
**aluminum** is a lightweight, silver-white metal that makes up approximately 7 percent of the Earth's crust. Virgin (new) aluminum comes from bauxite ore which is the mineral containing the aluminum. Bauxite must be mined and this is an energy intense activity; however, once made, aluminum is easily recycled over and over again saving energy and valuable resources. One of the most common uses of aluminum is for soft drink cans.

# did you know...

- Aluminum cans can be recycled in most communities.
- Typically, the aluminum gets recycled into new cans.
- It takes between100-500 years for an aluminum can to decompose but it takes less the 60 days for an aluminum can to be recycled and end up back on the grocery shelf.
- Aluminum was discovered in the 1820s, and is the most abundant metal on earth.
- The empty aluminum can is worth about 1 cent.
- Currently about two out of three cans consumed in the US are recycled – so about 62% (an average of 113,204 aluminum cans every minute of everyday). The goal of the aluminum industry is to recycle over 75%.
- Making new aluminum cans from used cans takes 95% less energy, and 20 recycled cans be made with the energy needed to produce one can using virgin ore.
- Recycling one aluminum can saves enough energy to keep a 100-watt bulb burning for almost four hours or run your television for three hours.

# how is it recycled?

In the USA, aluminum cans begin the recycling process either at local recycling centers, community drop-offs, charity collections, reverse vending machines or at curbside pick-up. The cans from these sources are collected at large, regional scrap processing companies. They condense the cans into highly dense, 30-pound briquettes or 1,200-pound bales (a large closely pressed package of merchandise bound and usually wrapped) and ship them to aluminum companies for melting. At the aluminum companies, the condensed cans are shredded or crushed and their coatings and outside decorations are burned off. Then the potato chip-sized pieces of cans are loaded into melting furnaces, where the recycled metal is blended with new, virgin aluminum. The molten aluminum is poured into 25-foot long ingots (molds) that weigh over 30,000 pounds.
The ingots are fed into rolling mills that reduce the metal thickness from 20+ inches to sheet that is about 10/1000 of an inch thick. This metal is coiled and shipped to can makers, who produce can bodies (the side of a can is the same thickness as a human hair!) and lids. They in turn deliver cans to beverage companies for filling. The new cans return to the store shelves or vending machines in as few as 60 days. Then the process starts all over again.

# what is it made into?

The three main areas where aluminum is used include cars, soda cans and other packaging, and building construction products. In 2000, aluminum passed plastic--with average content of 257 lbs per vehicle--to become the third most-used material in automobiles. Packaging includes food containers and aluminum foil. Aluminum building construction products are used in homes, industry, commercial businesses, farms, and in highway projects.


A **battery** is a device comprised of one or more cells filled with chemicals. These chemicals interact to produce electrons, and the movement of these electrons results in an electric current. Batteries power products that require electricity to work, and are useful because they allow us to transport electricity and use products in locations where there may be no electrical outlets available. Batteries come in different shapes and sizes, and utilize a variety of different chemicals. Once a battery is used up, it is important to recycle it because some batteries can contain heavy metals such as mercury, cadmium, and lead which can enter our air, ground, and surface water when the batteries are disposed of in landfills and Waste-to-Energy (WTE) Facilities.

# did you know...

- The most common household battery is a primary dry cell battery. Primary batteries can only be used once. When the electrolyte solution has been used up, the energy is no longer available and the battery is said to be expired. At this time the battery is no longer useful and should be disposed of responsibly. An example of a primary dry cell battery is an alkaline battery. Consumers refer to these batteries as AA, AAA, D, etc... These batteries power our flashlights and toys.
- Every year, more than 3 billion batteries are used and then thrown away by American households who use both single-use and rechargeable dry cell batteries. That equals 125, 000 tons of batteries discarded every year. If these batteries were in the form of AA batteries, and placed end to end, they would encircle the planet six times…per year! These batteries would fill 600 large yellow school buses each year.
- A secondary cell battery CAN be recharged and used repeatedly. When the energy is discharged, supplying electrical current to recharge the cell can restore it. A car battery (lead-acid) is an example of a secondary cell battery. It is continually recharged with the electric current of the car. When its charge becomes low (say, because you left your headlights on), we use electrical cables to "jump start" the car from another fully charged battery. However, rechargeable batteries do not last forever. Eventually, secondary cell batteries reach the end of their service life and cannot be recharged enough to restore them to a useful power level. When this happens, recycle your rechargeable batteries in your local curbside or drop-off program.
- Most rechargeable batteries can be recharged up to 1,000 times and some can supply power everyday for up to three years. Buying and utilizing rechargeable batteries is one way you can help to keep our planet clean and safe. When rechargeable batteries are used, the overall waste is reduced because they can be recharged many times over.

