



## The Recycling Process\*

Activity M.r/H.j

GRADE LEVELS: 7 - 12

**OBJECTIVE:** To review solid waste problems and learn how glass, paper, plastic, used oil, aluminum, yard waste, and tin-plated steel cans are recycled.

**VOCABULARY:** cullet, ore, caustic, pulp, fibers, electrolysis, ingots

### PROCEDURE:

Discuss the sequence of steps in recycling the following materials.

Glass is made from soda ash, sand, and lime. It can remain in a disposal site indefinitely and does not break down into its organic components. To be recycled, it must first be sorted by color and crushed into small pieces called cullet. The cullet is melted down into a liquid and then molded into glass containers. Other products made from recycled glass bottles are insulation and road-construction materials.

Aluminum is made from bauxite, an ore that must be mined from the ground. It takes a great amount of electricity to produce aluminum. Nature cannot decompose or break it down, so disposal is a problem. When recycled, aluminum is melted and then shaped again into new cans and other items. Making aluminum cans from old aluminum takes only 5 percent as much electricity as making cans from bauxite.

Tin-plated steel cans are made of iron ore and tin, both nonrenewable resources. The cans will eventually rust and break down, but throwing them away is a waste of valuable metals. In the recycling process, the cans are put into a huge container with holes in the bottom. This container is immersed in a caustic solution which dissolves the tin from off the cans. Then the steel cans are washed and sold as high grade steel. The dissolved tin is then removed from the caustic solution by electrolysis and made into ingots which are then sold to companies requiring tin.

Paper is made from trees. Paper is recycled by first shredding it into small pieces and mixing it with water. This mixture is beaten into a mush-like pulp which flows onto a moving screen through which most of the water passes. The wood or paper fibers remain. The fibers are pressed through heavy rollers that remove more water and then sent through steam-heated dryers. The result is recycled paper.

Plastic is made of petroleum. It can be recycled either as a mixture of different kinds of plastic or as a single type. Separating plastic by type enables manufacturers to produce higher quality recycled

products, or those closer to what could be produced from virgin materials. Polyethylene terephthalate (PET) (soft drink containers) and high density polyethylene (HDPE) (milk containers) are the plastics most commonly used in beverage containers and the types most easily separated. In the recycling process, plastics are melted down and reshaped into the recycled products. Some of the common uses for recycled PET are fiber, structural molding, and containers. HDPE can be recycled into bottles, toys, pipes, crates, and a variety of other products. Products of mixed batch plastic recycling include garbage pails, car stops, manhole covers, park benches, plastic “lumber,” and railroad ties.

Used motor oil collected from people who change their own oil (do-it-yourselfers) can be recycled safely and effectively. It can either be cleaned and used as fuel to be burned in asphalt plants or cement kilns, or it can be re-refined and used again as motor oil. The process of re-refining used motor oil is much cheaper and easier than processing virgin oil.

Yard waste, such as grass, leaves, shrubs, and tree clippings, can be collected and composted by individual households or on a community-wide level. The compost product from large-scale processing can be distributed to the community as fertilizer for landscaping, gardens, or agricultural uses. In this activity, students research the “life cycle” of a particular type of waste. Break students into groups and assign one of the types of waste listed below to each group. Reproduce and give each student the questionnaire on the following page to help them tell about their particular resource.

Aluminum Can

Plastic Tube

Cardboard Box

Tin Can

Glass Bottle

Have the groups present their findings to the class. They should make use of drawings, models, or other visual aids and try to make the presentation as informative and entertaining as possible. Older students may wish to make a film or videotape showing the life cycle of their chosen object. These films could be shown to the class or combined in a presentation to the entire school.

\* Source: U.S. Environmental Protection Agency Let's Reduce and Recycle: Curriculum for Solid Waste Awareness