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*This brochure was printed on 80 pound White Recycled Text, a recycled paper containing 20% post-consumer fiber.*

*The waste paper used is hand-sorted before recycling, to remove contaminants like plastic and adhesive labels.*

*Then the paper is separated according to type. While newspapers and corrugated cardboard are the most commonly recycled papers, they cannot be used in the manufacture of this paper, since it would be too difficult to maintain its whiteness.*



# RECYCLABLES

**THE CHASING ARROWS:** This well-known pattern of three arrows is compared to the Mobius Loop. Let your eyes travel clockwise from one arrow to the next and it's possible to move over the same route over and over again. The recycling process works in the same way. After materials are separated, broken down...and on and on into the never ending cycle.

# TEACHING THE LOOP



# GLASS



## HOW IS IT RECYCLED?

- Recycled glass bottles arrive at the recycling plant sorted by color—green, brown and clear.
- The glass is smashed into a sand-like mixture called “cullet.”
- The cullet is weighed and mixed with sand, limestone and soda ash.
- The mixture is heated to 2700 degrees until it looks like soft honey. The liquid is called “molten” glass.
- The hot molten glass is poured into glassforming machines.
- After the bottles have cooled, they are ready to go off to different factories to be filled again with peanut butter, ketchup, vinegar, lemonade, orange juice or anything else that might come in a glass container!

**BACKGROUND:** Glass was first made in Egypt nearly 5,000 years ago. It was so valuable that it was used for beads, jewelry and luxury items like perfume bottles. For a long time, glass makers used a process of heating and blowing to shape each container by hand. If you have seen glass blowers at county fairs or theme parks, you know that glass blowing takes a lot of skill and a lot of time. Some people still make glass the old-fashioned way, but most of the glass containers used today are made in large, automated factories where computers mold the molten glass.

Natural glass can be made when lightning strikes beach sand. The lightning heated the sand, the sand melted and formed glass tubes.



## Natural Resources

The things we use every day—newspapers, soda cans, plastic bottles, are made from materials that come from the Earth.



## facts

Many products are made from coal and oil. These are just a few examples:

### Products from coal

Plastics  
Perfumes  
Insectides  
Antiseptics  
Road surfaces

### Products from oil

Petrol (gasoline)  
Kerosene  
Diesel fuel  
Paraffin wax  
Pharmaceuticals

## fossil fuels



Explosives  
Pesticides  
Detergent  
Adhesives

Polishes  
Paints  
Nylon  
Plastics

These are the major natural resources that are used for energy today:

Oil	39%
Coal	23%
Gas	23%
Nuclear	8%
Hydro (water) power	3%
Biomass	3%
Other: geothermal, solar, wind	1%

*Energy consumption in U.S. for 2006*



Although 70 percent of the Earth's surface is covered in water, only 3 percent of all the water on Earth is fresh; the rest is salty. Of that 3 percent, over 2 percent is frozen in ice sheets and glaciers. That means that less than 1 percent is in lakes, rivers and under the ground.

## Web Sources

[www.rpa100.com](http://www.rpa100.com)  
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[www.napcor.com](http://www.napcor.com)  
[www.recycle-steel.org](http://www.recycle-steel.org)  
[www.ohiosteel.org](http://www.ohiosteel.org)  
[www.gpi.org](http://www.gpi.org)

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[www.novelis.com](http://www.novelis.com)



# facts



There is one operating solid waste landfill in Cuyahoga County in the City of Brooklyn.



There are over 300 recycling facilities in Cuyahoga County including public drop-off centers, buy back centers and processors. These facilities offer a wide range of recycling options and accept various materials from aluminum to oil.



Cuyahoga County residents and commercial businesses dispose of 1.8 tons of trash and recycle 1.5 tons annually.



3.4 million tons of garbage was generated in Cuyahoga County in 2007.

# facts



Paper fiber was the number one component found in the waste stream in Ohio in 2003 (41% by weight and 44% by volume). Plastic was second (16% by weight and 25% by volume).



The highest point in Ohio is "Mount Rumpke," which is actually a mountain of trash at the Rumpke sanitary landfill!



About 70 percent of Ohio's scrap tires are being recycled (Ohio EPA). Unfortunately, over three million scrap tires are disposed in tire-only landfills or illegally dumped.



