



## *Plastics Recycling Glossary*

### GENERAL COLLECTION AND RECYCLING

**BAG IN BAG** - A collection technique where plastic bags and wrap are bundled together inside another bag, and deposited in a recycling collection bin at curbside or store drop-off.

**BALE** means a compacted and wire-bound cube or block of recyclable material.

**COLLECTOR** - Entities that collect recyclables from generators and deliver them to processors or to markets. Collectors may collect postconsumer materials from curbside or from drop-off centers and deliver them to material recovery facilities (MRFs). Collectors are also referred to as haulers or carters. Some collectors may also own the operate the MRFs.

**COMMERCIAL RECYCLING** The practice of collecting recyclables from retail or commercial businesses, not including single-family households but frequently including multi-family residences such as condominiums or apartments.

**COMMINGLED CONTAINERS** The following material categories combined in one recycling bin or cart: aluminum cans, glass bottles and jars, plastic bottles, jars, jugs, and cups, and steel cans.

**CONSTRUCTION AND DEMOLITION (C & D) WASTE** Material including concrete, bricks, lumber, masonry, road paving materials, rebar and plaster generated from both homeowners' and contractors' construction or demolition projects.

**CONVERTERS** Businesses that buy raw material and convert that to finished goods. In the case of plastics, the plastic pellets of specific polymers are converted into items such as fibers, films, sheets, and rigid packaging along with semi-durable and durable goods.

**CURBSIDE RECYCLING** The collection method by which household generators deposit specified recyclables in rolling carts or "blue boxes", and place those at the street or curb adjacent to containers of household waste for periodic collection by collectors.

**DROP-OFF** A form of collection of household recyclables wherein the generators must deliver the items to a central

aggregation location. This is also known as Bring or depot collection.

**DROP OFF RECYCLING SITE(S)** Central aggregation locations, often serving rural areas, where the generators deliver recyclables. Retail collection of plastic bags and wraps at stores is a special type of drop off recycling site.

**DUAL STREAM** A recycling practice in which cans, bottles, and containers are collected separately from paper products.

**GAYLORD CONTAINER** The trade name for a large, reusable corrugated box used for shipping materials.

**INDUSTRIAL RECYCLING** The practice of long standing of one company selling its useful waste materials or process scrap to another company which uses those materials to make new items. A change of ownership is needed.

**PLASTIC SCRAP** Material that did not meet the quality specifications for fully acceptable product. The scrap can be pellets or converted goods, or trimmings. The scrap can be ground to repro and used again or sold or disposed, depending on levels of contamination and degradation.

**POSTCONSUMER** The status after an item has been used for its intended purpose. Postconsumer material may be generated by households or commercial establishments.

**POSTINDUSTRIAL** Material that has been processed initially and failed to meet specifications or otherwise not sold as prime material and sold to another party for reuse or reprocessing. Repro can be postindustrial material. Postindustrial material cannot be postconsumer material unless the manufactured item had been used for its intended use and was directed toward disposal.

**PRECONSUMER** The same as postindustrial

**RAW MATERIAL** The materials that are used to fabricate or manufacture items of commerce.

**RECLAIMER** A commercial entity that accepts aggregated postconsumer and/or postindustrial plastic materials and performs a series of operations to allow them to return to commerce as useful raw materials or new finished items of commerce.



**RECOVERY** The successful diversion of recyclable materials out of landfill disposal to recycling collection and reuse systems. The European definition can include incineration with energy capture.

**RECYCLABLES** Those materials identified for collection, processing, recovery or reuse as part of a local government, business or other recycling collection program.

**RECYCLING** Separating, collecting, processing, marketing, and ultimately using a material that otherwise would have been disposed.<sup>iii</sup>

**REPROCESS** To convert recovered materials into new raw materials that can be used to make finished goods. For example, plastic reclaimers reprocess plastic bottles into pellets, which can then be manufactured into new plastic products.

**RESIDENTIAL RECYCLING** The collection of recyclable, postconsumer items from the home either by curbside collection or drop-off collection

**RESIN IDENTIFICATION CODE (RIC)** A numerical coding system in which symbols and numbers are molded directly onto plastic bottles and containers to identify the resin from which they are made. The RIC was established in the late 1980's by the Plastic Bottle Institute; since 2014 it has been managed by ASTM. The RIC is not a recycling code.

#1 - polyethylene terephthalate (PET)

#2 - high density polyethylene (HDPE)

#3 - polyvinyl chloride (PVC)

#4 - low density polyethylene

#5 - polypropylene (PP)

#6 - polystyrene (PS)

#7 - mixed plastic

**ROLL CARTS** Large, wheeled carts used by generators, including households, to store recyclables. The wheels facilitate transportation to the curbside or to the hauling truck.

