

## ISSUES & CRITICAL THINKING:

1. Survey students to find out how much each family recycles. Break students into groups to brain storm ways to increase the number of people who recycle and the amount of things recycled.
2. Ask students to research what particular automobile parts are recyclable.
3. How can things like milk jugs, egg containers and plastic bags be used around your house?
4. One strategy that some people are pursuing is called "zero waste." Ask students to find out what it means and come up with practical applications that each student can use.
5. Lab Idea: Have students weigh how much their family throws out in one week. Have them calculate (based on how many people are in the family and the number of days of garbage) their average per person/day garbage mass. Calculate the average for the whole class. To apply this activity, have the students brainstorm ways to reduce their average. To extend the activity, repeat it at some point in the future and see if the averages have changed.

## GLOSSARY

**Computer aided design:** The field of computer aided engineering focusing on the drawing or physical layout steps of engineering design; often referred to as CAD/CAM.

**Electrolysis:** The passage of an electric current through an electrolyte with subsequent migration of positively and negatively charged ions to the negative and positive electrodes.

**Infrared spectroscope:** Any of various instruments that analyze the component parts of a sample by separating the parts into a spectrum. In a light spectroscope, light is focused as a thin beam of parallel rays by a lens, then passed through a prism or diffraction grating that separates the light into a frequency spectrum. The light intensity at different frequencies in the spectrum can be analyzed to determine certain properties of the source of the light, such as its chemical composition or how quickly it is moving.

**Palladium:** A malleable, ductile, grayish-white metallic element that occurs naturally with platinum. It is used as a catalyst in hydrogenation, in alloys for making electrical contacts and jewelry.

**Platinum:** A soft, ductile, malleable, silver-white metallic element that usually occurs with osmium, iridium, palladium, or nickel. It has a high melting point and does not corrode in the air. It is used as a catalyst and in making jewelry, electrical contacts, and dental crowns.

**Rhodium:** A rare, silvery-white metallic element that is hard, durable and resistant to acids; used as a permanent plating for jewelry; it is added to platinum to make high-temperature alloys.

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# Show Me Science

## Recycling Technology - Waste Not, Want Not

**K4573DVD**

**Advanced Teachers Guide**

**SYNOPSIS:**

The average American produces almost 2 kilograms of garbage per day, or 13 kilograms per week and 726 kilograms per year. New technologies are finding ways to reduce these numbers and recycle many valuable raw materials that used to end up lost in everyday trash. This program demonstrates how scientists are utilizing microorganisms to minimize waste and new separation technologies to aid in recycling. Removal of specific valuable metals from appliances, computers and automobiles has become lucrative business. To help protect our environment, engineers are learning to focus on creating new products with recycling in mind at their inception.

**CURRICULUM UNITS:**

- Ecology
- Environmental Science
- Physical Sciene
- Physics

**CAREER OPPORTUNITIES:**

- Biologist
- Ecologist
- Chemical Engineer
- Environmental Engineer
- Sanitation Engineer
- Mechanical Engineer

**PROGRAM OVERVIEW:**

In the past, waste was collected and deposited in a large pile and buried in the ground. However, disposal of waste to landfills has decreased from 89% in 1980, to 54% in 2007. The number of landfills has declined, but the capacity of each landfill has increased. With rapidly increasing recycling operations, the number of landfills will hopefully continue to decrease. Environmental concerns have influenced improved landfill policies and materials recovery. Efforts to reduce, reuse and recycle are paying off. The success of recycling programs begins with encouragement of individuals and businesses to separate their trash and recyclables.

Present day processing facilities are becoming increasingly more advanced in handling and separating different materials. Some waste processing facilities rely on biological processes to deal with waste. After waste is sorted and placed in closed containers, microorganisms are used to break down organic materials. To accelerate this process, engineers pump in warm, moist air. Before the process is over, the warm air is condensed and remaining water is sent though a micro-filter to vaporize it and burn off any dangerous gases. The result is toxin-free dry waste. Some larger non-biological materials are separated out and burned.

Magnets and whirlstreams are used to separate metals from nonmetals, and glass and mineral materials are separated on a conveyor belt that uses light to distinguish between what is transparent and what is not.

Extracting precious metals from things such as appliances, cellular phones, computers, and automobiles has also become highly profitable. In the past, what used to be done chemically is now often accomplished through electrolysis.

Modern automobiles are made up of thousands of kilograms of steel, glass, plastic, and hazardous waste and require specific practices in recycling. Many automobile manufacturers are designing their products with the future in mind. They account for the disassembling process and the possibility of parts for recycling before a car goes into production. The future of recycling technology is in automated systems and pre-planning of materials as recyclable. Increasingly intelligent separation technology will deal with increasingly complex products. Saving time and energy must make economic sense.