Product design review of an Own-Brand Vacuum Cleaner

This case study describes how simple design changes to an own-brand vacuum cleaner can improve sales, reduce product returns and increase customer satisfaction. The opportunities presented significant cost and environmental savings through improved production and assembly. Based on 100,000 unit sales per annum, savings were estimated to be:

- **~ £31,200 per annum**
- **~ 163 tonnes of CO_2e per annum**
- **~ 148 tonnes of material per annum**

The Vacuum Cleaner

The product considered was a value vacuum cleaner with a price point around £40. The retailer has received positive customer feedback as the product offers good value for money, is compact, lightweight, easy to use, aesthetically pleasing, and has excellent suction. However, issues have been reported to the retailer around faulty accessories, the cable failing to retract, and manoeuvrability.

Key Opportunities Summary

The review identified the following key areas were where design and/or manufacturing changes could save money and improve environmental performance:

- Carry out testing on all of the accessories to identify the faults and potentially carry out redesign;
- Improve the design of the cable rewind to ensure the cable fully retracts;
- Improve the design of the wheel assembly to reduce material use and improve performance; and
- Improve the design of the bypass valve holder to prevent stress occurring from the screw fastening.

These opportunities are described in detail within this case study.

Test all accessories for faults

One of the most common reasons for product returns for this model is broken or poorly fitting accessories. It is suspected that this is experienced upon delivery or within the early life of the product, and is therefore likely to be a production issue. It has been recommended that further investigations are undertaken directly with the manufacturer, which should include thorough testing of all accessories and a review of quality assurance procedures. Some redesign work may be required to rectify the faults.

The retailer can also take steps to reduce product returns and avoid premature failure by offering replacement accessories and filter cartridge replacements to consumers. A system could be put in place to harvest accessories in good condition for re-use from faulty products. This could be an effective method of reducing replacement costs.

Improve the cable rewind

When testing the cable rewind, it stopped around 1m from the end, resulting in having to manually push the cable back through the hole. Once the product was fully disassembled, the cable rewind assembly was reviewed in more detail. It was found that the tension of the coil was not strong enough to take the weight of the full recall of the cable. This is an issue that will only

get worse over time. It has been recommended that further testing is carried out with the manufacturer and some redesign takes place to improve the performance of the cable rewind and ensure that the cable fully retracts.

Cable rewind assembly

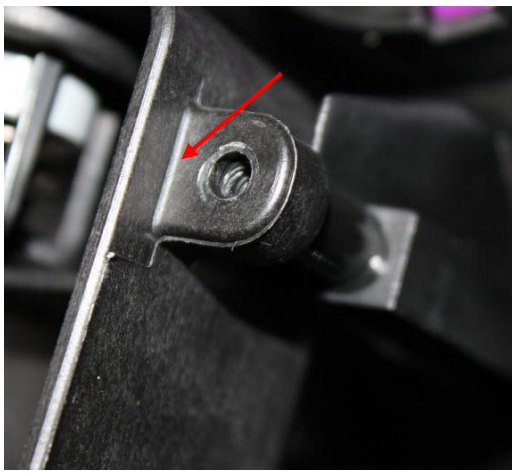
Improve the wheel assembly

The wheels are attached to the sides of the base plate with 4 snap fits and a spring clip, which were not easy to release. The motion of the wheels purely relies on the tolerance of the plastic mouldings. Using proper wheel bearings would enable a smoother rotation and improve manoeuvrability.

The wheels are manufactured from black ABS with an over-moulded purple rim for aesthetics. This uses considerable material, and could be redesigned with clip-fit hub caps that are replaceable if they become scuffed during use.

Improve the design of the bypass holder

The bypass valve holder is secured with just three screws and is easy to remove from the top plate mounting. However, one of the bosses twisted as the screw was released, and caused a whitened stress line to occur, as shown in the image above. It is recommended that the bosses are redesigned with improved strength and rigidity to prevent this stress occurring.



Recycled Content for Polymers

There is potential to introduce up to 100% recycled content to a number of components that have no cosmetic requirements, such as the dust container holder, filter cartridge assembly, and motor housing.

It is also recommended that alternative pigment types to carbon black or another colour are considered to facilitate ease of large-scale sorting at end of life.

Design Reviews and Buying specifications

Having undertaken 16 product design reviews WRAP are building on this work by developing buying and specification guidelines that will improve the durability of electrical products.

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