Recycling symbols (U.S.)

Recycling symbols can be further divided into two separate categories.

1. 'Recyclable' symbols marking products made from specific materials that are suitable for recycling depending on whether there is a collection mechanism in place within the local community for those particular materials.
2. 'Recycled' symbols designating products containing recycled materials.

The use of the terms 'recycled' and 'recyclable', among others, and the display of the symbols is governed by the Federal Trade Commission's Guides for the Use of Environmental Marketing Claims. These guidelines govern all environmental claims attached to and/or associated with products, including those described in labeling, advertising, and all forms of marketing.

The international standard for defining environmental claims on products or packaging can be found in ISO 14021: Environmental Labels and Declarations-Self-declared Environmental Claims.

'Recyclable' symbols

The symbols to the left represent two variations of the original recycling symbol. The upper symbol in outline form is accepted as the traditional, or universal recycling symbol while the lower one was a modification. Paper products typically display the outline form, often with lettering such as- 'This product can be recycled' or 'Recyclable'. When identified with one of the symbols, products, containers or packaging materials are referred to as recyclable products, or products that are able to be recycled. A product marked with either symbol can be recycled if the regulations and/or ordnances of the local community provide for its collection. Although the symbols are used on products distributed nationwide, the laws governing collection of these products for the purpose of recycling are determined

locally and vary widely from locality to locality.

'Recycled' symbols

A product, which may be a container or package, marked with this symbol was manufactured with at least some materials that have been recycled. Generally, additional information is conveyed with the symbol such as- 'Printed on recycled paper'.

When a percentage is indicated within the symbol, that percentage of the product has been made from recycled materials.

These last two symbols are 'recycled' symbols and are portrayed in a graphical style consistent with the original recycling symbol promulgated by the American Forest and Paper Association and its forerunners, including the American Paper Institute and the Container Corporation of America. These symbols are typically used on paper and paperboard products. On these products you will usually see the 'recycled' symbol with an explanation denoting the percentage of recycled content. However, even paper and paperboard products already made from recycled materials can be considered recyclable.

A third 'recycled' symbol is also in use. This symbol differs from the first two by having solid black arrows within an outer black circle. The outer black circle denotes that at least some content came from recycled material. This symbol is also seen with arrows of a particluar color.

'Recycled' symbol for paperboard

CARTON MADE WITH
100% Recycled Paperboard®
MINIMUM 25% POST CONSUMER CONTENT

In recent years a new 'recycled' symbol specific to the use of recycled paperboard has been developed. The graphical portion is a registered trademark and is controlled by the 100% Recycled Paperboard Alliance, an association of paperboard manufacturers, and is commonly seen on folding cartons or paperboard containers such as cereal boxes.

For illustration purposes only on this webpage, the registered trademark is shown in green while the descriptive explanation (not registered) is presented in black and varies

from product to product. The symbol and explanation, as might be displayed on a carton, can be interpreted as follows. The paperboard material of the carton has been made from 100% recycled content. Of that recyled content, at least 25% came from post consumer content. In other words, at least 25% of the paperboard used to make the carton came from recycled products that passed through the hands of consumers. The remaining recycled paperboard content most likely resulted from material discarded from an earlier manufacturing process. Remember, even though a product has been made from recycled materials, that same product can still be recycled for use in another product whose material requirements are less stringent.

'Recyclable' symbol for glass

The Glass Packaging Institute (GPI) has also developed a 'recyclable' symbol for use on glass packaging that can be recycled. Although most glass containers can be considered recyclable, the symbol nevertheless encourages the systematic identifying, and reusing, of recyclable materials.

