THE FOOD & BEVERAGE CARTON ALLIANCE

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LIQUID PACKAGING CARTONS

Design for Recycling Guidelines:

ALL TABLES

FBCA Design for Recycling Tables:
Material Compatibility Matrix for LPC Recycling

Food and Beverage Carton Alliance

RECY:CHECK

The Food and Beverage Carton Alliance (FBCA) has created these tables as part of the broader Design for Recycling Guidelines for Liquid Packaging Cartons (LPCs). They serve as a technical reference for recyclability classification across multiple material components. Always check that the version you are referring to is the current version (see bottom left).

GREEN CATEGORY (1)	YELLOW CATEGORY (2)	RED CATEGORY (3)
Fully compatible	Conditionally compatible	Not compatible unless testing proves otherwise
(1) Components or constituents of LPCs that are compatible with state-of-the-art collection, sorting, and recycling or are demonstrated as suitable for recycling through technical evaluation and can fully meet the quality requirements of secondary raw material in the recycling process	(2) Components or constituents of LPCs that are recognized as acceptable with limited compatibility with state-of-the-art collection, sorting, and recycling, or are demonstrated as having conditional compatibility through technical evaluation, or will not meet all quality requirements of secondary raw material in the recycling process	(3) Components or constituents of LPCs that are generally recognized as detrimental (disrupting) for recycling or are demonstrated as disrupting for recycling through technical evaluation, or are demonstrated as unacceptable, downgrading the yield or the quality of recycled material

Compatibility of LPCs with NIR sorting processes			
POLYMER OUTER LAYERS	PE or printed PE outer layer PP or printed PP outer layer		Other polymer outer layers
INKS CONTAINING CARBON BLACK	Surface coverage is less than 50% of the surface area		Surface coverage more than 50% (unless proven to be compatible by testing)
DECORATIVE METALLIC COMPONENTS		Metallization, which is achieved through direct or hot and cold transfer techniques, should not cover the surface of fibre-based products fully, as this could cause issues identifying or detecting fibre products	

Recycling compatibility of different fibres used in LPB with recycling processes at specialized mills			
FIBRES USED IN LPB	Bleached and unbleached sulfate kraft, bleached or unbleached CTMP		

Recycling compatibility of fillers, additives, and agents used in LPB with processes at LPC paper recycling mills			
FILLER/INORGANIC PIGMENTS	Clay (kaolin); CaCO3, Talc, Titanium dioxide		
SIZING, WET-END	AKD, ASA, Rosin		
DRY STRENGTH	Starch, Carboxymethyl Cellulose (CMC), Polyacrylamide, Guar gum, Glyoxalated polyacrylamide (GPAM), polyvinylamine (PVAm)		
WET STRENGTH AGENT	Glyoxalatedbpoly-acrylamide (GPAM), polyvinylamine (PVAm) Other wet strength agents: Polyamide epichlorohydrin (PAE), and Urea/Formaldehyde, if relative wet strength is less than 15%, determined by measuring dry tensile strength according to ISO 1924 and wet tensile strength according to ISO 3781:2011		

FBCA Design for Recycling Tables:
Material Compatibility Matrix for LPC Recycling

	GREEN CATEGORY (1) Fully compatible	YELLOW CATEGORY (2) Conditionally compatible	RED CATEGORY (3) Not compatible unless testing proves otherwise
Recycling compatibility of fillers, additives, and agents used in LPB with processes at LPC paper recycling mills (continued)			
COLOURANTS/DYE FOR SHADING	Colourants/dyes approved for food packaging applications		Colourants/dyes not approved for food packaging applications should be avoided
OTHERS	Surface sizing, Surface starch Colourants/pigments Polyvinyl alcohol (PVOH) Polyaluminium Chloride (PAC) Retention polymers, retention aids		Siliconizing agents
Recycling compatibility of pigment coatings used for LPB with processes at specialized LPC recycling mills			
PIGMENT COATINGS	**Clay and other pigment coatings:** Fully compatible with recycling processes at specialized mills, but board producers should seek to reduce the quantity of clay coating required, within the limitations of meeting printability requirements.		**Wax coatings:** For wax-coated LPB, recyclability would need to be determined through measurements, according to the relevant evaluation and test protocol.
BINDER	S/B latex, S/A latex; Starch-biobinder		
Recycling compatibility of adhesives used for attachments with processes at specialized LPC recycling mills			
ADHESIVES	Water-soluble adhesives Hotmelt adhesive (with softening temperatures ≥ 68°C) with an application size above 2mm x 2mm	Water-insoluble or re-dispersing adhesives: Potential to cause generation of stickies in the products manufactured from the recovered fibres, thereby reducing quality Hot melt adhesive (with softening temperatures ≥68 °C) with an application size below 2mm x 2mm	Hotmelt adhesives with softening temperatures ≤ 68°C: compatibility with recycling processes at specialized mills is unknown
Compatibility of inks with recycling processes at specialized mills and with recycling processes for the foil fraction of the PolyAl			
INK TYPE	Vegetable oil-based inks Water-based inks and varnishes Solvent-based inks and varnishes Liquid and solid toner-based inks Two component-based inks and varnishes	UV cured inks and varnishes Mineral oil-based inks - Not relevant for LPC recycling process. Inks based on mineral oils are fully compatible with the recycling process. However, the use of mineral oil-based inks restricts the use of the recovered fibres to non-food applications. Therefore, it is not used for LPCs today and it is not recommended to be used	**Inks non-compliant with EuPIA Exclusion Policy** Not compatible with PolyAl recycling processes. Their exclusion from recycling is not directly related to reprocessing, but due to hazardous and toxicology implications. Digital-hotmelt inks
BINDERS IN INK SYSTEMS	Total quantity of dry inkfilm should not exceed 5wt% of packaging structure, whether a single ink/overprint varnish or a combination of ink and overprint varnish Nitrocellulose (NC) based inks, and overprint varnishes up to a maximum of 0.8% NC binder by weight of the total packaging structure	NC-based inks and overprint varnishes from > 0.8% to 1.3% NC binder by weight of the total packaging structure	Inks and overprint varnishes containing PVC co- and terpolymers Any other chlorinated binders

