



Quantitative

Energy and Recycling

PURPOSE

- Compare energy costs of recycling aluminum for cans to making cans from raw materials
- Investigate extrinsic benefits and disadvantages of recycling, such as environmental and economic factors

BACKGROUND

The county government in one eastern state initiated an aluminum recycling program. Most of the aluminum is in the form of beverage cans. In the first year, the county collected 1.4×10^6 kg of cans. It takes about 65 modern aluminum cans to make a kilogram.

All communities in the county have curbside pickup of recycled materials. On average, each truck makes a 75-km trip to pick up 3,500 kg of aluminum and gets 5 km/L fuel economy. Each liter of fuel produces 42,000 kJ energy.

Fig. 8-1

Scrap Aluminum
to Be Recycled





Show all your work.

Exercises

1. How many cans did the county collect in the first year?
2. To the nearest whole number, how many trips were needed to collect all the cans?
3. Calculate how many liters of fuel the trucks used to pick up the cans.
4. How many kilojoules (KJ) of energy were consumed collecting the cans?
5. Making cans from recycled aluminum requires about 180 kJ of energy per can. Calculate the total energy needed to make cans from recycled aluminum, including the energy used to collect them.
6. It takes 1,520 kJ of energy to make one aluminum can from bauxite ore. Assuming no other energy is used, calculate how much energy is needed to make the cans from bauxite ore.
7. Calculate the energy difference between the two methods. How many liters of fuel are saved by recycling the cans?

