Short Summary

CEPI – Eurokraft guidelines

Paper sacks and bags

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More information:
- https://www.cepi-eurokraft.org/

1 Definition

CEPI Eurokraft published a new guideline in June 2023 in order to define the recyclability of paper sacks and bags.

Paper sacks – this term can be more accurately applied to larger flexible containers made from paper for shipping industrial products between businesses, generally more than 10 kg net content. In Europe, paper sacks may contain up to 25 kg of product, so strength is a key feature. Such paper shipping sacks are more likely to arise as waste in commercial and industrial waste streams.

Paper bags – this term can be more accurately applied to smaller consumer-sized packages, generally less than 10 kg net content. Such paper bags are more likely to arise as waste in household waste streams.

Paper sacks are a relatively small fraction of the overall paper packaging stream, representing only around 1.5% of all paper packaging in Europe, and less than 1% of total European paper and board consumption. For this reason, there is generally no Europe-wide dedicated separate recycling system for paper sacks. Instead, paper sacks would currently be collected as part of the
general paper packaging stream for recycling.

2 Additives and agents

Sack kraft paper is made from long white or brown virgin fibres which are subjected to refining to increase fibrillation and surface area
for hydrogen bonding to maximise paper sheet strength. This paper grade is distinguished by its high cellulose fibre content. Stock
additives, where needed, are carefully selected so as not to reduce the inherent fibre bonding strength.

Most additives do not interfere with the recyclability of the paper sacks. Please find the exhaustive list in the guideline.

Some additives may cause problems, such as:

Wet-strength	Polyamide epichlorohydrin (PAE)	**Conditionally compatible with standard recycling processes**	Overall, permanent wet-strength paper is not considered compatible with standard recycling mill processes when included in large quantities in the recovered paper mix. Potential for recyclability depends on a number of factors, such as relative wet-strength (WS) level, amount of WS agent, etc. Subsequently, minimising or avoiding these wet-strength resins can make the recycling process more efficient, facilitating lower pulping temperature and time, and reduced chemicals usage, etc. Further testing may be required to demonstrate the fibre yield from sack kraft paper containing PAE as a wet-strength resin to demonstrate recyclability or otherwise.

3 Non-fibre components – barrier films (free films), barrier coatings and adhesive laminated films

qFor some applications, kraft paper sacks need a functional barrier or surface coating to protect food and non-foods from external factors such as water and water vapour, oxygen ingress, etc. These functional barriers also retain product moisture, shelf life-extending modified atmospheres and prevent pack damage from oily and greasy produce. The techniques that are used to functionalise kraft paper sacks include:

- Free films
- Coatings
- Lamination
- Production of a paper-aluminium composite

Component	Subcategory	Recyclability	Implications for recyclability assessment
Free film	Polyethylene (PE) – fossil-based and bio-based[1]	**Fully compatible with standard recycling processes**	PE-free film barriers allow fibre dispersion. The PE film is less dense than cellulose fibre and water, allowing it to be captured by the mill's cleaning processes. The proportion of PE within the overall packaging composition should be minimised and should ideally be less than 10% of the pack weight – a level that does not interfere with the recyclability of the kraft paper sacks in standard recycling mills. Higher levels, up to 20%, are possible but, in this case, testing is recommended to ensure compatibility with the standard recycling mill processes. If polymers other than PE are used, then compatibility with the recycling process will depend upon the density of the polymer in question. Polymers with low shear strength that break down in the pulper into microplastics should also be avoided because microplastics may pass through mill wastewater cleaning systems and be discharged into water courses or pass into and contaminate the finished product. For biodegradable polymers, the material is unlikely to have sufficient time to degrade before it passes through the repulping and papermaking process.
	Other fossil-based and non-fossil-based non-biodegradable films	**Compatibility with standard recycling processes unknown – testing required to prove recyclability**	
	Fossil-based and bio-based biodegradable polymers	**Compatibility with standard recycling processes unknown – testing required to prove recyclability**	