**SECTOR (OR CROSS-SECTOR)** One part of the recycling infrastructure, such as the industrial, commercial, or public sector.<sup>iv</sup> Cross-sector means an activity affecting more than one sector or a partnership between more than one sector.

**SINGLE STREAM** A municipal, commercial, or industrial practice in which recyclable materials are combined together with no sorting required by the generator. Sorting will be done at a central location such as a materials recovery facility (MRF).

**SOURCE SEPARATION** A municipal, commercial or industrial recycling practice that requires sorting of different recyclable materials such as glass, metals, paper and plastics at the point of generation prior to collection. Source separated materials may still be taken to a MRF for baling.

**TANGLERS** Items such as extension cords, Christmas lights, and hoses that contaminants in curbside recycling bins due to operational impacts at the MRF.

**WASTE DIVERSION** The act of preventing waste from being disposed into landfills and incinerators by directing it instead into the recycling stream.

**WASTE STREAM** The flow of materials from generation to disposal.

## PLASTIC PACKAGING AND ITEMS

**BIODEGRADABLE PLASTICS** Plastics that will degrade relatively rapidly by naturally occurring organisms in natural and specialized environments to carbon dioxide for aerobic composting or methane/natural gas for anaerobic biodegradation. The degradation occurs either due to additives blended into the polymer, or due to the material substrate itself. Biodegradation in most landfills is not helpful and usually sought to be avoided. Biodegradable plastics are recyclable if collected separately from other plastics, but are considered contaminants to plastics recycling if mixed with non-degradable plastics.

**BIOPLASTICS** Plastics either partially or fully created with plants, that are identical to the polymers created by petrochemical refining. In other words, a #1 PET bottle made from bioplastics components is chemically identical to one made from natural gas derived components. Bioplastics are usually fully compatible with plastics recycling systems.

**METALIZED FILM** A thin metal layer deposited on a plastic component, typically through a physical vapor deposition (PVD) process. The metal layer in this state is not capable of supporting itself as an independent structure. Metalized films are often used in packaging to improve the gas and moisture barrier properties of a package. Metal films can also be used on packaging components such as labels or closure for decorative reasons.

**METAL FOIL** A thin metal layer thick enough to support itself. Metal foils can be applied to plastics with adhesive or with a mechanical bond or be an independent structure wrapped around a portion of the package.



**METALLIC INKS** Inks containing metallic flake pigments, from aluminum or bronze flake, for example, to impart a shiny metallic appearance.

**FLEXIBLE PACKAGING** Plastic bags and film such as bread bags, produce bags, paper towel and beverage overwraps, and also new packaging technologies such as pouches and multi-layer films. Retail store drop-off locations collect polyethylene (LDPE and HDPE) flexible bags and films from consumers for recycling.

## FACILITIES

**LANDFILL** A specially engineered site for disposal of solid waste on land. It is generally spread in thin layers which are then covered with soil. A RCRA Subtitle D sanitary landfill is intended to be a dry, airless, and cold entombment with little or no biological activity.

**MATERIAL RECOVERY FACILITY (MRF)** A facility employing various manual and machine processes to sort recyclable materials, remove contamination, and process, usually by baling, for shipment and sale to various markets.

**MIXED WASTE FACILITY** A Material Recovery Facility (MRF) that accepts municipal solid waste (MSW) and recyclable materials mixed together. Recyclables are separated from the MSW, then sorted and baled for shipment to market. Residual MSW is disposed.

**MUNICIPAL SOLID WASTE (MSW)** Residential and commercial non-hazardous waste generated by municipalities and commercial entities, not including medical or industrial or construction/demolition waste.

**SECONDARY MRF** An industrial facility that accepts low-volume or low-value materials from MRFs and conducts further separation, contamination removal, and aggregation to transform these materials into marketable grades for sale.

**PLASTIC RECYCLING FACILITY (PRF)** An industrial facility that accepts mixed plastic items from MRFs or generators, then conducts separation and contamination removal to create saleable grades of discrete plastic resin types. A PRF may also conduct preliminary recycling operations such as size reduction to plastic flake.

**TRANSFER STATION** A facility that receives and consolidates solid waste from collection trucks and other vehicles and loads the wastes onto tractor trailers, railcars or barges for long-haul transportation to distant disposal facilities.