'Recyclable' symbol for corrugated

Lastly, the Corrugated Packaging Council (CPC) has developed a 'recyclable' symbol for use on corrugated packaging that can be recycled. The symbol may be used without specific permission on all corrugated products that are readily recyclable. If a corrugated product is coated with a material that is not repulpable (not convertible to pulp), then it is not readily recyclable. A wax or asphalt coating, for example, prevents a corrugated product from being readily recyclable. The symbol is merely a general statement that the corrugated product on which it appears can be recycled. It is not meant to imply that any content was already recycled or a product of recycling. The CPC is a non-profit organization that develops and coordinates industry-wide programs to address corrugated packaging issues. It is sponsored by the Association of Independent Corrugated Converters (AICC), and the Fibre Box Association (FBA).

'Recyclable' symbols for plastic bottles, containers and packaging

---

PETE | HDPE | PVC | LDPE | PP | PS | Other
R- resins: ALREADY RECYCLED | Symbols without Acronyms

Plastic bottles, containers and packaging typically have a symbol that indicates the type of plastic resin from which the item was made. The resin coding system was introduced in 1988 by the Society of the Plastics Industry (SPI). The symbols imprinted on plastic bottles, containers and packaging are a variation of the original three wide mobius arrows. They have been modified to a simpler and thinner version. SPI has promulgated a guide for the correct usage of the symbols. On a bottle, the symbol can usually be found on the bottom, molded into the plastic itself as a raised impression and thus not always easily seen. The symbol includes a number within the mobius arrows, and usually, but not always, the chemical resin below the mobius arrows in acronym form. Although presence of the symbol implies that the plastic item is recyclable, the symbol is actually only intended to identify the plastic resin from which the item was made. Recyclability is ultimately determined by the local governing ordnances concerning what materials are collected for recycling.

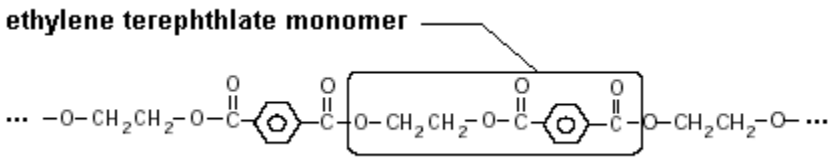
More information: Association of Postconsumer Plastic Recyclers (APR)

Polyethylene Terephthalate (PETE or PET)

MOLECULAR FORMULA:

$$(\text{-CO-C}_6\text{H}_4\text{-CO-O-CH}_2\text{-CH}_2\text{-O-})_n$$

OR



Within the United States PETE is an acronym that is used specifically by manufacturers to mark and identify plastic bottles or containers made from polyethylene terephthlate for the purpose of recycling. The acronym PET is more generally utilized within the chemical industry to designate the plastic material polyethylene terephthalate, which can also be written as poly (ethylene terephthalate). PET is the acronym accepted by standards organizations including American Society for Testing and Materials International, (ASTM International- formerly just ASTM), and the International Organization for Standardization (ISO). Nevertheless, the acronyms PETE and PET refer to the same class of plastic materials. In the discussion below, PETE is used in reference to a recyclable container made from PET, while PET refers directly to the plastic material polyethylene terephthlate. However, please note that packaging manufactured outside of the U.S. may utilize the marking PET.

Properties: toughness, strength, heat resistance, barrier to moisture and gas. Density: 1.35-1.38 g/cc

Statistic: In 1999 PET accounted for 48% of plastic bottle resin sales, making it the most widely used resin in plastic bottles

Description: PET, also referred to as polyester, is a popular packaging material for food and non-food products because it is inexpensive, lightweight, resealable, shatter-resistant and recyclable. PET is clear and has good moisture and gas barrier properties. Its color may be green. The flakes and pellets of cleaned postconsumer recycled PET are in heavy demand for use in spinning carpet yarns and for producing fiberfill and geotextiles.

Packaging applications: Soft drink bottles, water bottles, beer bottles, mouthwash bottles, peanut butter containers, salad dressing containers, juice bottles, vegetable oil bottles

Recycled products: Fiber, tote bags, new PETE containers for both food and non-food products, fabric for clothing, athletic shoes, luggage, upholstery, furniture, carpet, fiberfill for sleeping bags and winter coats, industrial strapping, sheet, and film, and automotive parts, such as luggage racks, headliners, fuse boxes, bumpers, grilles and door panels

More information: National Association for PET Container Resources (NAPCOR)

Although the acronym PETE was adopted by manufacturers to identify packaging made from PET, primarily in resposnse to a potential trademark dispute, a recycling symbol that includes the designation PET rather than PETE has been identified on packages of products imported from outside of the US.

