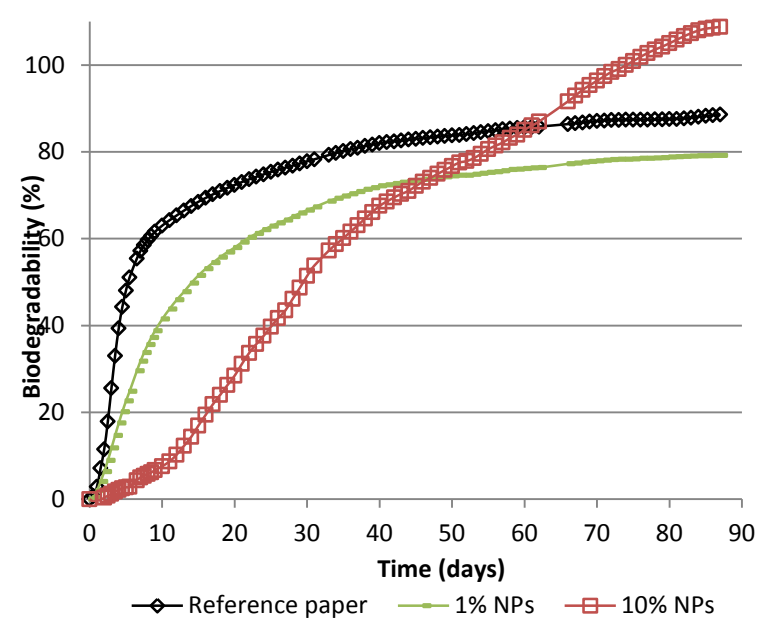
### Compostability:

A&I packaging must be analyzed case by case to understand whether it is possible to comply with composting standard

### Question to answer:

- is it possible to separate the A&I part of the packaging?
- what is the % of non biodegradable part?
- May the active molecules affect biodegradability behaviour?

We studied few cases of biodegradability of packaging containing active nanoparticles:



Biodegradability behaviour maybe function of type and concentration of NPs. The presence of active ingredients do not necessarily prevent the biodegradation of the material, however it shall be studied case by case before drawing any conclusion.

### Recyclability

A&I packaging solutions must be analyzed case by case to understand which is the effect on quality of paper for recycling.

### Question to answer:

- is it possible to separate/sort the non paper A&I part of the packaging?
- Does A&I packaging affect the repulpability or sticky particles behaviour?
- May A&I lower the quality of the recovered fibers?

## Communication to the end users how to dispose

In every country, one of the greatest challenge is the communication of proper disposal up to the consumers. The producer shall communicate at best how to dispose new packaging solutions, particularly when different options are possible. Adoption of simple ways , like clear labels or innovative smart devices shall be further developed to help consumers.

**Conclusions:** Currently there is no a specific legislation for the end of life of Active and Intelligent packaging therefore new packaging solutions shall comply with the standard normative rules. More studies should be done to evaluate the effect on composting process of the active molecules and the intelligent inks.