# how is it recycled?

Not all batteries are the same. The procedure for recycling a battery depends on what kind of battery it is. Most rechargeable batteries contain Nickel-Cadmium. Cadmium is recovered in a special high-temperature metal recovery process with no byproducts being sent to a landfill. Cobalt and lead (car batteries) are also extracted through a high temperature process. Since Carbon-Zinc and Alkaline batteries no longer contain mercury, any decision to recycle them must include the considerations of the overall cost and time needed to collect, transport and recycle them. In the United States, battery companies are investigating the possibility of recycling the zinc, manganese and/or steel in the batteries. Under federal law, Carbon-Zinc and Alkaline- Manganese batteries are no longer considered to be hazardous waste since they no longer contain mercury, and can be disposed of in the normal manner; however, they are short-lived and contribute to the municipal solid waste. Many communities have long since passed laws that regulate the sale, disposal or mandatory recycling of all kinds of batteries.

# what is it made into?

The recovered cadmium is purified before being used once again to make new rechargeable batteries. The recycled nickel and iron go back to the steel industry to be used in making stainless steel products, like cooking pots and pans. The plastic cases that coat the battery are separated from the cells prior to processing and are used as a fuel in a special furnace.


**glass** is a hard, brittle, generally transparent or translucent material typically formed from the rapid cooling of liquefied minerals. Glass was discovered a long time ago, when some people saw lightening strike a sandy beach. The sand grew very hot and melted. When it cooled, the sand turned into glass. Today glass is made in factories where millions of bottles are made each day. Most commercial glass is made from a molten mixture of soda ash, sand, and lime.

## did you know...

- When glass is made in factories, sand is mixed with soda ash and limestone. Then it is heated in a large furnace. When the sand gets hot, it melts, turning into a hot, thick liquid called molten. Finally, the molten glass is poured into molds and air is blown through to create the shape of a bottle.
- Glass bottles and jars can be recycled over and over again. There is no limit.
- Glass furnaces are heated to 2700 degrees in order to melt cullet (crushed glass) into molten. That is 27 times as hot as a 100 degree summer day.
- Cullet melts more easily than sand. So when recycling factories use cullet, they can turn down the temperature in their furnace and that saves energy!
- Using cullet in place of other natural ingredients saves natural resources.
- If any metal gets mixed in with the molten glass, the new glass will break easily. This is why it is important to remove all metal caps, rings, and lids from containers.

## how is it recycled?

Glass bottles can be recycled in most communities. Generally, you need to rinse bottles and jars and remove all metal caps, rings, and lids. Sometimes, your program asks you to separate glass into three colors – brown, clear, and green – or the glass is sorted one it is collected. The glass gets taken to a recycling center where it is crushed and then sent to a glass factory. The crushed glass is called “cullet.” At the glass factory, the glass is mixed in with sand and minerals. The mixture is then heated and melted into molten in order to produce new, recycled glass bottles and jars.

## what is it made into?

Glass bottles and jars! When a glass container is recycled, then new glass container is just as strong and useful as a container made from raw materials.
However, some kinds of glass are made from different ingredients than glass bottles and jars.
For instance, window glass, drinking glasses, dishes, and mirrors are all made differently and therefore, cannot be recycled with glass bottles and jars. Recycled glass is also used to make tile and is sometimes used in road paving.


**paper** is made of pulp from wood, rags, or other fibrous materials and used for writing, printing, or wrapping. Paper is easilty recycled saving energy and valuable resources. Each time it is recycled (up to about seven times maximum), the paper fibers get shorter and shorter. High-quality papers such as office paper have long fibers, and as they are recycled into items like bags, boxes and tissues, you can see the fibers get shorter.