## WASTE TO ENERGY FACILITY/ MUNICIPAL WASTE

**COMBUSTER** A facility where recovered municipal solid waste is converted into a usable form of energy, usually via combustion.<sup>iii</sup>

## EQUIPMENT AND PROCESSES

**BALER** A type of equipment that uses pressure to densify and contain recyclable material, forming wire-tied cubes of specified sizes that are easily handled by forklifts, stacked for storage, and loaded onto tractor-trailers.

**BALLISTIC SEPARATOR** A mechanical device used to separate materials, typically used in MRFs, by exploiting their different physical characteristics such as weight, size, and shape.

**COMPACTOR** A container for solid waste storage and transportation, usually used at commercial and industrial locations, that uses pressure to maximize container weight for efficiency.

**EDDY CURRENT SCREEN** A mechanical device used to separate non-ferrous metals, such as aluminum cans, from the mixed material stream in a MRF. The eddy current generated is an electrical field that repels conductive non-ferrous metals away from non-conductive materials such as plastics.

**EXTRUSION BLOW MOLDING** A common method used to make plastic containers in which plastic is melted and extruded into a hollow tube (a parison). The parison is then captured into a cooled metal mold, and takes on the shape of the mold by inflation with compressed air. When cooled and released it is ejected as a finished container.

**INJECTION BLOW MOLDING** A common method used to make plastic containers that have thin walls and excellent strength, such as soft drink bottles. Plastic is melted and injection molded into a preform. The preform is removed from the injection machine, cooled, then reintroduced into a blow molding machine where heat and compressed air shape it into its final container form.

**PARISON** The extrusion molded initial form of an extrusion blow-molded container. The parison is molded into its final container form in the same machine.

**PREFORM** The injection molded initial form of an injection blow-molded container. The blow molding step forms the finished container by heating, stretching, and applying compressed air to the preform in a mold in a different machine..



**STAR SCREEN (or DISC SCREEN)** A mechanical device used to convey and separate materials, typically used on MRFs. Star shaped discs mounted on rotating shafts allow lighter, larger, and 2-dimensional items to flow forward and force heavier, smaller, and 3-dimensional items to drop through.

**TROMMEL SCREEN** A mechanical screening machine used to separate materials, typically used in MRFs. It consists of a perforated cylindrical drum that is normally elevated at an angle at the feed end.

## BALE SPECIFICATION DEFINITIONS

### SOURCE: APR MODEL BALE SPECIFICATIONS

[\\*Click here to connect to APR Model Bale Specifications\\*](#)

[\\*Click here to connect to the APR Plastic Recycling Market Information and Services Directory\\*](#)

## RESIN SEGREGATED RIGID PLASTIC BALES

**PET BOTTLE BALES** Any whole polyethylene terephthalate (PET) bottle with a screw-neck top that contains the ASTM D7611 “#1, PET or PETE” resin identification code and that is clear, transparent green, or transparent light blue. All bottles should be free of contents or free flowing liquids and rinsed. Closures (caps, lids, and rings) may be left on bottles.

**PET THERMOFORM BALES** Any whole polyethylene terephthalate (PET) package labeled with the ASTM D7611 “#1, PET or PETE” resin identification code, not including bottles and jars, but including and not limited to egg cartons, baskets, clamshell containers, cups, lids, cake domes, covers, blister pack without paperboard backing, tubs, deli containers, trays and folded PET sheet containers. All packages should be free of contents or free flowing liquids and rinsed. Closures (caps, lids, and rings) may be included

**HDPE NATURAL BOTTLES BALES** Any whole, blow-molded, high density polyethylene bottle containing the ASTM D7611 “#2, HDPE” resin identification code that is unpigmented, and was generated from a curbside, drop-off, or other public or private recycling collection program. Bottles are defined as containers that have a neck or mouth that is smaller than the base. All bottles should be free of contents or free flowing liquids and rinsed. While including closures (caps, lids, and rings) on bottles is acceptable, removal of closures is also acceptable.

**HDPE – COLORED BOTTLES BALES** Any whole, blow-molded, high density polyethylene bottle containing the ASTM D7611 “#2, HDPE” resin identification code that is pigmented and opaque, and was generated from a curbside, drop-off, or other public or private recycling collection program. Bottles are defined as containers that have a neck or mouth that is smaller than the base. All bottles should be free of contents or free flowing liquids and rinsed. While including closures (caps, lids, and rings) on bottles is acceptable, removal of closures is also acceptable.

**HDPE INJECTION – BULKY RIGID PLASTICS** Any injection grade #2 HDPE, typically found to be wide mouthed containers and/or oversized items generated through a positive sort from curbside, drop-off or other public or private recycling collection program. Examples include: carts, crates, buckets, baskets, lawn furniture, etc. Metal such as axels and bolts should be removed. Buckets/pails with metal handles are acceptable.