Component	Subcategory	Recyclability	Implications for recyclability assessment
Barrier coating	Thermoplastic (one side coated – inside the pack only)	**Fully compatible with standard recycling processes**	An outside coating may affect the sorting process (as it is detected by NIR). In only very few cases is the inside lamination detected by NIR. For internal thermoplastic coating, the method is considered fully compatible with recycling. For external thermoplastic coating, the method is considered conditionally compatible with recycling. In either case, the proportion of non-fibre material (lamination film plus adhesive) within the overall packaging composition should be minimised and should ideally be less than 10% of the pack weight – a level that does not interfere with the recyclability of the kraft paper sacks in standard recycling mills. Higher levels, up to 20%, are possible but in this case, testing is recommended to ensure compatibility with the standard recycling mill process.
	Thermoplastic (one side coated – outside the pack only)	**Conditionally compatible with standard recycling processes**	
	Thermoplastic (two-side coated/ laminated)	**Not compatible with standard recycling processes unless testing proves otherwise**	Two-sided laminates are more challenging to recycle in standard paper mills and should be collected and reprocessed separately for recycling in special recycling mills.
	Wet barrier coatings (dispersion coatings)	**Conditionally compatible with standard recycling processes**	This includes aqueous polymer dispersions (e.g. EEA, SB, ABS, PVDC, etc), solvent-based coatings and water-soluble coatings. For any wet barrier coatings, testing is required. For aqueous polymer dispersions (which may include acrylics), the properties of the polymer dispersions depend on the amount and strength of the adhesive and the presence of fillers. Water-soluble coatings require thorough cleaning in the milling to prevent issues such as foam forming. The COD load will be higher for soluble polymers.
	Wax/paraffin coatings – dipping of paper in molten wax (two sided)	**Not compatible with standard recycling processes unless testing proves otherwise**	May impact on stickiness and cause screen clogging, challenging to recycle in standard paper mills. According to the German Minimum Standard, a wax coating is not considered as an incompatibility, but the dissolvability has to be measured with an appropriate test method. In the Institute cyclos-HTP method, the products need to be dissolved under the technical operating parameters in typical reprocessing facilities. Wax-coated sack kraft papers would not achieve the same dissolution rate in water as standard paper sacks. Recyclability would need to be determined through measurements, according to the relevant testing methodology.

Lamination with polymers (extrusion lamination and adhesive lamination)	Two-sided laminates	**Not compatible with standard recycling processes unless testing proves otherwise**	Two-sided laminates are more challenging to recycle in standard paper mills and should be collected and reprocessed separately for recycling in special recycling mills.
	Adhesive lamination with PE or other thermoplastics	**Conditionally compatible with standard recycling processes**	Some adhesives can penetrate the paper sheet that can lock in fibre and prevent dispersion during repulping, which reduces fibre yield. Adhesives can increase the potential of stickies. Whilst some laminating adhesives facilitate fibre dispersion, the initial consensus is that this product has limited recyclability, but further test results are needed (courtesy of the Cepi Harmonised European Laboratory Test Method). The proportion of non-fibre material (lamination film plus adhesive) within the overall packaging composition should be minimised and should ideally be less than 10% of the pack weight – a level that does not interfere with the recyclability of the kraft paper sacks in standard recycling mills. Higher levels, up to 20%, are possible but in this case, testing is recommended to ensure compatibility with the standard recycling mill process.
	Adhesive lamination with water-soluble adhesives	**Fully compatible with standard recycling processes**	For preference, the industry would wish that laminates be lightly bonded with a water-soluble adhesive agent, so that the plastic layer separates easily in the paper pulping process. Needs thorough cleaning in the milling to prevent issues such as foam forming. The COD load will be higher for soluble polymers. The proportion of non-fibre material (lamination film plus adhesive) within the overall packaging composition should be minimised and should ideally be less than 10% of the pack weight – a level that does not interfere with the recyclability of the kraft paper sacks in standard recycling mills. Higher levels, up to 20%, are possible but in this case, testing is recommended to ensure compatibility with the standard recycling mill process.

