



The APR Design® Guide for Plastics Recyclability is the most comprehensive resource outlining the plastics recycling industry's recommendations in the marketplace today. The content is regularly updated to ensure APR's Recyclability Categories represent today's North American plastics recycling infrastructure. Although it is designed as an online resource, with links to all relevant information, a PDF of the complete document can be downloaded as well.

The APR Design® Guide specifically addresses plastic packaging, but the principles can be applied to all potentially recycled plastic items.

APR encourages package designers to utilize The APR Critical Guidance and Responsible Innovation programs, as well as the APR Design® Guide to create the most recyclable packaging. Assistance is available through APR or one of the APR member, independent laboratories found in the member directory.

The intended audience for the APR Design® Guide for Plastics Recyclability is the package design engineer for use in designing packaging that complies with the capabilities of the recycling infrastructure. Before accessing the APR Design® Guide for Plastics Recyclability the user should thoroughly understand the fundamentals of its concept as described in the scope, definition of recyclability and recyclability categories outlined below.

SCOPE

This guide covers plastic items entering the postconsumer collection and recycling systems most widely used in industry today. Collection methods include single stream and dual stream MRF's, deposit container systems, mixed waste facilities, and grocery store rigid plastic and film collection systems. The impact of package design on automated sortation process steps employed in a single stream MRF, as well as high volume recycling processes is of primary consideration.

Items recovered in recovery systems where they are source-selected and sent to a recycler specializing in this particular item are specifically excluded from this guide.

APR's DEFINITION OF RECYCLABLE

An item is "recyclable per APR definition" when the following three conditions are met:

- At least 60% of consumers or communities have access to a collection system that accepts the item.
- The item is most likely sorted correctly into a market-ready bale of a particular plastic meeting industry standard specifications, through commonly used material recovery systems, including single-stream and



dual stream MRFs, PRF's, systems that handle deposit system containers, grocery store rigid plastic and film collection systems.

- The item can be further processed through a typical recycling process cost effectively into a postconsumer plastic feedstock suitable for use in identifiable new products.

APR's RECYCLABILITY CATEGORIES

The APR Design® Guide is itemized by design features commonly used with packaging applications. The recycling impact of each design feature is discussed within the Guide. The APR's guidance on the design feature is developed considering this impact and broken down into four categories which should be thoroughly understood:

- **APR DESIGN GUIDE® PREFERRED:** Features readily accepted by MRFs and recyclers since the majority of the industry has the capability to identify, sort, and process a package exhibiting this feature with minimal, or no, negative effect on the productivity of the operation or final product quality. Packages with these features are likely to pass through the recycling process into the most appropriate material stream with the potential of producing high quality material.
- **DETRIMENTAL TO RECYCLING:** Features that present known technical challenges for the MRF or recycler's yield, productivity, or final product quality but are grudgingly tolerated and accepted by the majority of MRFs and recyclers.
- **RENDERS PACKAGE NON-RECYCLABLE PER APR DEFINITION:** Features with a significant adverse technical impact on the MRF or recycler's yield, productivity or final product quality. The majority of MRFs or recyclers cannot remove these features to the degree required to generate a marketable end product.
- **REQUIRES TESTING:** In order to determine compatibility with recycling, testing per an APR testing protocol is required.

DISCLAIMER

This document has been prepared by the Association of Plastic Recyclers as a service to the plastic industry to promote the most efficient use of the nation's plastic recycling infrastructure and to enhance the quality and quantity of recycled postconsumer plastic. The information in this document is offered without warranty of any kind, either expressed or implied, including WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, which are expressly disclaimed. APR and its members accept no responsibility for any harm or damages arising from the use of or reliance upon this information by any party. Participation in the Recognition Program is purely voluntary and does not guarantee compliance with any U.S. law or regulation or that a package or plastic article incorporating the innovation is recyclable or will be recycled.



The Association of
Plastic Recyclers

APR Design® Guide for Plastics Recyclability for PET (Polyethylene Terephthalate, Resin Identification Code #1)

Due to its clarity and natural CO₂ barrier properties, PET is one of the most widely used packaging resins. It is easily blown into a bottle or formed into a sheet, thereby becoming the resin of choice for many applications. PET does not normally have the desired properties for closures, handles, attachments or labels so other polymers are commonly used for these items and affixed to the PET package. PET properties can be enhanced with colorants, UV blockers, oxygen barriers/scavengers and other additives. Each modification and addition to the base, clear PET in a package must be considered for its effect on the recycling stream. Items should either be economically removed from the PET in the typical recycling process or be compatible with RPET in future uses. The density of PET is 1.38 and so it sinks in water. Closures, labels and attachments should be made from materials with a density less than 1.0 that will float in water and therefore be readily separated from the PET.

The APR's Recognition Program encourages consumer product, plastic package and bottle component manufacturers to work with the APR protocols to determine whether new modifications to a regularly recycled plastic package will negatively impact the recycling process prior to introducing the modification.