**PP SMALL RIGID PLASTICS** Any whole bottle, container or product, with a #5 PP resin code, generated through a positive sort from curbside, drop-off or other public or private recycling collection program. Examples of Bottles, Containers and Products include: prescription bottles, yogurt cups, margarine tubs, ice cream tubs, cold drink cups, microwavable trays, tofu tubs, dishwasher safe storage containers, hangers, caps

**PP ALL RIGID PLASTICS – VARIATION OF PP ALL RIGID PLASTICS** Bulky PP is items greater than 5 gallons, (e.g. buckets, crates, waste baskets, toys, and storage bins)

## MIXED RESIN RIGID PLASTIC BALES

**TUBS & LIDS BALES** Any whole container, with a #5 PP, #2 HDPE and/or #4 LDPE resin codes, generated through a positive sort from curbside, drop-off or other public or private recycling collection program. Tubs are containers that have a neck or mouth similar in size to its base. Lids are caps for tubs that have a fastening feature other than threads. Examples include: yogurt cups, margarine tubs, ice cream tubs, cold drink cups (transparent, cold serve).

**TUBS & LIDS WITH BULKY RIGID PLASTICS BALES – VARIATION OF TUBS AND LIDS** Please refer to “Bulky Rigid” model bale specs for additional allowable material

**MIXED BULKY RIGID PLASTIC BALES** Any large rigid #5 PP and/or #2 HDPE plastic bulky items, generated through a positive sort from curbside, drop-off or other public or



private recycling collection program. Examples include: crates, buckets, baskets, totes, and lawn furniture. Metal such as axels and bolts should be removed. Buckets/pails with metal handles are acceptable. This bale should not contain mixed #1-7 containers, toys with metal, drums or PVC/vinyl.

**1-7 ALL RIGID PLASTIC BALES** Rigid plastic generated in a positive sort from a curbside, drop-off, or other public or private recycling program that does not separately sort any plastic bottles. Bales consist of all plastic bottles—no bottles should be removed from the mix prior to baling— household containers (including thermoform packaging, cups, trays, clamshells, food tubs and pots), small rigid products (e.g. hangers) and bulky rigid plastic (e.g., drums, crates, buckets, baskets, toys, totes and lawn furniture).

#### **1-7 BOTTLES AND SMALL RIGID PLASTICS – VARIATION ON**

**1-7 ALL RIGID PLASTICS.** (Also known as “Bottles and Containers” (B&C). Bulky rigid plastic, greater than 2 gallons, should be avoided (e.g., drums, crates, buckets, baskets, toys, totes and lawn furniture). Bales should consist of 65% bottles.

**3-7 BOTTLES AND ALL OTHER RIGID PLASTIC BALES** - Rigid plastic items generated in a positive sort from a curbside, drop-off, or other public or private recycling programs from which the PET and HDPE bottles have been removed. Pre-picked plastic consists of non-PET and non-HDPE household bottles and all non bottle containers including thermoform packaging, cups, trays, clamshells, food tubs and pots, and all large rigid plastics, primarily PE and PP (includes plastic crates, carts, buckets, baskets and plastic lawn furniture). Metal, as typically found in toys or bucket handles, should be removed when possible. Plastic items from construction or demolition should not be included in Pre-Picked bales.

**3-7 BOTTLES AND SMALL RIGID PLASTICS (ALSO KNOWN AS “SMALL PLASTIC CONTAINERS” (SPC) AND “HOUSEHOLD CONTAINERS”) – A VARIATION ON 3-7 BOTTLES AND ALL OTHER RIGID PLASTIC BALES** - Bulky rigid plastic, greater than 5 gallons, should be avoided (e.g., drums, crates, buckets, baskets, toys, totes and lawn furniture)

## **FILM & FOAM BALES**

**MRF CURBSIDE FILM BALES** Any polyethylene film (HDPE, LDPE, and LLDPE) collected at a Materials Recycling Facility, MRF, by vacuum removal. Non-polyethylene films are to be excluded. All film bundles should be free of free-flowing liquids. Postconsumer is defined as “used for its intended purpose and otherwise directed to disposal”. Films may be coded with ASTM D7611 resin identification code.

**PE RETAIL BAGS AND FILM BALES** Any polyethylene bag and overwrap accepted by retailers from their customers or polyethylene stretch wrap or other film generated back of house may be included. Bags may be mixed color or printed and primarily HDPE but are expected to include other polyethylene bags and LDPE/LLDPE overwrap. Films may be coded with ASTM D7611 resin identification code “#2, HDPE” and #4, LDPE”. All bag bundles should be free of free-flowing liquids. Postconsumer is defined as “used for its intended purpose and otherwise directed to disposal”.