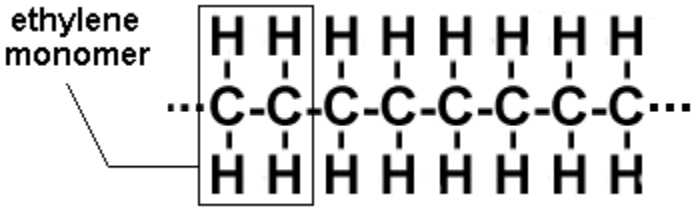
(NOTE: C_6H_5 in the molecular formula comprises a benzene ring. Benzene is generally considered a carcinogenic substance.)

High Density Polyethylene (HDPE)

MOLECULAR FORMULA:

$$(\text{-}CH_2\text{-}CH_2\text{-})_n$$

OR



The C=C double bond in an ethylene monomer is transformed into a C-C single bond in the polymer.

Properties: toughness, strength, stiffness, ease of forming, ease of processing, resistance to moisture and chemicals, permeability to gas. Density: 0.94-0.96 g/cc

Statistic: In 1999 HDPE accounted for 47% of plastic bottle resin sales, making it the second most widely used resin in plastic bottles. HDPE and PETE together accounted for 95% of plastic bottle resin usage.

Description: Bottles made from HDPE come in both pigmented and unpigmented resins. The unpigmented resin is translucent. It also has good stiffness and barrier properties. Thus, it is ideal for packaging products having a short shelf-life such as milk. HDPE's good chemical resistance allows it to be used in containers holding household or inductrial chemicals. The pigmented resin has even better crack resistance and chemical resistance than the unpigmented resin.

Packaging applications: Milk containers, juice bottles, water bottles, bleach, detergent, and shampoo bottles, trash bags, grocery and retail carrying bags, motor oil bottles, butter and margarine tubs, household cleaner bottles, yogurt containers, and cereal box liners

Recycled products: Drainage pipe, liquid laundry detergent bottles, oil bottles, pens, benches, doghouses, recycling containers, floor tile, picnic tables, fencing, lumber, and mailbox posts

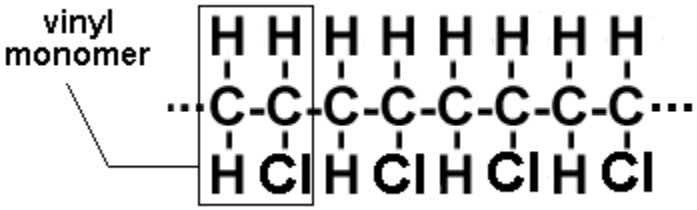
Plastic bag manufacturers have adopted a somewhat different symbol identification for HDPE as shown at the left.

Polyvinyl Chloride (PVC, sometimes V)

MOLECULAR FORMULA:

$$(\text{-}CH_2\text{-}CHCl\text{-})_n$$

OR



The C=C double bond in each monomer is transformed into a C-C single bond in the polymer.

The V in the first (and original) symbol actually stands for vinyl, however, the plastic resin is usually referred to as polyvinyl chloride (PVC) and therefoere the symbol has evolved to the resin designation of PVC.

Properties: toughness, strength, ease of blending, ease of processing, resistance to grease, oil, and chemicals, clarity.
Density: 1.32-1.42 g/cc

Statistic: In 1999 PVC accounted for 2% of plastic bottle resin sales.

Description: Vinyl, or polyvinylchloride, has stable electrical and physical properties. It has excellent chemical resistance and good weatherability. Its flow characteristics make it well-suited for injection molding.