Due to economy and consumer choices, the national average of pounds of trash per person per day has increased from 2.7 pounds in 1960 to over 4.5 pounds today.



# cuyahoga county

## U.S.A.

# facts



Glass bottles and jars can be recycled. But other types of glass, such as window panes, pyrex, and light bulbs can not be recycled.



Returnable bottles are made with thick glass so that they last longer.



Glass represents about 6% of everything thrown out by U.S. households.



Glass food and beverage containers are 100 percent recyclable and can be reused an infinite number of times.



# GLASS



# PLASTIC



## HOW IS IT RECYCLED?

- Plastics are sorted by type, squashed, and made into bales at the recycling center.
- At the plastic factory sorted plastics travel along conveyor belts to be chopped into small pieces the size of cornflakes. The cornflake-like pieces are washed in swirling water to remove any dirt or labels.
- The wet plastic flakes are dried with huge industrial dryers and blasted along pipes into big sacks.
- The washed and sorted plastics are now ready to be sold to manufacturers who will mold them into new products.



BACKGROUND: Plastics are made from oil, a non-renewable resource, which means the oil took thousands of years to create. Chemists make plastics from the gas which comes from oil when it is heated. When you are in big department stores, try to find all the plastic things; bags, pens, brushes, shoes, plugs, acrylic, nylon, cellophane, polyester, polystyrene. They all come from oil. There are 7 different types of plastics, but 95 percent of bottles are made out of only three types.

One of the most popular plastic is the #1 PETE bottle. The PETE bottle was patented in 1973 by chemist, Nathaniel Wyeth. PETE bottles are the most popular method of packaging carbonated drinks. PETE plastic has proven to be economical, lightweight and more convenient than glass or aluminum for larger containers of soda.



## facts



One ton of newspapers tied in bundles is about the same size as a double bed.



Every day, Americans throw out about 39 million newspapers—the equivalent of about 500,000 trees a week.



Newspaper recycled gets made into more newspapers, as well as insulation, paperboard (the type of cardboard cereal boxes are made of), and egg cartons.



The average American uses around 120 pounds of newsprint every year.



Paper and paper products make up over 40% of the national waste stream.



For each ton of paper that is recycled, 24,000 gallons of water is saved.



The first ice hockey goalies protected their shins with newspapers and magazines.



# NEWSPAPER

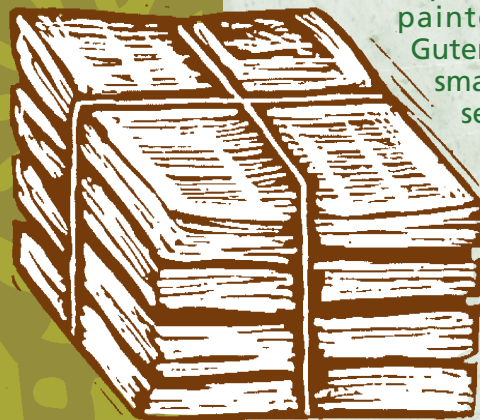


# NEWSPAPER



## HOW IS IT RECYCLED?

- Once paperclips, thumbtacks, plastic, string and wire have been removed, bales of paper are dropped into a huge tank of hot water.
- The paper is chopped and stirred into a mass called pulp, which looks like oatmeal.
- The pulp is poured onto a wire mesh which resembles a big sieve.
- Any water left in the fibers is squeezed out and the paper is dried with lots of heavy rollers that are heated by steam.
- When paper is dry, then it is ready to be wound into big paper reels and made into all kinds of new paper products.



**BACKGROUND:** The oldest papermakers in the world are wasps! Wasps make cardboard like nests. They chew up bits of wood softened with saliva and shape them into cells for their eggs. A Chinese man, Tsai-Lun, watched the wasps and invented paper by copying them. This happened in China about 105 A.D.

For over six hundred years, the Chinese kept their paper a secret to the rest of the world. During a war in 751, some Chinese papermakers were taken prisoner in Samarkand. From Smarkand, the secret traveled to the Middle East. There the Chinese method of making paper improved by adding rags of hemp, cotton and linen. The paper was considered cloth parchment.

In the 1200 Century, the Moons conquered Spain and paper was introduced to Europe. The oldest recorded document was a deed of King Roger of Sicily in 1102.

