

Solutions to Aluminum Life Cycle Activities

1. Percentage of energy required for secondary Al compared to primary Al

Total secondary = 2.8 kWh/kg Al

Total primary = 52.85 kWh/kg Al

Percent required for secondary Al production = $2.8/52.85 \times 100 = 5.3 \%$

{Note: an alternative way to look at this is to deduct the rolling, extrusion and shape casting from the energy use for primary production, i.e.

$2.8/(52.85 - 1.1 - 1.3 - 1.5 - 2.6) \times 100 = 6 \%$; a very small difference}

2. Percentage of CO₂ for secondary Al compared to primary Al:
= $0.58/16.936 \times 100 = 3.4 \%$

3. (a) No. of Aluminum cans = 1.93 billion lbs x 33.1 cans per pound
= 63.883 billion cans

(b) Percent cans recycled = $63.883/102.2 \times 100 = 62.5 \%$

4. (a) No. of cans per year = 1,650,000 x 10 x 12 = 198 million cans

At 33.1 cans per pound it is $198,000,000/33.1 = 5,981,873$ lbs per year

(b) The amount not recycled will be about

$(1,883,000 - 1,130,000)/1,883,000 \times 100 = 40 \%$

The amount not recycled = $0.4 \times 5,981,873 = 2,392,749$ lbs per year

5. If all from primary production, i.e. 52.85 kWh/kg Al = 24 kWh/lb Al

(1 kg = 2.2 lbs)

Energy requirements for the cans not recycled:

$2,392,749 \text{ lbs} \times 24 \text{ kWh/lb} = 57,425,976 \text{ kWh}$

6. The number of houses that can be run on this amount of electricity per month is:

$57,425,976 \text{ kWh}/2,000 \text{ kWh/house} = 28,713 \text{ houses}$