## did you know...

- Enough paper is collected for recycling each year to make a box-car train 7,600 miles long!
- Americans recycle much more paper than we send to landfills.
- The average office worker can recycle enough office paper each week to fill a paper grocery bag – about 15 pounds. So ask your parents to reuse and recycle paper at work!
- You could build a 12-foot high wall from Los Angeles, California to New York City, New York with all the writing paper and office paper collected each year. Wow!
- 84% of Americans recycle their used paper by putting it in their curbside recycling bin or by recycling it at a local drop-off sites in their community.
- Americans recycle more than 60% of the newspapers bought each day. That's almost two out of every three newspapers end up in the recycle bin!
- In the US, one-third of the fiber material used to make new paper items, comes from recycled paper.

## how is it recycled?

Do you ever wonder what happens to paper once it is taken away for recycling? It's a neat process that has several steps:

1. First the paper is separated from other recyclable items like plastic and glass and put in to bales, which are bundles of paper tied with wire.
2. The paper is then sent to a paper mill to be recycled.
3. At the paper mill, the paper is shredded, washed and mashed into a watery mixture called pulp. Unwanted items, like plastic from envelopes and metal staples, are taken out.
4. Once clean, the pulp is spread in a thin, even layer over a wire screen and dried.
5. The paper is then put on big rolls and sent to places that make it in to new products.

## what is it made into?

Can you identify these products in your household that are made with recycled content paper? Check to see if their package says they are made of recycled paper.

| | |
|---|---|
| Writing paper | Newspaper |
| Cardboard boxes | Cereal boxes |
| Toilet paper | Tissue paper |


**plastic** is a material made from petroleum capable of being molded, extruded, or cast into various shapes. There are many different kinds of plastic made from different combinations of compounds. To learn more about the plastic resin codes #1-#7 and what these plastics are recycled into, check out the chart below!

If you are not sure which plastic the containers are made of, there should be a small triangle embossed on the bottom of these containers with a number in it -- a triangle with a "1" is #1 plastic, a triangle with a "2" is #2 plastic, etc. This is the resin code.

| Resin Code | Descriptions | Properties | Packaging Applications | Recycled Products |
|---|---|---|---|---|
| 1 PETE | Polyethylene Terephthalate (PET, PETE) is clear, tough, and has good gas and moisture barrier properties. Nickname: Polyester. | Clarity, strength, toughness, barrier to gas and moisture, resistance to heat. | Plastic soft drink, water, sports drink, mouthwash, catsup and salad dressing bottles. Peanut butter, pickle, jelly and jam jars. Ovenable film and ovenable prepared food trays. Strapping, and non-food containers. | Fiber, tote bags, clothing, film and sheet, food and beverage containers, carpet, strapping, fleece wear, luggage and bottles. |
| 2 HDPE | High Density Polyethylene (HDPE) is translucent, has good barrier properties and stiffness, and is well suited to packaging products with a short shelf life such as milk. | Stiffness, strength, toughness, resistance to moisture, permeability to gas, ease of processing, and ease of forming. Note: Chemical resistance makes it good for packaging house-hold and industrial chemicals such as detergents and bleach. | Milk, water, juice, cosmetic, shampoo, dish and laundry detergent bottles; yogurt and margarine tubs; cereal box liners; grocery, trash and retail bags. Note: Pigmented HDPE bottles have better stress crack resistance than unpigmented HDPE bottles. | Liquid laundry detergent, shampoo, conditioner and motor oil bottles; pipe, buckets, crates, flower pots, garden edging, film and sheet, recycling bins, benches, dog houses, plastic lumber, floor tiles, picnic tables, fencing. |
| 3 V | Vinyl (Polyvinyl Chloride or PVC) has stable physical properties, excellent chemical resistance, good weatherability, and stable electrical properties. Diverse - can be used to make rigid and flexible materials. | Versatility, clarity, ease of blending, strength, toughness, resistance to grease, oil and chemicals. | Clear food and non-food packaging, medical tubing, wire and cable insulation, film and sheet, construction products such as pipes, fittings, siding, floor tiles, carpet backing and window frames. | Packaging, loose-leaf binders, decking, paneling, gutters, mud flaps, film and sheet, floor tiles and mats, resilient flooring, cassette trays, electrical boxes, cables, traffic cones, garden hose, mobile home skirting. |
| 4 LDPE | Low Density Polyethylene (LDPE) is predominately used in film applications due to its toughness, flexibility and relative transparency, and is popular for use in applications where heat sealing is necessary). | Ease of processing, strength, toughness, flexibility, ease of sealing, barrier to moisture. | Dry cleaning, bread and frozen food bags, squeezable bottles (e.g. honey, mustard). Also used to manufacture some flexible lids and bottles, and it is used in wire and cable applications. | Shipping envelopes, garbage can liners, floor tile, furniture, film and sheet, compost bins, paneling, trash cans, landscape timber, lumber. |
| 5 PP | Polypropylene (PP) is strong, has good chemical resistance, and a high melting point making it good for hot-fill liquids. It is found in flexible and rigid packaging to fibers and large molded parts for automotive and consumer products. | Strength, toughness, resistance to heat, chemicals, grease and oil, versatile, barrier to moisture. | Catsup bottles, yogurt containers and margarine tubs, medicine bottles. | Automobile battery cases, signal lights, battery cables, brooms, brushes, ice scrapers, oil funnels, bicycle racks, rakes, bins, pallets, sheeting, trays. |
| 6 PS | Polystyrene (PS) is versatile and can be rigid or foamed. General purpose PS is clear, hard and brittle. It has a relatively low melting point. Typical applications include protective packaging, containers, lids, cups, bottles and trays. | Versatility, insulation, clarity, easily formed. | Compact disc jackets, food service applications, grocery store meat trays, egg cartons, aspirin bottles, cups, plates, cutlery. | Thermometers, light switch plates, thermal insulation, egg cartons, vents, desk trays, rulers, license plate frames, foam packing, foam plates, cups, utensils. |
| 7 OTHER | Other. Use of this code indicates that the package in question is made with a resin other than the six listed above, or is made of more than one resin listed above, and used in a multi-layer combination. | Dependent on resin or combination of resins. | Three and five gallon reusable water bottles, some citrus juice and catsup bottles. | Bottles, plastic lumber applications. |