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Material Compatibility Matrix for LPC Recycling

	GREEN CATEGORY (1) Fully compatible	YELLOW CATEGORY (2) Conditionally compatible	RED CATEGORY (3) Not compatible unless testing proves otherwise
Compatibility of straws and protective wrappers with recycling processes at specialized mills			
STRAWS	Paper straws		
PROTECTIVE WRAPPERS	**PE (fossil-based and bio-based) protective wrappers** **PP (fossil-based and bio-based) protective wrappers** The wrappers will most likely be removed during collection and sorting and are therefore unlikely to be processed in the specialized mills **Paper protective wrappers** If not removed during collection and sorting, the wrappers will be repulped in the specialized mill		
LPCs: Compatibility of PE-based laminate and barrier materials used in non-aseptic and aseptic LPCs with PolyAl film fraction recycling processes for injection moulding and LPC applications			
POLYETHYLENE (PE): FOSSIL-BASED AND BIO-BASED	> 75% (in the polymer film fraction) Mono-PE including co-extruded, orientated, co-polymers—Laminated PE/PE with or without barrier layers and coatings as indicated below		< 75% (in the polymer film fraction) Mono-PE including co-extruded, orientated, co-polymers—Laminated PE/PE with or without barrier layers and coatings as indicated below
PP OR PE CARRIER FILMS WITH VAPOUR DEPOSITION BARRIERS	AlOx SiOx Metallization as applied by vapour deposition		
EVOH	Up to 10% EVOH as co-extruded layer in the polymer component of the PolyAl film fraction, with at least one surrounding layer containing maleic anhydride (MAH) grafted PE in a ratio ≥ 1 g per g EVOH		> 10% EVOH as co-extruded layer in the polymer component of the PolyAl film fraction, with at least one surrounding layer containing maleic anhydride (MAH) grafted PE in a ratio ≥ 1 g per g EVOH
POLYAMIDE (PA)	Up to 20% (in the polymer film fraction) polyamide 6 (PA6) or co-polyamide 6/6.6 as co-extruded layer, with at least one surrounding layer containing maleic anhydride grafted PE as a tie layer specified for PA/PE co-extrusion in a ratio of ≥ 0.5 g per g PA in the polymer film fraction		> 20% (in the polymer film fraction) polyamide 6 (PA6) or co-polyamide 6/6.6 (PA 6/6.6) as co-extruded layer, with at least one surrounding layer containing maleic anhydride grafted PE as a tie layer specified for PA/PE co-extrusion in a ratio of ≤ 0.5 g per g PA.5 in the polymer c film fraction Polyamide 6 (PA6) or co-polyamide 6/6.6 with less than 0.5 g per g PA of maleic anhydride grafted PE as a tie layer in the coating structure film fraction
PET		≤ 5% PET in the polymer film fraction: LPCs containing less than 5% PET in the polymer component of the foil fraction (i.e., > 95% PE) are likely to result in contamination levels that are undesirable but nonetheless manageable for the recycling processes	> 5% PET in the polymer film fraction

FBCA Design for Recycling Tables:
Material Compatibility Matrix for LPC Recycling

	GREEN CATEGORY (1) Fully compatible	YELLOW CATEGORY (2) Conditionally compatible	RED CATEGORY (3) Not compatible unless testing proves otherwise
LPCs: Compatibility of PE-based laminate and barrier materials used in non-aseptic and aseptic LPCs with PolyAl film fraction recycling processes for injection moulding and LPC applications (continued)			
BIODEGRADABLE POLYMERS (SUCH AS BUT NOT LIMITED TO POLYLACTIC ACID (PLA) AND POLYHYDROX-YBUTYRATE (PHB)			No compatibility with PolyAl recycling processes
ALUMINIUM FOIL	Gauge < 10 µm		Gauge > 10 µm
FILLERS IN POLYMER FOIL	Amount of fillers that do not raise the density of polymer to a value above 0.99 g/cm3 or beyond	Amount of fillers that raise the density of polymer to a value of 0.99 g/cm3 to 1.0 g/cm3	Amount of fillers that raise the density of the polymer to above 1.0 g/cm3
LPCs: Compatibility of PP-based laminate materials and barrier solutions used for retortable LPCs with PolyAl foil fraction recycling processes where the PolyAl recyclate is used for injection moulding			
PP OR PE: FOSSIL-BASED AND BIO-BASED	PP or PE in the polymer component of the PolyAl film fraction		
ALUMINIUM FOIL, PA, EVOH, PET, BIODEGRADABLE POLYMERS	For compatibility of these elements, the limits and classifications reported for PE-based laminates in the table above also apply for PP-based laminates		
Compatibility of polymers used for caps and closures with standard PO recycling processes			
POLYMERS	**> 90% PO**	**80–90% PO**	**< 80% PO** **Biodegradable polymers** Biodegradable and compostable polymers, even at low levels, are expected to cause disruption of the mechanical PE, PP, and mixed PO recycling processes and negatively affect the quality and value of final recyclate