

PRACTICE PROBLEM #2: The environmental impact of washing a load of dirty dishes in an electric dishwasher differs from that of washing them by hand in a sink. Use the information and data below to answer the questions that follow. Show your calculations.

Assume the following:

1. The dishes all fit in one load.
2. The water coming into the water heater for the sink and into the water heater in the dishwasher is at 50 °F.
3. The water heaters for the sink and the dishwasher are both 100 percent efficient.
4. In one complete cycle, the electric dishwasher uses 10 gallons of water heated to 140 °F and the dishwasher also uses 0.500 kilowatt-hour of electrical energy for its mechanical operation.
5. Washing the dishes by hand requires 20 gallons of water heated to 110 °F.

Other information:

- 1 gallon of water = 8 pounds of water
- 1 BTU = the amount of energy needed to raise the temperature of 1 pound of water by 1 °F
- 1 kilowatt-hour = 3,400 BTUs

- (a) Calculate the total energy (in BTUs) used to both heat the water and run the electric dishwasher to wash a load of dishes.
- (b) Calculate the energy (in BTUs) used to heat the water for washing the load of dishes by hand.
- (c) Discuss the economic and environmental costs and benefits of
 - i. using the electric dishwasher (including its manufacture and disposal)
 - ii. washing the dishes by hand.