

LCA Homework (KEY)

- 1) Your company is a manufacturer of computer workstations, currently producing the computer (CPU) and monitors (17 inch video display units [VDUs]). Manufacturing is performed in Indonesia and shipped to the US. You've been tasked with determining the life cycle impact of the VDUs. The life of these VDUs is 5 years and the average usage per monitor per year is 2,000 hrs per year. Identify the following:
- Product life, functional unit, and system boundaries
 - Bill of materials, including production, energy usage, transportation, and disposal
 - Calculate the impacts
 - What is the most significant impact and make a recommendation that would reduce that impact.

Assumptions:

Major components:

- Plastic: PVC rigid, 20 lbs
- Metal: aluminum, 5 lbs
- Metal: lead, 2 lbs
- Metal: copper, 2 lbs
- Integrated circuitry, 6 sq. inches, weight 0.5 lbs.
- Glass, clear, 1.5 lb.
- Packaging: brown cardboard, 1 lb.
- Power consumption during use: 260 Watt (remember, 1000 W = 1 kW)
 - Remember that these VDUs run 2,000 hours per year
- Transport: intercontinental container ship, 5000 miles
- Manufacturing: injection molding for the PVC and aluminum extrusion for the aluminum
- Disposal: product takeback by the manufacturer, so nothing to landfill, but must be shipped by 28-ton diesel truck, total weight = 32 lbs. Distance = 500 miles.

Don't forget: when doing the calculations, the transportation impacts are based on the total weight and distance of the product being shipped.

- a) Product life, functional unit, and system boundaries
 Product life: 5 years; 2,000 hrs/yr = 10,000 hrs
 Functional unit: impacts per 1,000 hours
 System boundaries: display only, excluded power cord, cables, computer (CPU), storage

b) Bill of materials

Materials:

PVC, rigid	20 lbs
Aluminum	5 lbs
Lead	2 lbs
Copper	2 lbs
Integrated Circuits	6 sq. in. (0.5 lb)
Glass, clear	1.5 lb
Cardboard, brown	1.0 lb
TOTAL WEIGHT	32 lbs.

Manufacturing:

PVC injection molding	20 lbs
Aluminum extrusion	5 lbs

Power consumption:

260 Watt x 10,000 hrs ÷	
1,000 Watts/kWatt =	2,600kW-hrs

Transport:

Container shipping: 32 lbs total wt	
÷ 2,000 lb/ton x 5,000 miles =	80 ton-mi
Recycling shipping: 32 lbs total wt	
÷ 2,000 lb/ton x 500 miles =	8 ton-mi

- c) Calculate impacts
 Suggested format:

<u>Input</u>	<u>Amount</u>	<u>unit</u>	<u>eco Factor</u>	<u>Impact</u>
Materials:				
Plastic: rigid PVC	20	lb.	33/lb	66 millipoints
Etc.				

Input	Amount	x	Factor millipoints/unit	=	Impact millipoints	
Materials					4,428.70	7.8%
Plastic: Rigid PVC	20.000 lb.		33 /lb.		660.00	1.2%
Metal: Aluminum	5.000 lb.		140 /lb.		700.00	1.2%
Metal: lead	2.000 lb.		670 /lb.		1,340.00	2.4%
Metal: copper	2.000 lb.		160 /lb.		320.00	0.6%
Glass, clear	1.500 lb.		9.8 /lb.		14.70	0.0%
Packaging, cardboard	1.000 lb.		14 /lb.		14.00	0.0%
Integrated circuitry (in2)	6.0	0.5 lb.	230 /in2		1,380.00	
total weight	32.000 lb.					
Manufacturing					350.00	0.6%
Aluminum extrusion	5.000 lb.		26 /lb.		130.00	2.4%
PVC Injection molding	20.000 lb.		11 /kW-Hr		220.00	0.0%
Power					52,000.00	91.4%
Electricity	2,600.00 kW-hrs		20 /kW-hr		52,000.00	0.2%
Transport					44.80	0.1%
Intercon Container Ship	80.000 ton-mi.		0.56 /ton-mi.		44.80	0.0%
Disposal					77.60	0.1%
Truck, 28-ton diesel	8.000 ton-mi.		9.7 /ton-mi.		77.60	0.0%
Landfill: product takeback	32.000 lb.		0 /lb.		-	0.0%
functional unit time	1,000 hrs					
Total Impacts/Life					56,901.10	1.00
					lifetime (hrs)	10,000
Total Impacts/Functional Unit					5,690.11	

