Vacuum Cleaner

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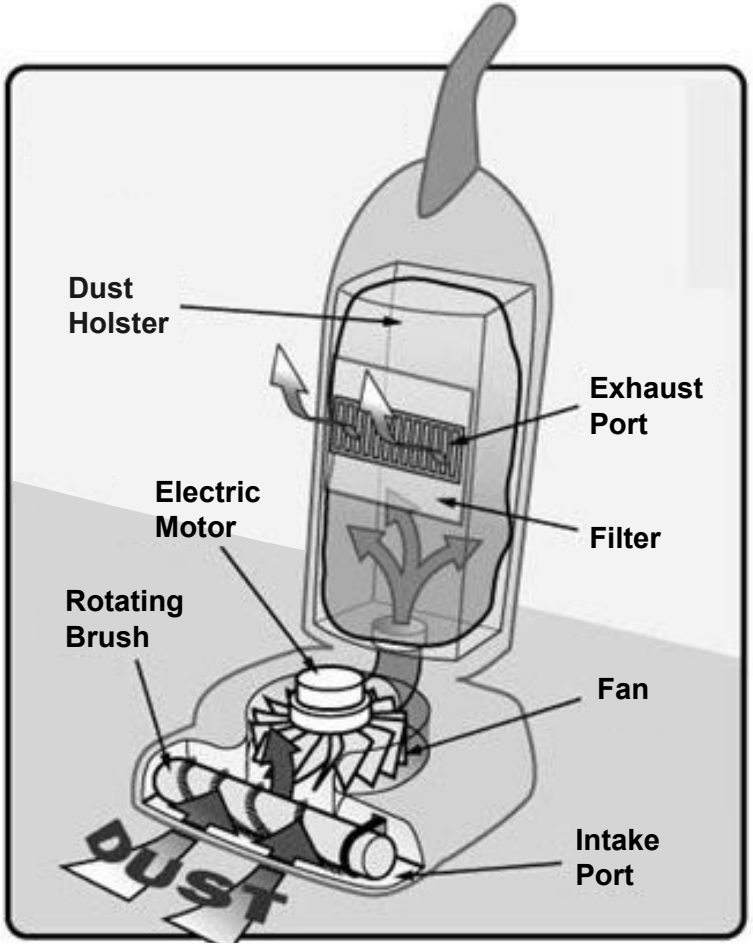
Main Components

- Main Frame
- Dust Compartment
- Filter
- Fan
- Belt
- Rotating Brush
- Base & Wheels
- Electric Motor
- Electrical Cord



🔄 Usage and Production

- 1400 Watts on Average
    - Used once a week
    - 30 Minutes
- Made in China
    - Shipped overseas to California [6500 miles]
    - Delivered to Hoboken via Truck [3000 miles]
- Last roughly 8 years, then sent to landfill

Initial Product

Material, manufacture and end of life

Qty.	Component name	Material	Recycled content	Mass (kg)	Primary process	End of life
1	Fan	Cast Al-alloys	Virgin (0%)	0.246	Casting	Landfil
1	Main Frame	Polypropylene (PP)	Virgin (0%)	1.02	Polymer molding	Landfil
1	Rotating Brush	Polypropylene (PP)	Virgin (0%)	0.155	Polymer molding	Landfil
1	Dust Compartment	Polycarbonate (PC)	Virgin (0%)	0.34	Polymer molding	Landfil
4	Wheel	Polypropylene (PP)	Virgin (0%)	0.034	Polymer molding	Landfil
1	Base	Polypropylene (PP)	Virgin (0%)	0.136	Polymer molding	Landfil
1	On/Off Button	Acrylonitrile butadiene st...	Virgin (0%)	0.007	Polymer molding	Landfil
1	Filter	Paper and cardboard	Virgin (0%)	0.017	Incl. in material value	Landfill
1	Belt	Carbon black reinforced...	Virgin (0%)	0.102	Polymer molding	Landfill
1	Electrical Cord	Cable	Virgin (0%)	0.07	Incl. in material value	Landfill
1	Plug	Plugs, inlet and outlet	Virgin (0%)	0.067	Incl. in material value	Landfill
1	Rotar [Motor]	Cast iron, ductile (nodular)	Virgin (0%)	0.978	Casting	Landfill
1	Stator/Stator Core [Motor]	Cast iron, ductile (nodular)	Virgin (0%)	0.489	Casting	Landfill
1	Bearings [Motor]	High carbon steel	Virgin (0%)	0.2445	Casting	Landfill
1	Housing [Motor]	Cast Al-alloys	Virgin (0%)	0.489	Casting	Landfill
1	Windings [Motor]	Copper	Virgin (0%)	0.2445	Wire drawing	Landfill
1	Magnetic Core [Motor]	Cast iron, ductile (nodular)	Virgin (0%)	0.978	Casting	Landfill
1	Permanent Magnet [Motor	Low alloy steel	Virgin (0%)	0.8802	Casting	Landfill
1	Commutator [Motor]	Copper	Virgin (0%)	0.5379	Casting	Landfill
1	Insulators [Motor]	Butyl rubber (IIR)	Virgin (0%)	0.0489	Polymer molding	Landfill

