

# Products

## How Are Products Made?

Everyone uses a variety of **products** each day—from toothbrushes to notebooks to lunch boxes to video games. Each of these products has an effect on the environment in one way or another. Sometimes merely using (or misusing) a product can affect the health of people and the environment. Some products can affect the environment through the way they are made or disposed of. For example, products made from virgin **natural resources** have different effects on the environment than those made from **recovered resources**. By understanding a product's **life cycle**—the development, use, and disposal of a product—people can make better decisions about what products to buy and how to use them wisely.

A product's life cycle generally includes design; exploration, extraction, and processing of resources (raw materials); manufacturing; distribution and use; and retirement. If a product is made from 100 percent recovered materials, exploration and extraction of virgin materials is not necessary. If a product is recycled, composted, or reused, people do not have to throw it away. By altering the product life cycle in these ways, people can save energy and resources, and therefore, prevent waste and pollution.

## The Product Life Cycle

The following sections describe each stage in the product life cycle, as well as the challenges, benefits, and emerging trends associated with each step.

### Design

Product design can involve research, testing, and development. This includes development of synthetic materials, such as plastics, which derive from natural sources.

Some products are designed to be used only once (**disposable**), while others are designed to be used many times (**durable**). Engineering and material choices can determine whether a

### Key Points

- Product life cycle includes design, extraction of natural resources, manufacture, use, and disposal or recycling. If a product is made with recovered materials, raw materials do not have to be extracted from the Earth. If a product is recycled or reused, its life cycle begins anew and has less effect on the environment.
- The extraction of raw materials and the manufacture and disposal of a product can create pollution and waste and can require a great deal of energy resources.
- Durable products can be used many times and create less waste, while disposable products are usually used only once.
- Product manufacturers are beginning to make more products that have environmentally preferable attributes.

product is durable, disposable, or **recyclable**, or a combination.

Over the last few decades, as people's lives have become more complicated and technology more advanced, many consumers have come to desire the convenience of disposable items over the durability of reusable ones. Also, it is sometimes easier to replace items rather than fix them. Thus, more and more items end up as trash in **landfills** or **incinerators**.

Products are often conceived and designed with a focus simply on how they will be used and with less concern about the other stages in their life cycle. In the past decade, however, consumers have begun to demand more **environmentally preferable products** or "green" products—products that have fewer negative

effects on human health and the environment when compared to traditional products. Manufacturers have responded by offering products that are made from recycled-content materials, low in toxicity, and high in energy-efficiency. Other products have been designed to conserve water, minimize air pollution or, through a combination of factors, have fewer negative impacts on the environment.

### Exploration, Extraction, and Processing

Manufacturers must obtain the materials needed to make their products. If a manufacturer uses recovered materials, the company can obtain them from recycling processors or other similar sources. Virgin resources, however, must be mined (for metals and minerals) or harvested (for wood and other biobased materials) from the Earth. Once they are extracted, they must be processed for use in manufacturing.

The extraction of raw materials generates waste and pollution and requires a great deal of energy. In many cases, the natural resources used in manufacturing are nonrenewable. This means that, eventually, the natural resource will be depleted. As more



### Product Facts

- Most glass bottles and jars contain at least 25 to 30 percent recycled glass.
- Making 2,000 pounds of paper from trees requires 3,700 pounds of wood, 200 pounds of lime, 360 pounds of salt cake, 76 pounds of soda ash, 24,000 gallons of water, and 28 million BTUs of energy.
- Making an aluminum can from recycled material requires 95 percent less energy than making one from the natural resource raw material, bauxite ore.
- For every 100 pounds of products made, over 3,000 pounds of waste is generated.

(Sources: Glass Packing Institute; Can Manufacturers Institute; Weyerhaeuser Company.)

and more communities offer recycling programs and people participate in them, manufacturers may be able to use increased recovered materials instead of virgin materials to make products.

### Manufacturing

Whether a product is made from virgin or recovered materials, often the factories that manufacture the product are specially designed to use a consistent form of material. If a product is made in a plant designed to process virgin materials, changing to recycled materials might not be easy. Changing the kinds of materials used in manufacturing, such as using recycled paper instead of virgin paper, can require changes in technology and equipment and can slow down the pace of production. In the past decade, however, many manufacturing plants have begun retooling and learning to use recovered materials rather than virgin materials, and thus, the variety of recycled-content products has been growing. (See the Teacher Fact Sheet titled *Recycling* on page 101 for more information.)

Manufacturing products generates pollution and usually requires a great deal of energy. Using recovered materials can often save energy and reduce pollution. The manufacturing process also generates waste, but at some manufacturing plants, this waste can be reused.

### Distribution and Use

People rely on various products to live in a modern society. Most people purchase and use some type of manufactured product every day because it is easier and more convenient than making the same items from scratch (for example, going to a store and buying a box or bag of rice is much simpler, and more practical, than trying to grow rice in a paddy in the backyard).

After products are manufactured, many must be packaged for transportation and distribution. Often, products are transported long distances across the nation or even internationally before people can purchase and use those items.

Products often require packaging to protect them from spoilage, damage, contamination, and tampering during transportation, storage, and sale. Sometimes packaging is necessary to inform consumers about product benefits, proper use, and other information. While some products might appear to have excessive packaging, in many cases the packaging serves several purposes, without which the products might not be available as widely or as frequently.

Packaging—when it is discarded—can create a great deal of waste. In communities where common packaging materials are not recyclable, these items must be thrown away, wasting precious resources and potential recovered materials.

### **Product Retirement**

After use, many items or packaging are disposed of in landfills or incinerators. Others are recovered for recycling. If products are disposed of in landfills or incinerators, they can no longer provide any benefit. Emissions to air and water from these disposal methods can affect human health and the environment.

## **Think Globally, Buy Locally**

One way consumers can help eliminate the need for excessive packaging is to buy products locally. This concept, known as bioregionalism, works on the idea that if consumers buy products made within their own communities, packaging that would otherwise be needed to protect the products during transportation and storage could be eliminated or reduced.

If products are recycled, composted, or reused, they continue to serve a purpose, either as a raw material or for the same use they were originally intended. Extending a product's life is a way to save natural resources, prevent waste, reduce pollution, and conserve energy.

The more people recycle and buy recycled products, the more incentive manufacturers will have to make products with recovered content.

### **Additional Information Resources:**

Visit the following Web sites for more information on designing and purchasing products with the environment in mind:

- U.S. Environmental Protection Agency (EPA): <[www.epa.gov](http://www.epa.gov)>
- U.S. EPA Office of Solid Waste product stewardship site: <[www.epa.gov/epaoswer/non-hw/reduce/epr/index.htm](http://www.epa.gov/epaoswer/non-hw/reduce/epr/index.htm)>
- U.S. EPA Office of Pollution Prevention and Toxics, Design for the Environment Program: <[www.epa.gov/dfe](http://www.epa.gov/dfe)>
- U.S. EPA Office of Pollution Prevention and Toxics, Environmentally Preferable Purchasing: <[www.epa.gov/opptintr/epp](http://www.epa.gov/opptintr/epp)>

To order the following additional documents on municipal solid waste and product life cycle, call EPA toll-free at (800) 490-9198 or look on the EPA Web site <[www.epa.gov/epaoswer/osw/publicat.htm](http://www.epa.gov/epaoswer/osw/publicat.htm)>.

- *WasteWise Update—Extended Product Responsibility* (EPA530-N-98-007)
- *Puzzled About Recycling's Value? Look Beyond the Bin* (EPA530-K-97-008)
- *A Collection of Solid Waste Resources* on CD-ROM