ME 553: Product and Process Design Team 10 - Power Generating Door

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Idea Selection



Complexity

Idea selected! Power generating door.

US Energy Consumption

Energy use per capita

Primary energy use (before transformation to other end-use fuels) in kilograms of oil equivalent, per capita.



Total US Residential and Commercial Energy Consumption: Over 19 Quadrillion BTU (Lawrence Livermore National Laboratory, 2006)

Market Competition

- No existing patents found for our product.
- The crank light and revolving door were the closest matches.



Product Functional Hierarchy



Concept Selection

Design Decision: Placement?



Concept Selection

Design Decision: Import relative motion?



Concept Selection

Design Decision: Where will the energy go?



Final Design





Final Design Component: Casing



Final Design Component: Casing Features



Final Design Component: Dynamo and Flywheel

- Schmidt Original Dynamo – Chosen for power generation at low RPMS and high efficiency
- Flywheel steadies shaft rotation







Final Design Component: Gearing Mechanism

- Baseplate brackets position gearing mechanism
- Overrunning clutch design allows power generation when door opens or closes.





Flywheel rotates in same direction regardless of opening or closing

Bill of Materials and Cost

		Procurement	Material	Manufacturing	Total
Part	Qty	Cost (\$)	Cost (\$)	Cost (\$)	Cost (\$)
Dynamo	1	10			10
Wheels	2	2.25			2.25
Shafts	3		0.45	0.15	0.6
Flywheel	1	1.05			1.05
Bevel Gears	3	1.5			1.5
Overruning Clutch	3	4.75			4.75
Casing and Cover	1		0.192	0.1	0.292
Mounting Plate	1		0.176	0.075	0.251
Fastners	8	0.8			0.8
Wires	2	0.35			0.35
LED Lamp	1	1.35			1.35
				Total Estimated	22.10
				Cost	23.19

Life Cycle Analysis: Total Impact = 1.716 Pts



Comparing product stages; Method: Eco-indicator 99 (I) V2.04 / Europe EI 99 I/A / single score

Life Cycle Analysis: Impact Categories



Comparing product stages; Method: Eco-indicator 99 (I) V2.04 / Europe EI 99 I/A / weighting

How much electricity can we generate?

- Inputs for power simulation:
 - **Door Open Distance** 0
 - Time to Open 0
 - Time to Close 0

Power Generated (Watts)

- Parameters: •
 - Normal distributions 0
 - Monte Carlo simulation 0

Power Generated vs. Dynamo Speed



Energy Savings

- 35W Fluorescent Lamp (Always on)
- > 23.52 KiloWatt Hours (In one month)
- \$1.94 a month in electricity consumption
- Return on Investment 18 months
- Can replace the infrared trigger

U.S. Energy Information Administration

Independent Statistics and Analysis

Questions?