Aluminum Fan

Mainly Plastic Parts

Phase	Energy (J)	Energy (%)	CO2 footprint (kg)	CO2 footprint (%)
Material	4.69e+08	14.9	27.6	14.8
Manufacture	9.33e+07	3.0	6.89	3.7
Transport	3.82e+07	1.2	2.75	1.5
Use	2.54e+09	80.9	150	80.0
Disposal	1.44e+06	0.0	0.101	0.1
Total (for first life)	**3.15e+09**	**100**	**187**	**100**
End of life potential	0		0	

Goals for Improvement

Increase Airflow

Get **more suck for your buck** by ensuring that the fan is moving as fast as possible

Recycle Plastics

Recycle all plastic components rather than wasting space and time in a landfill

Reduce Emissions

Find a way to decrease emissions and overall energy usage in the initial product

Shipping and Handling

Before

Transport

Name	Transport type	Distance (m)
China -> California	Ocean freight	1.046e+07
California -> Hobken	55 tonne (8 axle) truck	4.828e+06

After

Transport

Name	Transport type	Distance (m)
China -> California	Ocean freight	1.046e+07
California -> Hoboken	Rail freight	4.828e+06

Revised Product

Material, manufacture and end of life

Qty.	Component name	Material	Recycled content	Mass (kg)	Primary process	End of life
1	Fan	Polyethylene (PE)	Virgin (0%)	0.136		Recycle
1	Main Frame	Polypropylene (PP)	Virgin (0%)	1.02	Polymer molding	Recycle
1	Rotating Brush	Polypropylene (PP)	Virgin (0%)	0.155	Polymer molding	Recycle
1	Dust Compartment	Polypropylene (PP)	Virgin (0%)	0.34	Polymer molding	Recycle
4	Wheel	Polypropylene (PP)	Virgin (0%)	0.034	Polymer molding	Recycle
1	Base	Polypropylene (PP)	Virgin (0%)	0.136		Recycle
1	On/Off Button	Acrylonitrile butadiene st...	Virgin (0%)	0.007	Polymer molding	Recycle
1	Filter	Paper and cardboard	Virgin (0%)	0.017	Incl. in material value	Recycle
1	Belt	Carbon black reinforced...	Virgin (0%)	0.102	Polymer molding	Landfill
1	Electrical Cord	Cable	Virgin (0%)	0.07	Incl. in material value	Landfill
1	Plug	Plugs, inlet and outlet	Virgin (0%)	0.067	Incl. in material value	Landfill
1	Rotar [Motar]	Cast iron, ductile (nodular)	Virgin (0%)	0.978	Casting	Landfill
1	Stator/Stator Core [Motor]	Cast iron, ductile (nodular)	Virgin (0%)	0.489	Casting	Landfill
1	Bearings [Motor]	High carbon steel	Virgin (0%)	0.2445	Casting	Landfill
1	Housing [Motor]	Cast Al-alloys	Virgin (0%)	0.489	Casting	Landfill
1	Windings [Motor]	Copper	Virgin (0%)	0.2445	Wire drawing	Landfill
1	Magnetic Core [Motor]	Cast iron, ductile (nodular)	Virgin (0%)	0.978	Casting	Landfill
1	Permanent Magnet [Motor	Low alloy steel	Virgin (0%)	0.8802	Casting	Landfill
1	Commutator [Motor]	Copper	Virgin (0%)	0.5379	Casting	Landfill
1	Insulators [Motor]	Butyl rubber (IIR)	Virgin (0%)	0.0489	Polymer molding	Landfill

Polyethylene Fan

Recycled Plastic Parts

Phase	Energy (J)	Energy (%)	CO2 footprint (kg)	CO2 footprint (%)
Material	4.21e+08	13.7	24.2	13.3
Manufacture	8.85e+07	2.9	6.57	3.6
Transport	2.53e+07	0.8	1.82	1.0
Use	2.54e+09	82.6	150	82.0
Disposal	2.39e+06	0.1	0.167	0.1
Total (for first life)	**3.08e+09**	**100**	**182**	**100**
End of life potential	-3.49e+08		-21.3	

Initial Product

Energy Used:
3.15 GJ

CO2 Footprint:
187 kg

Zero end of life potential

Improved Product

Energy Used:
3.08 GJ

CO2 Footprint:
182 kg

-0.35 GJ & -21.3 kg
End of Life Potential

🔄 Conclusion

- 3% decrease in emissions
    - -7 GJ of Energy
    - -5 kg of CO2
- Recycling yielded an end of life potential
- Shipping and handling plays a notable role in emissions

Thank You