Packaging applications: Window cleaner bottles, cooking oil bottles, detergent bottles, shampoo bottles, clear food packaging, wire and cable jacketing, medical tubing, with additional significant usage in household products and building materials, particularly siding, piping, and windows

Recycled products: Binders, decking, paneling, mudflaps, roadway gutters, flooring, cables, speed bumps, and mats

More information: The Vinyl Institute, Vinyl products

NOTE: The Cl (chlorine atom) in the molecular formula renders PVC a potentially toxic material when it is burned. The burning of PVC can result in the creation of dioxins, a material that is considered highly carcinogenic.

Low Density Polyethylene (LDPE)

MOLECULAR FORMULA:

$$(- CH_2 - CH_2 -)_n$$

Properties: toughness, strength, flexibility, ease of sealing, ease of processing, barrier to moisture. Density: 0.91-0.93 g/cc

Statistic: In 1999 LDPE accounted for just 1% of plastic bottle resin sales.

Description: Because of its toughness , flexibility, and transparency, LDPE is commonly used in applications where heat sealing is necessary. It is also widely used in wire and cable insulation and jacketing.

Packaging applications: Squeezable bottles, breadbags, frozen food bags, tote bags, clothing, furniture, dry cleaning bags, and carpet

Recycled products: Film and sheet, loor tile, garbage can liners, shipping envelopes, furniture, compost bins, paneling, trash cans, lumber, landscaping ties

Plastic bag manufacturers have adopted somewhat different symbol identifications for LDPE bags as shown at the left.

(NOTE: The molecular formulas for LDPE and HDPE are the same. The difference in the plastics is the density of the molecular chains. The density varies in the manner in which the polymeric chains form. In HDPE the chain is essentially one long continuous chain, allowing the strands to fold back upon one another and densely occupy space. In LDPE the chains have multiple branches, which interfere with a neatly organized packing of chains. Instead the packing is more disorganized, occupying more space and thus resulting in a lower density.)

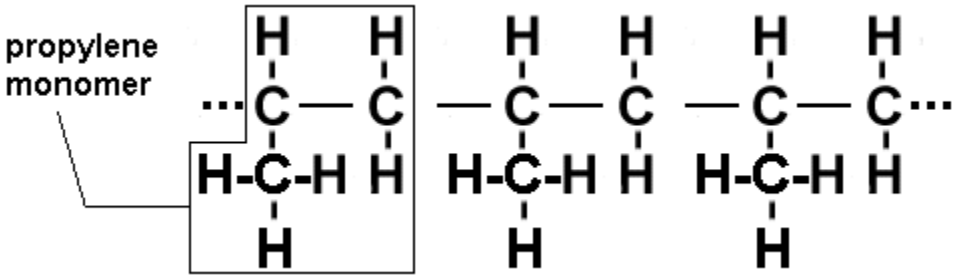
Plastic bag manufacturers are also making their products using low low density polyethylene, a symbol for which appears to the left. As you might guess, low low density polyethylene has a molecular density even less than low density polyethylene.

Polypropylene (PP)

MOLECULAR FORMULA:

$$(\text{-CHCH}_3\text{-CH}_2\text{-})_n$$

OR



The C=C double bond in each monomer is transformed into a C-C single bond in the polymer.

Properties: toughness, strength, resistance to heat, grease, oil, and chemicals, barrier to moisture. Density: 0.90-0.92 g/cc

Statistic: In 1999 PP accounted for 2% of plastic bottle resin sales.

Description: Polypropylene has the lowest density of the resins used in packaging. It is strong and is resistant to chemicals. Since it has a high melting-point it can be utilized in applications requiring that a container be filled with a hot liquid.