During the Middle Ages, books were rare and expensive. Monks slowly hand copied print and painted elaborate pictures. In 1450, Johann Gutenberg invented a special printing press, using small letters on the end of little metal bars. Now, several copies of a book could be made quickly and easily. The increased demand for paper caused a shortage of rags to make paper for books: therefore in the eighteenth century, a French scientist called Reaumur made paper from wood. Reaumur observed the paper wasps building their nests out of wood, like Tsai-Lun. Paper is made from wood to this day.

## SYMBOLS:

39 states, including Ohio, require that all plastic containers display a recycling arrow with a number inside to identify the type of plastic. Most recycling programs only accept (♻️) and (♻️) plastic.



Polyethylene terephthalate, is used mainly in plastic soda bottles and some microwavable food trays.



2-HDPE High density polyethylene is used for milk and juice jugs, water containers, laundry detergent bottles, cleaning fluids and many household products like aspirin bottles.



3-V Vinyl polyvinyl chloride is used for Cooking oil containers, some water bottles and wrap for meats.



4-LDPE Low density polyethylene is used for. Plastic shopping bags, margarine and dairy tubs.



5-PP Polypropylene makes Yogurt cups and ketchup bottles.



6-PS Polystyrene makes Insulating plastic foam cups, thermoses and meat trays.



7-Other plastics which contains more than one plastic used for some drink bottles and some food containers for ready-made lunches. #7's are difficult to ever recycle.

## facts



Five two-liter PETE bottles will make one square foot of carpet.



Five PETE bottles make enough fiber for an extra large T-shirt.



Half of all polyester carpet manufactured in the US is made from recycled plastic bottles.



It takes 25 two-liter bottles to make a sweater.



Five two-liter bottles make enough fiberfill for a ski-jacket.



It takes 35 two-liter PETE bottles to make enough fiberfill for a sleeping bag.

# PLASTIC





# STEEL

## HOW IS IT RECYCLED?

- When you are finished with a can, rinse out the steel container and recycle them through a curbside recycling program or at drop off centers.
- Steel and other metal cans like aluminum need to be separated from each other. At a recycling facility, the steel cans are separated from aluminum cans through the use of large magnets that attract the steel.
- Steel cans are crushed into large bails and sent to steel mills. At the mills, steel cans along with other scrap steel are melted to make new steel products such steel packaging cans, construction materials, transportation parts and appliances.



**BACKGROUND:** When countries were seeking colonial expansion and interested in providing hungry troops with unspoiled food, finding a safe way to package food became important. Around 1875, Peter Durand was granted a patent from King George III for preserving food in tin plated containers known as a can. By 1813, the Royal Navy used as many as 24,000 large cans of food. At the same time, the canning industry was starting in the United States.

A thin layer of tin was applied to the can's inner surface to prevent rusting and to protect food and beverage flavors. This is where the term tin can originated. Currently, a large number of cans use a chromium wash instead of tin. Most steel cans are used for food packaging. Other cans are made to package paint and aerosol products.

Locally, Ohio's first blast furnace went into operation in Youngstown in the early 1800's. By 1853, Cleveland was known as the third largest iron and steel city in the country with Ohio ranked second largest steel producer by the end of the century. Today, Ohio remains a leading center of domestic steel production.

## facts



Currently, a Pentium IV or PowerMac G4 or newer computer and working 15-inch or larger monitors, mice, keyboards and cables are suitable for direct reuse. Up to five-year-old working laptops are in demand. All computers with 256 MB of RAM and 20 gigabyte hard drives can be refurbished for reuse.



700 different materials and chemicals make up a computer weighing 55 pounds. A computer's most common materials are steel (40%), plastic (40%), aluminum (7-10%) and copper (5%).



Just for 2005, the space needed to landfill whole personal computers and scrap parts that could not be recycled add up to a 4,000 foot high pile an acre wide.



Computer chips are less than one pound, but create 89 pounds of waste with seven of those pounds being toxic waste. A circuit board weighs four pounds, but creates 46 pounds of waste with 40 of those pounds being toxic waste.



With 25 million new computer systems manufactured in this country each year, they require approximately one million barrels of crude oil and 7.5 billion cubic feet of natural gas to be manufactured.



A computer's 2.5 pounds of copper requires excavating 280 pounds of ore and at least 300 pounds of other rock over the ore. The energy equivalent of 73 gallons of gasoline is required to mine, crush, grind and smelt the ore into copper.