**PE CLEAR FILM BALES** – Any mix of natural polyethylene film, HDPE or LDPE or LLDPE, totaling at least 95% clear or natural polyethylene film is accepted. All film bundles should be free of free-flowing liquids. Any mix of post commercial or postconsumer. Films may be coded with ASTM D7611 resin identification code.

**LDPE COLORED FILM BALES** - Any mixture of natural translucent LDPE film and mixed color translucent LDPE with limited label contamination is acceptable. Films may be coded with ASTM D7611 resin identification code #4, LDPE. All film bundles should be free of free-flowing liquids. Postconsumer is defined as “used for its intended purpose and otherwise directed to disposal”.

**LDPE FURNITURE MIX FILM BALES** - Any mixture of natural LDPE film used for sofa overwrap, bubble wrap, mattress bag and LLDPE stretch film and polyethylene thin foam which is white and gray foam backed with LDPE film. Color contribution can be only from the white foam, gray foam backed with LDPE film, and blue mattress bags. The mass shall consist of 70% to 80% LDPE and/or LLDPE films and the remainder polyethylene foam. Films may be coded with ASTM D7611 resin identification code #4, LDPE. All film bundles should be free of free-flowing liquids.

**AGRICULTURAL PE FILM INCLUDING MULCH BALES** Any polyethylene film collected after use as in-field mulch film. This can include bale wrap, field film, and greenhouse film provided the film is polyethylene. Non-polyethylene bale wrap is excluded. All bag bundles should be free of free-flowing liquids.

**AGRICULTURAL PE FILM, NOT MULCH BALES** - Any polyethylene film collected after use in agriculture not including mulch film. This can include bale wrap, and greenhouse film provided the film is polyethylene and has not been used as mulch film. Non-polyethylene bale wrap is excluded. All bag bundles should be free of free-flowing liquids





**SOLID POLYSTYRENE BALES** - Any non-foam container or product, with a #6 PS resin code, generated through a positive sort from curbside, drop-off or other public or private recycling collection program. Examples of solid PS containers and products include: yogurt cups and tubs, red party cups, CD “jewel” cases, disposable coffee lids, and some clamshell containers

**SOLID/FOAM POLYSTYRENE BALES** - Solid/Foam Polystyrene bales must be optically sorted by material recovery facilities and include at least 95% foam and solid/rigid polystyrene (GPPS/Crystal/HIPS). Moisture content must be less than 5%.

**DENSIFIED DEPOT GRADE FOAM POLYSTYRENE** Foam Polystyrene blocks must include at least 98% polystyrene foam. Moisture content must be less than 2%. This specification is intended for densified foam that will be used as a raw input and not further processed before extrusion. Depot grade foam is collected from the public at municipal or private drop-off facilities. Material can be densified through cold or thermal compression.

**DENSIFIED MRF GRADE FOAM POLYSTYRENE** Foam Polystyrene blocks must include at least 95% polystyrene foam. Moisture content must be less than 5%. This specification is intended for densified foam that will be used as a raw input and not further processed before extrusion. MRF grade foam is foam sorted from residential recycling programs by material recovery facilities. Material can be densified through cold or thermal compression.

## PLASTIC COMMODITY TERMS IN ADDITION TO BALE SPECIFICATIONS

### PET BOTTLES AND THERMOFORMS

PET bottles, jars and thermoforms commingled

### HDPE - MIXED NATURAL AND COLORED BOTTLES

Mix of all HDPE bottles, defined with a neck or mouth smaller than the base, no pigment separation, may or may not include containers

### PP BOTTLES

PP bottles, defined with a neck or mouth smaller than the base

### PET and HDPE Bottles

PET & HDPE Bottles combined

### Mixed Clamshells

A mixture of PET, PS, PVC, PLA thermoformed containers (trays, cups, clamshells, boxes)

## PLASTICS RECYCLING TESTING TERMINOLOGY

**AIR DRY SAMPLES** To allow any samples that are water wet to dry at ambient laboratory conditions, or no greater than 40o C, so that heat does not affect the samples.

**ATTACHMENTS** Components bonded to plastic packages, for example handles or spouts, after the base item is molded and not during the molding process itself.

**CLUMPING** An effect that occurs when amorphous or low melting point polymers are mixed with crystallized polymers such as PET. The amorphous or low melting polymers become soft and sticky at elevated PET drying temperatures and act as an adhesive creating clumps of PET flake.