Packaging applications: Yogurt containers, syrup bottles, ketchup bottles, caps, straws, medicine bottles

Recycled products: Signal lights, battery cables, brooms, brushes, auto battery cases, ice scrapers, landscape borders, bicycle racks, rakes, bins, pallets, and trays

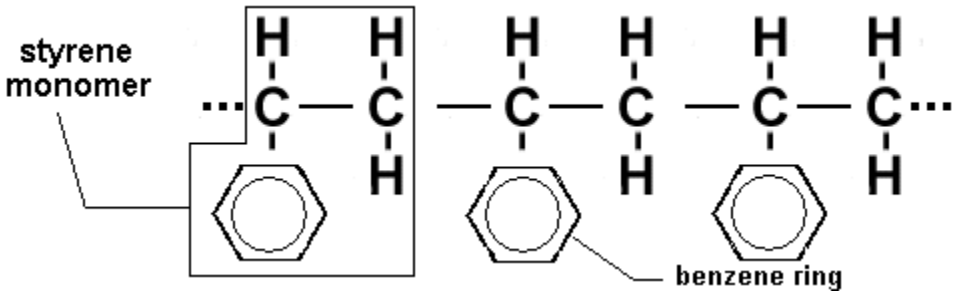
An alternative recycling symbol for polypropylene utilizing the original design for the mobius arrows, but inverted, is shown to the left.

Polystyrene (PS)

MOLECULAR FORMULA:

$$(-CHC_6H_5-CH_2-)_n$$

OR



The C=C double bond in each monomer is transformed into a C-C single bond in the polymer.

Properties: ease of forming, clarity, low heat transfer, good thermal insulation. Density: 1.03-1.06 g/cc

Statistic: In 1999 PS usage as a plastic bottle resin was essentially nil.

Description: Polystyrene can be made into rigid or foamed products. It has a relatively low melting point.

Packaging applications: Plates, cups, cutlery, meat trays, egg cartons, carry-out containers, aspirin bottles, compact disc jackets

Recycled products: Thermal insulation, light switch plates, egg cartons, vents, rulers, foam packing, carry-out containers

More information: Polystyrene Packaging Council (PSPC), Alliance of Foam Packaging Recyclers (AFPR)

(NOTE: C_6H_5 in the molecular formula comprises a benzene ring. Benzene is generally considered a carcinogenic substance.)

Other

Properties: varies according to constituent resins

Statistic: In 1999 there was minimal usage of resins in the 'other' category in plastic bottles.

Description: The category of "Other" includes any resin not specifically numbered 1, 2, 3, 4, 5, or 6, or combinations of one or more of these resins.

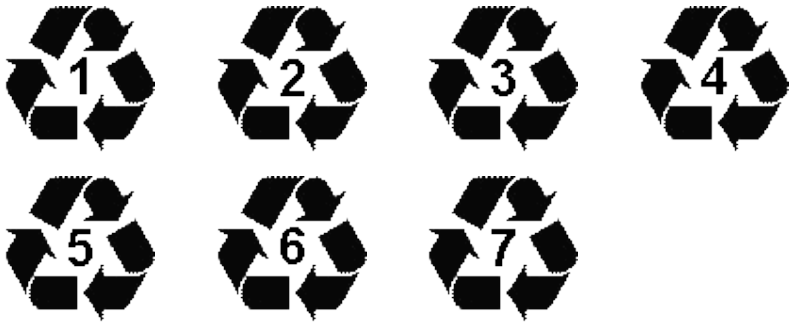
Packaging applications: Three and five gallon water bottles, certain food product bottles

Recycled products: Plastic lumber, custom-made products

Resin Symbols without Acronyms

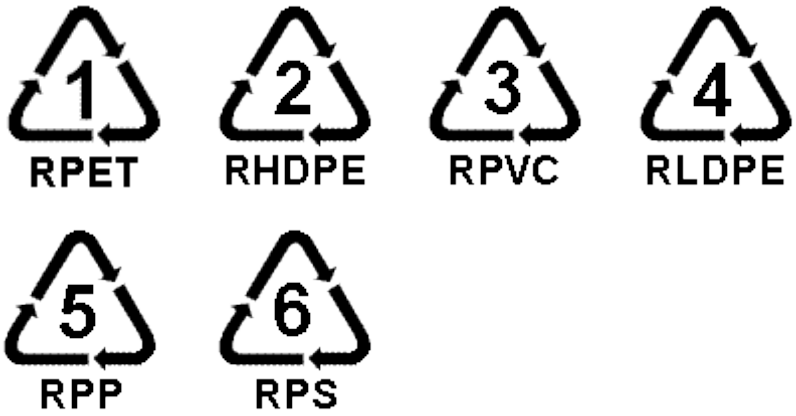
You may come across recycling symbols that only indicate a number without an acronym for the plastic resin. The plastic resin of containers or packing labeled in this manner can be identified by this number and although not as informative compared to an acronym listed below the symbol, it is certainly a workable means of identifying and classifying recyclable plastics.