# COMPUTERS



# COMPUTERS

## HOW IS IT RECYCLED?

- Residents and businesses turn in unwanted computers to a computer recycling business through private and public collections.
- The age of the computer will determine if it is refurbished and reused or taken apart into its parts for recycling. Pentium IV and newer computers can be fixed to be used again.
- Sometimes whole computers cannot be fixed, but their parts such as hard drives or processors can be used again. To be used again, drives must be erased and identifying marks removed prior to being resold. The other usable parts such as casing cover, card shell, cables and connectors, power supply, motherboard and metal strips are sent to processing facility for recycling.
- The unusable parts or software must be destroyed, smashed or melted before reuse or disposal.

BACKGROUND: Computers and other electronics are recycled to avoid taking up space in landfills. This year over 63 million personal computers are estimated to be retired. The useful life of a computer is only three to five years with a monitor at four to seven years. Computers also contain hazardous waste such as lead, mercury, cadmium, selenium and arsenic in monitors, circuit boards, cables and switches. Computers and other electronics contribute the largest amount of heavy metals to landfills.

Discarded computers are a valuable resource. Computers contain parts that could be refurbished and sold for a profit such as memory boards, disk drives, video cards and microprocessor chips. Also, they contain precious metals, plastics, glass and other materials that can be recycled and made into new products. Plastics are shredded and baled and shipped to plastic processors; plastics. Shrink wrap, cardboard, floppy disks and compact disks and manuals from the software packages are separated and directed to the proper recycling processor. Precious metals such as gold, silver, copper, nickel, palladium and platinum are recovered and shipped to a metal smelter, which melts the metal into large nuggets or new metal products.



## facts



Not only are soup and tomato sauce cans recycled, but large steel products such as cars and refrigerators are recycled too.



The steel industry claims that steel is the number one recycled material in North America with the highest rate of 75.7% steel recycling in 2005, but only 68.7% in 2006.



Everyone uses at least one steel can a day, adding up to about 100 million steel cans that Americans use daily.



For every ton of steel recycled, 2,500 pounds of iron ore, 1,400 pounds of coal and 200 pounds of limestone are conserved. Recycling prevents the extraction of more minerals and rock from the earth.



Recycled steel is necessary to make new steel. Steel cans contain around 25% recycled steel. Engine blocks and other cast steel products may contain upwards of 75% recycled steel, and steel structural beams and plates are usually made from almost 100% recycled steel.



# STEEL



# ALUMINUM

## HOW IS IT RECYCLED?

- Soda cans and other aluminum products like cat food cans and aluminum foil are collected and sent to factories, where they're ground into little metal chips.
- The chips are then melted down and turned into solid aluminum bars.
- The bars are rolled into sheets of aluminum, which are then sold to canmakers!



**BACKGROUND-** Aluminum is the most common metal on Earth. Most aluminum used is extracted from an ore called bauxite. It occurs naturally in many different kinds of rock. Because aluminum easily combines with other elements, a lot of energy is needed to separate it into its metallic form.

In 1886, two chemists independently discovered a cheap way of extracting aluminum using electricity. Their discovery reduced the price of aluminum to a fraction of the price of silver in four years. The two chemists were Charles Martin Hall (1863-1914), a student at Oberlin College in Ohio, and P.L.T. Heroult (1863-1914), a young chemist working in France. Coincidentally, they were the same age when they made their discovery, and they also died within eight months of each other.

Today, the aluminum can is one of the oldest pieces of refined aluminum on the planet. Most bauxite comes from Jamaica, Africa or Australia. If a magnet sticks to a can it is steel. If a magnet doesn't stick to the can it's aluminum.



## facts



Four out of every five drink cans in the world are made from aluminum.



There is no limit to the number of times aluminum can be melted down and reused.



More than 20 million Hershey's Kisses are wrapped with 133 square miles of aluminum foil every day.



The top of the Washington Monument is a solid block of pure aluminum. It had to be transported under armed guards when it was installed in 1884.



Aluminum baseball bats are used from Little League up through college and the Olympics, but they're illegal in the Big Leagues. Why? They work too well. Modern hitters could rewrite the records book with aluminum bats.



The aluminum can you throw away today will be here 500 years from now.



Today, recycling aluminum is so efficient that it can take as few as sixty days for an aluminum can to be collected, melted down and made into a new can sitting on a supermarket shelf.

# ALUMINUM