**COLOR VALUES** Measurements of color for PET that are typically measured by a spectrophotometer using the L\*a\*b\* system where: L\* is a measure of lightness and darkness; b\* is a measure of blueness or yellowness; and a\* is a measure of redness or green. For transparent plastics such as PET, the % haze can also be evaluated by the spectrophotometer.

**CONTROL RESIN** A resin of known composition used to minimize the effects of variables other than the ones introduced by the innovation being tested. There are resins specified that can be used as control resins. There is also a procedure that can be used to confirm that a resin not on the recommended list is suitable for use as a control resin.

**CONTROL PACKAGE** The package made using the control resin.

**DESICCANT DRYER** – A technology that uses a dessicant bed to remove moisture from the air in the dryer used to dry PET prior to molding. This results in lower moisture values in the PET flake or pellets. This is done because PET can react with moisture in an extrusion or injection molding step resulting in a loss of molecular weight.

**DIRTY FLAKE** The result when a plastic item or package has been granulated, but not washed. This flake will include the residual contents in the packaging, labels and closures on the packaging, and any dirt or contamination from collection and sorting of the packaging.



**ELUTRIATION** The process of circulating PET flakes through an air separation where flake is passed down with gravity through a process unit that has an up-draft of air. The up-draft is used to remove light pieces of contamination such as fines, label residue, and multi-layer residue.

**EXTRUSION** Manufacturing process in which a molten polymer is forced through a die and quickly cooled to form a continuous strand or otherwise shaped plastic.

**FLAKE (Or BOTTLE FLAKE)** The resulting small, flat shaped pieces of material created when plastic bottles are granulated

**GRANULATION** The reduction in size of large plastic parts for washing and extrusion by machine processing. Typically, rotating cutting knives are used to cut the plastic to a size that falls through a screen resulting in pieces of plastic in the range of 6 to 12 mm. These pieces are referred to as granulate or flake. Alternately referred to as “grinding”.

**INNOVATION** A general term used in APR Documents to refer to a resin, material, component or package design that is being considered for evaluation for compatibility with recycling.

**INTRINSIC VISCOSITY (or IV)** A common measure related to the molecular weight of PET resin. A sample of resin is dissolved in a solvent, and the viscosity of the solution is a measure of molecular weight. Some laboratories measure the melt viscosity of a PET resin using a capillary rheometer and use a correlation curve to relate the melt viscosity to the intrinsic viscosity. Some use the comparative terms solution intrinsic viscosity and melt intrinsic viscosity to distinguish the measurements.

**MELT FILTRATION** The process of melting plastic in an extruder and forcing it through a fine screen to filter the melt. Melt filtration is widely used to remove metals, wood and paper, thermoset materials and other unmelted physical contamination from recycled plastics.

**MULTI-LAYER CONTAINERS OR FILM** Packages made with layers of polymer. Multi-layer packaging may consist of multiple layers of the same polymer or incorporate different polymers or substances. Two common examples:

- A blow molded PET bottle with a co-injected layer of nylon to provide a container with higher oxygen and CO<sub>2</sub> barrier than can be achieved with PET alone.
- A thermoformed PP container made from a multi-layer co-extruded sheet that has layers of PP, EVOH, adhesive tie layers to bond the EVOH to the PP and perhaps a re-grind layer.

**LIBERATE** To remove an attached package component through machine processing. As an example, a package employs a tamper evident band secured to the finish of a bottle. The granulation process liberates the tamper evident band from the container finish.

**PELLETS** A form of plastic created when washed flake is extruded into a strand and chopped into uniformly sized pieces called pellets, for the purpose of achieving higher bulk density than flake with better feeding and conveying performance.

**SEPARATE** To use machine processes that take advantage of different properties of package components that have been liberated to separate them. An example is a HDPE tamper evident band on a PET bottle which separate in the float/sink step. Other separation technologies may include metals removal, size screening, air separation and flake color sortation.

**SOLID STATING** Heating PET pellets under vacuum or inert atmosphere that contains no moisture. Solid stating promotes removal of water and advances the polyester condensation reaction to build molecular weight.

**STRAND CUT PELLETS** Pellets of plastic produced by cutting the strands of plastic formed from extrusion of melted material through a die. In the laboratory, as well as commercial practice, it is common to extrude strands of plastic through a die, cool the strands in water, and then pelletize the solid strands to recover plastic pellets.

**WASHED FLAKE** Flake obtained after dirty flake is washed to remove surface contamination. Washed flake also goes through a variety of other steps to remove contamination and improve uniformity. These steps can include: float/sink tank separation, metals removal, size screening, air separation, and flake color sortation.