FEATURE	RECYCLABILITY CATEGORIES				TEST	
	APR DESIGN® GUIDE PREFERRED	REQUIRES TESTING	DETRIMENTAL TO RECYCLING	RENDERS PACKAGE NON-RECYCLABLE PER APR DEFINITION	SCREENING/BENCHMARK TEST (indicative only - see definition of Screening and Benchmark tests)	DEFINITIVE TEST
BASE POLYMER:						
PET with a crystalline melting point between 225-245°C	X					
Post consumer RPET content	X					
Blends of PET and other resins		X				Critical Guidance Protocol for Clear PET Resins and Molded Articles
BARRIER LAYERS, COATINGS & ADDITIVES						
Non-PET layers and coatings		X			PET Heat History and Discoloration Evaluation	Critical Guidance Protocol for Clear PET Resins and Molded Articles
Degradable additives		X			PET Degradable Additives Test	
Additives		X			PET Heat History and Discoloration Evaluation	Critical Guidance Protocol for Clear PET Resins and Molded Articles
Optical brighteners			X			
COLOR						
Clear unpigmented	X					
Transparent light blue	X					
Transparent green	X					
Transparent colors other than green and light blue			X			
Translucent and opaque colors including white			X			
Nucleating agents, hazing agents, fluoresters, and other additives for visual and technical effects			X			
Dark color with an L value < 40 or NIR reflectance <=10%		X			Evaluation of the Near Infrared (NIR) Sorting Potential of a Whole Plastic Article	
DIMENSIONS						
More 2 dimensional than 3 dimensional (one dimension <2")				X		
2 dimensions less than 2"		X			Evaluation of Size Sorting Potential for Articles with at Least 2 Dimensions Less Than 2"	
Greater than 2 gallons in volume			X			
CLOSURES AND DISPENSERS						
Polypropylene or Polyethylene	X					
Closure systems without liners	X					
EVA and TPE liners in plastic closures	X					
Metal parts and foils		X			Evaluation of Sorting Potential for Plastic Articles Utilizing Metal, Metalized or Metallic Printed Components	Critical Guidance Protocol for Clear PET Articles with Labels and Closures
Polystyrene or thermoset plastics			X			
Silicone polymer parts			X			
PVC				X		



FEATURE	RECYCLABILITY CATEGORIES				TEST	
	APR DESIGN® GUIDE PREFERRED	REQUIRES TESTING	DETRIMENTAL TO RECYCLING	RENDERS PACKAGE NON-RECYCLABLE PER APR DEFINITION	SCREENING/BENCHMARK TEST (indicative only - see definition of Screening and Benchmark tests)	DEFINITIVE TEST
LABELS INKS AND ADHESIVES						
PP or PE with specific gravity less than 1.0	X					
Full bottle sleeve labels		X				Critical Guidance Protocol for Clear PET Articles with Labels and Closures
Pressure sensitive labels		X			Benchmark Test for Clear PET Articles with Labels and Closures	Critical Guidance Protocol for Clear PET Articles with Labels and Closures
Polystyrene labels		X			PET Packaging Component Sink or Float Evaluation	
Label systems that sink in water because of substrate, inks, decoration, coatings, and top layer		X				Critical Guidance Protocol for Clear PET Articles with Labels and Closures
Paper labels (for pressure sensitive use pressure sensitive category)			X			
Metal foil, metalized or metallic printed labels		X			Evaluation of Sorting Potential for Plastic Articles Utilizing Metal, Metalized or Metallic Printed Components	
PVC and PLA labels				X		
ADHESIVES						
Non-water soluble/dispersible adhesives			X		Benchmark Test for Clear PET Articles with Labels and Closures	Critical Guidance Protocol for Clear PET Articles with Labels and Closures
Inks		X			Benchmark Test for Clear PET Articles with Labels and Closures	See appropriate test for label type
Direct printing other than date coding		X			Benchmark Test for Clear PET Articles with Labels and Closures	Critical Guidance Protocol for Clear PET Articles with Labels and Closures
ATTACHMENTS						
Clear PET	X					
Tamper evident sleeves and safety seals		X			PET Packaging Component Sink or Float Evaluation	Critical Guidance Protocol for Clear PET Articles with Labels and Closures
Non-PET attachments		X			PET Packaging Component Sink or Float Evaluation	Critical Guidance Protocol for Clear PET Articles with Labels and Closures
Metal and metal containing		X			Evaluation of Sorting Potential for Plastic Articles Utilizing Metal, Metalized or Metallic Printed Components	
Paper			X			
Welded attachments			X			
RFID's			X			
PVC and PLA				X		

BASE POLYMER

PET and PET variants resins which have a crystalline melting point between 225 and 255C are preferred. Materials of a lower melt point or non-crystalline materials often become sticky in the reclaimers' pre-extrusion dryer when the dryer is operated at PET temperatures and prevent the material from flowing through the process. Materials of a higher melt point remain solid in the reclaimers' extruder and cause blockages in melt screens. Both conditions greatly hinder the ability of the reclaimer to operate.

PET PACKAGING

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