Alternative Plastic Resin Recycling Symbols



An altenative recycling symbol for plastic resins may be encountered embodying the original mobius three-chasing arrows together with a number in the center. These symbols may appear with or without a descriptive acronym.

R-resins: ALREADY RECYCLED



You may ask, all those plastic bottles that are recycled, or those newspapers, what happens to them? Generally, a product that is recycled is remanufactured into a new product that has less demanding specifications for the new use of the recycled product. In the case of paper products, the white copy paper may end up as newsprint. Newsprint may end up as toilet paper. Plastic materials may be recycled into a packaging material of less stringent requirements. Thus, resins that have become a recycled product, are further identified with an R in front of the previous designation in order to denote that the material has already been recycled. The symbols identifying these products are shown

above. As an example, RHDPE is the acronym interpreted as recycled high density polyethylene. However, keep in mind that the R-materials still have potential for further recycling.

Acrylonitrile Butadiene Styrene (ABS)

Properties: resilient, low density, rigid, impervious

Description: Acrylonitrile butadiene styrene was not part of the original resin identification system.

Applications: Pipes, car bumpers, toy building blocks, golf club heads, enclosures

(NOTE: The three components of ABS, acrylonitrile, butadiene and styrene are considered probable human carcinogens.)

Origin of the recycling symbol

The original recycling symbol was designed in 1970 by Gary Anderson, a senior at the University of Southern California at Los Angeles. It was submitted to the International Design Conference as part of a nationwide contest for high school and college students sponsored by the Container Corporation of America. The contest was a result of continuing growth of consumer awareness and environmentalism and a response to the first Earth Day.

The recycling symbol represents a Mobius loop consisting of three-chasing-arrows in the shape of a triangle having rounded vertices. Each arrow twists and turns itself, and all three arrows chase each other. It is a consummate representation of recycling. The mobius loop itself was discovered in 1858 by August Ferdinand Möbius (1790-1868), a German mathematician and astronomer, and has been a mathematical marvel of simplicity, singularity, and continuity ever since.

Meaning of the recycling symbol

Each of the three arrows can represent one step in a three-step process that forms a closed loop, the recycling loop. The first step represents collection of materials to be recycled. This step takes place when recyclable materials are placed into your curbside recycling bin or taken to a local collection center. The collected materials are then cleaned and sorted for sale to a manufacturing facility. The manufacturing process is the second arrow in the recycling symbol. The recyclable materials are manufactured into new products for retail or commercial sale. The third step is the actual purchase and use of the products made from the recycled materials. The loop is now complete.

Remember the three R's- Reduce, Reuse and Recycle

Evolution of recycling symbols

The present resin identification coding system that is detailed above was introduced by the Society of the Plastics Industry (SPI) in 1988 at the urging of recyclers around the country. In an effort to decrease the volume of waste subject to tipping fees at landfills, a growing number of communities were implementing recycling programs. These programs were often driven by state-level recycling mandates. The resin identification code was developed to meet recyclers needs while providing manufacturers a consistent, uniform system that could apply nationwide.

The resin identification coding system offered a means of identifying the resin content of bottles and containers commonly found in the residential waste stream. By identifying the resin content, consumers would know what types of plastic packaging were being utilized, and hence, which ones could be recycled. Consumers were, and will always be, the first line of action in any effective recycling program. The bulk recyclers would also filter the incoming stream of post consumer recyclables by looking at the code on the plastic packaging.