**WASH WATER** The water-based solution used to wash plastic flake. Plastics are washed under different conditions depending upon the plastic and the end use requirements. PET, for example, is commonly washed in heated water that contains a caustic detergent composition. HDPE detergent bottle flake might be washed in water near room temperature that only contains the residual detergent from the bottles.



## *Terms used with Labels, Inks and Adhesives*

### Label terms

**DE-LABELING** The process steps used to remove a label from a container.

**DE-SEAMING** The process step that removes shrink sleeve labels with adhesive seams from plastic bottles by dissolving the adhesive in hot caustic wash water, thus allowing the label to be liberated from the container.

**DIRECT PRINT LABELS** Decorations that are printed directly onto the container to create a label. Silk screening is one method used. Another gaining use is digital printing with UV cured inks.

**GENERIC LABEL** A label prepared for testing specified so as to represent any label construction within the scope of the test. Generic labels are typically printed with three chromatic inks, along with white and black ink in a test pattern.

**IN-MOLD LABELS** – Labels for plastic packages or items that are applied during the molding process, as opposed to being applied to a finished item. First, a label is printed on a plastic film. Then the label is placed in a mold and the container is molded over the label. The technology can be used in both injection molding and blow molding. The hot melted plastic of the container adheres firmly to the label film.

**INTENDED LABEL** An actual label that will be used in production; the label is intended for commercial use.

**LAMINATED FILM LABELS** Labels made by printing on the surface of a film, and then laminating a clear protective layer over the first to sandwich the ink between the two layers.

**LAMINATED PAPER AND FILM LABELS** Labels made by printing on a paper surface, then laminating a clear plastic film over the printed paper surface to sandwich the ink between the two layers.

**MONO-WEB LABELS** Plastic film labels made by printing on an exterior surface of a single film layer.

**PRESSURE SENSITIVE FILM LABELS** Plastic film labels with an adhesive backing that adhere to a package when pressed onto the surface of the package.

**PRESSURE SENSITIVE PAPER LABELS** Paper labels with an adhesive backing that adhere to a package when pressed onto the surface of the package.

**ROLL-ON SHRINK-ON (ROSO) LABELS** Labels that are wrapped around a container where the leading film edge is adhesively attached to the container and the trailing edge is adhesively attached to the leading film edge. When the label is heated with hot air or steam, the label shrinks to conform to the shape of the container.

**STRETCH LABELS** Labels made in the shape of a tube that are stretched to fit over a container.

**SHRINK SLEEVE LABELS** Labels placed around a package, usually as a preformed tube shape, that shrink to conform to the package when heated.

**WET GLUE-ON LABELS** Labels using an adhesive layer that is moistened, and then the label and adhesive are adhered to the package.

**WRAP AROUND LABELS** Labels that are wrapped around a container and fixed in place with an adhesive on the ends, but not fixed with heat like ROSO labels. Wrap around labels are typically polypropylene film or paper.

### Ink terms

**BLEEDING INK** Ink that washes off a label in substantial amounts and becomes dissolved, mixed, or suspended in wash water, to the degree that the printing and graphics are no longer legible.

**INCIDENTAL INK** The amount of ink released from the exposed cut edges of a label that becomes suspended in the wash water to the degree that it is visible, but the text and the graphics of the label are still clearly legible and visually not affected by the wash process. Some specific pigments used in inks may be slightly soluble in hot caustic wash water and introduce incidental ink color into the wash water. This incidental ink might also be small particles of ink from cut edges.

**LAMINATED INK** The ink between the layers of a laminated label.

**OVER-VARNISH** A clear coating applied over a printed label to provide abrasion, moisture and chemical resistance.

**SOLVENT BASED INK** A type of printing ink where the ink binder is dissolved in an organic solvent; the ink is dried by heating and removing the solvent from the printed surface.

**STAINING INK** Ink that stains or discolors plastic as a result of the flake wash process; resulting in either discoloration of washed flake, or of a molded part made from the washed flake.





**THERMOSET INK** A type of printing ink that is cured using UV light or an electron beam to create a cross-linked polymer binder for the ink.

**WATER BASED INK** A type of printing ink where the ink binder is dispersed primarily in water, and the ink dries as the water evaporates from the printed surface.

### Adhesive terms

**ADHESIVE ADHERED TO LABEL** Adhesive that separates from the plastic container and remains adhered to the label film after flake washing.

**ADHESIVE ADHERED TO PLASTIC** Adhesive that remains adhered to the original plastic container surface and is not removed by the washing process.

