

Sustainable Vacuum Design

Design Methodology

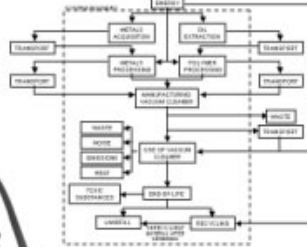
'Life-Cycle RADAR' was developed by the team as a new framework for sustainable product design. It's distinct stages emphasises the consideration of each life-cycle phase during the development process

- First Define the goal and scope then...
- Research sustainable technologies
- Analyse existing design
- Design product concepts
- Analysis of Redesigns



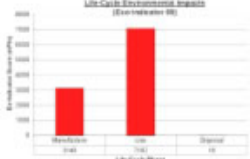
Goal & Scope

Improvement of the social, economic and environmental impact of vacuum cleaning.



Functional unit

- 32hrs use annually
- 1,100w (nominal)
- 6.5yrs life
- 6 dustbags per year



Analysis of concepts' Enviro Impact 'vs' cost



Regulations

wEEE SWaG used to recover single material main body and hose (73.5% by weight). PostaMota enables easy recovery, reuse and remanufacture. Power cable is now a reusable item.

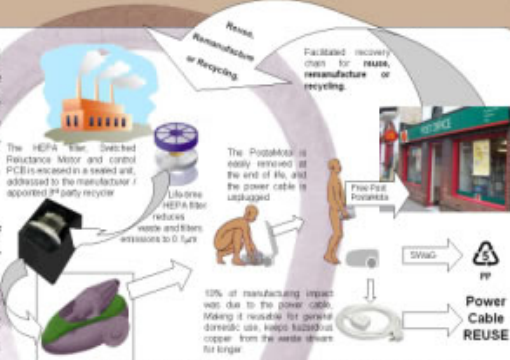
RoHS Compliant (with careful selection of material) due to the reduction / elimination of certain plastic additives and metal coatings.

Eco-label: After testing and development, new design could attain this award.

PostaMota

Enables easy removal (modular design) of the systems electronics facilitating upgrade (avoiding technology obsolescence), repair, reuse and recycling.

A key social benefit of PostaMota is consumer engagement, increasing awareness of sustainable consumption whilst reducing downstream processing steps.



- Facilitated recovery chain
- Increased user involvement
- Easier reuse and repair
- Helps to meet WEEE targets
- Brushless motor increases life
- No wearing parts enabling reuse

SWaG -Shred, Wash and Granulate

...developed as a design target for efficient resource recovery, reduces the product to a single material, eliminating separation during recycling. Also high impact metal components were eliminated outside of the PostaMota. Examples of SWaG -

Floor tool redesign

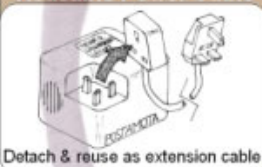
- Flip-over head for hard/carpeted floors
- 19 parts reduced to 9, 7 materials reduced to 1 (PP)
- Environmental impact reduced, 1025mPt to 181mPt (82%)
- 8 manufacturing processes reduced to 2, non-subtractive



Reducing Mechanical Fastenings

Using push fits, clip features or plastic security screws where unavoidable. Increased ease of disassembly and helps achieve SWaG. Also, NO joining of dissimilar materials.

Reusable Power Cable

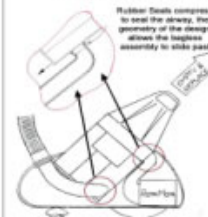


Turbo Button

- Run motor at 80% power
- 20% extra enabled by push-to-make switch with timer.
- Saves ~ 10% (1030 mPts) of the overall Eco impact

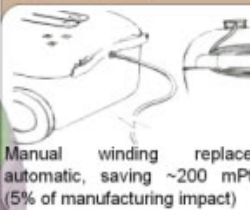
Bag-less Technology

- ✓ Cyclone dust separation
- ✓ No bags used - Reduces Waste
- ✗ Cyclone Design Increases Plastic Mouldings
- ✗/✓ Higher turbine speeds (to create cyclone) require a Switched Reluctance motor
- ✓ S. R. Motor Reduces Materials Requirements (Cu, Steel)
- ✗ New Motor Needs Control PCB
- ✗ No brushes to wear out (enabling further reuse).



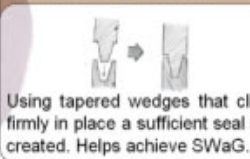
Although now an established technology it is not as environmentally friendly as customers think there is only a small reduction in impact over bagged technology (which loses a not very significant max of 10% suction as the bag fills), but social acceptance and desirability are increased making the product sustainable rather than merely environmentally friendly.

Cable Winder



Manual winding replaces automatic, saving ~200 mPts (5% of manufacturing impact)

Eliminating Rubber



Using tapered wedges that clip firmly in place a sufficient seal is created. Helps achieve SWaG.

Overall Improvement

- 27% improvement in environmental impact over the products life
- 16 material types reduced to 9 (7 used only in the PostaMota)
- Manufacturing impact reduced 9%
- Carcinogenicity reduced (eliminating the carbon brushes)
- Bagless tech and Turbo button improves use phases impact 18%
- Disposal, by recycling the vacuum 1220mPt are recovered
- Increased recyclability reduces resource depletion
- Essential, high impact power cable redesigned facilitating reuse
- Hazardous / Toxic materials significantly reduced.
- PostaMota delivers substantial societal benefit by involving consumers in the recycling process.

Diagrams comparing Benchmark & Redesign