Since the first recycling symbol was designed, and the plastic resin codes introduced, certain industries have developed unique symbols specific to an industry. For example, industry associations for glass, for paperboard, and for corrugated materials have all developed, and in some cases trademarked, unique recycling symbols. These three separate symbols can all be classified as 'recyclable' symbols.

Miscellaneous recycling symbols

A generic form of the plastic resin identification codes without the number is also being utilized to designate recyclability of products that aren't plastic. Usually there is descriptive text designating the particular content.

In a further twist to the evolution of recycling symbols, at least one individual company has promulgated its own version of a 'recycled' symbol. Hewlett-Packard identifies its packaging materials with a symbol that is similar to the 'recyclable' symbol for plastic resins. In the 'recycled' symbol that is depicted the basic material is of course paper. The first number of the pair tells the minimum percentage of post-consumer recycled content (in this case 50%), while the second number denotes the total recycled content (in this case 80%). Other materials, including plastics, are identified with an appropriate labeling.

The symbol with the blue background shows the three arrows in a planar context. This particular symbol is a relatively new arrival.

The Rechargeable Battery Recycling Corporation (RBRC) is a non-profit, public service organization that promotes the recycling of portable rechargeable batteries. These batteries are typically found in cordless power tools, cellular and cordless phones, laptop computers, camcorders, digital cameras, and remote control toys. Nickel cadmium (Ni-Cd) batteries, nickel metal hydride (Ni-MH) batteries, lithium ion (Li-ion) batteries, and small sealed lead (Pb) batteries weighing less than 2 lbs are all accepted for recycling. Please keep in mind that batteries CAN NOT be deposited for recycling in a curbside recycling container with other recyclable products. Batteries must be delivered to a battery collection site. Visit the RBRC website to find a nearby collection site or call the phone number shown on the recycling symbol. The collection sites are widely available and include large well-known retailers such as Sears, Home Depot, Wal-Mart and Target among others.

The 'Green Dot' (Der Grüne Punkt)

The green dot (in German- der grüne punkt) was orignally developed by Duales System Deutschland AG, a privately owned non-profit German company, in 1991. It has since been adopted by other countries of the European Union including Austria, Belgium, France, Germany, Ireland, Luxembourg, Portugal, Spain and Sweden. It has also been adopted in the non-EU countries Latvia, Norway, the Czech Republic, Hungary and Poland.

In 1995, a general license for the 'green dot' was transferred to Packaging Recovery Organisation Europe s.p.r.l., otherwise known as PRO EUROPE, having its headquarters in Brussels, Belgium. PRO EUROPE licenses the 'green dot' to nationally recognized systems set up in European Member States to implement the European Directive on Packaging and Packaging Waste dated December 20, 1994, with the further objective of making the 'green dot' at least a pan-European trademark.

The 'green dot', as utilized in Europe, carries a somewhat different meaning than the recycling symbols used in the United States. The presence of a 'green dot' symbol on packaging denotes that the manufacturer of the package has purchased a license for the right to use the 'green dot' trademark. The cumulative license fees fund a system of not only recovering and recycling packaging materials, but also of minimizing the use of packaging material, and of creating packaging that is easier to recycle.

Closing statement

Other specialized symbols for aluminum cans and steel cans are being utilized by individual manufacturers. Therefore, the trend in the evolution of recycling symbols can be summarized as follows:

1. First, birth of what was intended to be a universal recycling symbol.
2. Second, divergence of the original recycling symbol into a 'recycled' symbol and a 'recyclable' symbol, with variations of each.
3. Third, proliferation of industry-specific recycling symbols of the 'recyclable' variety together with use of unique symbols by individual companies, and by other regions of the world.
4. Lastly, additional symbols will continue to appear as new variations and categories of recycled and recyclable products are developed.

SPREAD THE WORD-
REDUCE, REUSE, RECYCLE!!