**FREE ADHESIVE** Adhesive that separates from the plastic surface as well as the label and becomes dispersed in the wash water. Typically acrylic and hot melt adhesives are dispersed as a second non-aqueous phase in wash water. Some wet glue adhesives might be soluble in wash water.

**HOT MELT ADHESIVE** A polymer composition that is fluid or viscous when heated, and then cools to provide an adhesive bonding agent.

**PRESSURE SENSITIVE ACRYLIC ADHESIVE** A common adhesive used for pressure sensitive labels.

**PRESSURE SENSITIVE HOT MELT ADHESIVE** A second adhesive type used on pressure sensitive labels.

**WET GLUE ADHESIVE** A water sensitive glue that provides an adhesive bond upon drying.

## RECYCLING LEGISLATION

**\*Click links for additional information\***

**BOTTLE BILL OR CONTAINER DEPOSIT LAW** A law which requires a minimum refundable deposit on beer, soft drink or other beverage containers to encourage the return of these containers for recycling.

**PLASTIC BOTTLE DISPOSAL BAN** A law that prohibits landfill disposal of plastic bottles by generators or collectors. The intent of disposal bans is to encourage recycling

**PLASTIC BAG BAN** A local ordinance or state law prohibiting retail locations from providing free carry-out plastic bags to

their customers. Some bans provide exceptions if recycling rates are met, or if bags contain some recycled content.

**MANDATORY RECYCLING** A law that requires generators to recover and recycle specified materials instead of disposing. Various logistical systems are used. Some mandatory recycling systems require commercial business to establish recycling opportunities for their customers or guests, and some require collectors or haulers to offer recycling collection services to their solid waste customers.

**RIGID PLASTIC PACKAGING CONTAINER (RPPC) LAW** (AB 2020) California's groundbreaking legislation enacted in 1991 as part of an effort to reduce the amount of plastic waste disposed in California landfills and to increase the use of recycled postconsumer plastic.

## PUBLIC POLICY INITIATIVES

**EXTENDED PRODUCER RESPONSIBILITY** a strategy to impose accountability over the entire lifecycle of products and packaging introduced to the market. this may take the form of legislation that mandates private sector roles, responsibilities and outcomes for the funding and operating of systems designed to recover post-consumer packaging.

**PAY-AS-YOU-THROW (PAYT)** A fee structure for solid waste collection and disposal that is based on the amount of solid waste generated. Under a PAYT system, residents are charged a variable rate depending on the amount of service they use. Most communities with PAYT charge residents a fee for each bag or can of waste they fill. In a few communities, residents are billed based on the weight of solid waste.<sup>ii</sup> In many PAYT communities recyclables are collected at no charge.

**PRODUCT STEWARDSHIP** An environmental management strategy in which all parties involved in the design, production, sale and use of a product, including manufacturers, retailers, users and disposers, share responsibility for reducing the product's environmental, health and social impacts throughout its life. Product stewardship can be either voluntary or required by law.<sup>iii</sup>

**SHARED PRODUCER RESPONSIBILITY** A form of product stewardship in which producers of consumer goods are responsible for the management of products at the end of their useful life.

**SHARED RESPONSIBILITY** A form of materials management in which producers of consumer goods, retailers, those who use a product and those who dispose of a product are recognize they are jointly responsible for the management of products

at the end of their useful life. The division of responsibility and actions taken will vary.

**VOLUNTARY PRODUCER RESPONSIBILITY (VPR)** A range of voluntary approaches, financed by industry, to increase post-consumer material recovery. Approaches to VPR may include cross competitor industry collaboration, coalition building, and public-private partnerships to achieve goals. VPR does not necessarily include supporting legislation.

**ZERO WASTE** The reduction of solid waste generation to zero, or as close to zero as possible by minimizing solid waste generation.

## RESOURCES

<sup>i</sup> Adapted from definitions found at <http://www.sherbrooke-oem.com/optical-sorter> and [http://www.eaglevision.com/optical\\_sorting](http://www.eaglevision.com/optical_sorting).

<sup>ii</sup> Adapted from <http://www.epa.gov/solidwaste/conserve/tools/payt/index.htm>.

<sup>iii</sup> Adapted from definitions found at [www.productstewardship.us](http://www.productstewardship.us) and <http://www.epa.gov/epawaste/conserve/tools/stewardship/index.htm>.

<sup>iv</sup> Adapted from Oxford University Press.

<sup>v</sup> Adapted from Plastics Recycling Outreach and Commodity Terms- a project managed by Moore Recycling and sponsored by The American Chemistry Council found at <http://www.recycleyourplastics.org/recycling-professionals/education/terms-tools-app/>