Component	Subcategory	Recyclability	Implications for recyclability assessment
Paper-aluminium composite	Lamination with PE-aluminium foil	**Conditionally compatible with standard recycling processes**	Testing required. May have a "stardust" effect in visual appearance.
	Metallisation (direct or transfer)	**Conditionally compatible with standard recycling processes**	

4 Adhesives

Component	Subcategory	Recyclability	Implications for recyclability assessment
Adhesives	Starch-based, PVA, acrylic, polyurethane	**Fully compatible with standard recycling processes**	Any water-soluble adhesive application can be expected to dissolve into the process water during the fibre repulping process. These materials will become, and remain, part of the process water throughout the further processing steps (4evergreen, 2022). Hot melts exhibit tackiness only above their softening point. Thus, by choosing hot melts with a suitably high softening point, i.e. above the temperatures encountered in paper recycling secondary micro-sticky formation can be minimised (4evergreen, 2022).
	Hot-melt adhesives	**Conditionally compatible with standard recycling processes**	Hot melts exhibit tackiness only above their softening point. Thus, by choosing hot melts with a suitably high softening point, i.e. above the temperatures encountered in paper recycling secondary micro-sticky formation can be minimised (4evergreen, 2022). For hot-melt adhesives with a melting point <68 °C, there is potential to cause generation of stickies in the products manufactured from the recovered fibres, thereby reducing quality. Testing is required where it has not been specifically proven that these applications can be removed. As an alternative to testing, removability can be estimated using the EPRC assessment methodology described in the Scorecard for the Removability of Adhesive Applications, which could be applied to determine removability (European Paper Recycling Council, 2017).
	Pressure sensitive applications (self-adhesive labels, tapes)	**Conditionally compatible with standard recycling processes**	Paper sack manufacturers are generally not specifying and applying self-adhesive labels. However, these may be applied by downstream stakeholders (in particular fillers). Some pressure-sensitive labels may incorporate phthalates, which can significantly reduce the future uses of recycled paper and board. Therefore, particular care should be taken to ensure that the adhesive for pressure-sensitive labels does not include phthalates in its make-up.

5 Additional components

Component	Subcategory	Recyclability	Implications for recyclability assessment
Packaging aids	Carrying handles	**Conditionally compatible with standard recycling processes**	» Potentially interfere with NIR recognition of the package as paper-based. » Form part of the mill rejects stream.
	Patched-in plastic windows		
	Patched-in plastic netting		
	String closure/opening mechanisms	**Conditionally compatible with standard recycling processes**	» Form part of the mill rejects stream.

Inks and varnishes

Water-based, solvent based and UV-cured inks and varnishes seem to be fully compatible with the standard recycling process.

6 Labelling and communication

These guidelines address recyclability from the perspective of the packaging supplier and what can be done regarding the materials used and the physical construction of the paper sacks. Packaging suppliers have limited influence over the graphical design and information carried on the final package. However, aiding recyclability is a responsibility of all actors in the value chain. Fillers/brand owners should be encouraged to provide appropriate information to end-users regarding what to do with sacks at end-of-life. Particular considerations include:

- Where recycling is a desirable end-of-life solution for paper sacks, the sacks should be clearly marked as recyclable. The end-users should be instructed to fully empty sacks before placing them in the recycling stream, as residues are a significant impediment to recycling. Appropriate graphics and text should be used to convey these messages.
- Paper sacks are used to pack a wide range of products, including hazardous materials and dangerous goods (e.g. certain chemicals, fertilisers, pesticides, etc). For paper sacks which have contained these products, incineration with energy recovery may be the most appropriate end-of-life solution as any product residues could contaminate the recycled fibre stream and limit the applications for which the recycled paper could be used. Appropriate graphics and text should be used to make the end-user aware that these paper sacks should not be placed in the recycling stream.

Packaging suppliers should work with, and be ready to provide advice to, their customers on appropriate labelling and communication.