**tires** can be recycled in most communities. Tires are made of hot rubber, white lead, and sulfur. Synthetic rubber is formed from a combination of two gases, butadiene and styrene. When these two gases are mixed in the presence of soapsuds in a reactor, liquid latex results. The dry rubber in the liquid is coagulated into crumbs, washed, dried, and baled. It is then ready to be shipped to manufacturers to make tires and other rubber-made items.

# did you know...

- It takes seven gallons of oil to produce one tire. Five gallons of butadiene and styrene gasoline comprises the substances that tires are made out of, and two gallons of gas are used to generate the energy needed to manufacture the tires.
- Dumping waste tires in non-designated areas is hazardous to our health and to our natural habitat, AND it is against the law.
- An estimated 250 million waste tires are discarded every year.
- If you and your parents perform certain tire maintenance steps such as rotation, inflation, balance, and alignment, you can extend tire life and decrease waste tire generation by 15 percent.
- It is important to recycle your tires because improper disposal/illegal dumping can results in fires that are difficult to extinguish. When tire piles catch fire, the melted rubber generates oil that can pollute surface and groundwater. Furthermore, tire piles tend to collect water creating a perfect breeding space for disease-carrying animals such as mosquitoes, snakes, and rats.

# how are they recycled, and what are they made into?

In the USA, reusing or recycling tires keeps them out of landfills. When buying new tires, leave your old ones at the dealer. Many communities have designated recycling drop-off centers where you can safely and responsibly dispose of your tires. The majority of recycled waste tires are used as a source of energy, otherwise known as tire-derived fuel or TDF. When heated in combustion facilities, most notably in cement kilns, pulp and paper mill boilers, and power utility boilers, energy is produced and used as fuel to power these facilities. Waste tires can also be used to make many useful objects. When all non-rubber material is removed from the tires, rubber chips are left over to make crumb-rubber modified asphalt, which is used to pave highways. Waste tires can also be made into doormats, water hoses, shoe soles, door stoppers, playground and athletic surfaces, non-slip products, sheet rubber for manufacturing products, and artificial reefs for marine life habitats.