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Nils F. Nissen
Melanie Jaeger-Erben (eds.)

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Repair or Replace? Is It Worth Repairing an Old Device From a Consumer Perspective?

Schick, P.; Morys, M.; Neisser, A.; Schwan, G.
Stiftung Warentest, Berlin, Germany

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Abstract: When household appliances break down users have to make a decision. Is it better to repair the existing device or to replace it by a new one? Our studies show that we can support the decision with the help of life cycle assessments, cost balances and other data obtained from surveys (e.g. prices, repair frequency). We focused on following product groups: fully automatic coffee machines, vacuum cleaners, washing machines and dishwashers. Specific conclusions have been drawn for each product group to help consumers make their choice and how to analyse further product groups. Three steps towards longer service lifetimes are proposed.

Method

What burdens household budget and environment more - repairing or replacing? Our life cycle assessments and cost analyses take into account several thousand answers to our reader surveys on test.de as well as surveys of 506 independent workshops of Meinmacher.de portal and 111 repair cafes of Reparatur-initiativen.de portal.

Life cycle of a product is divided into several stages for Life Cycle Assessment (LCA): Production, packaging, transport, operation (with German electricity mix), disposal / recycling. Products were disassembled in the testing institute and the masses of metals, glass, plastics, electronic components, etc. were recorded separately for the Ecoinvent LCA database. Not only materials used, but also processes involved (e.g. shaping of metal; transport by truck or freighter) are recorded, including all material and energy consumption of the upstream processes from the respective raw material extraction.

For cost analyses we determined when equipment breaks down, average purchase prices and repair costs for most common defects. In addition to electricity and water costs, usage costs also include expenses for auxiliary and operating materials such as dust bags, detergents, descaling agents or coffee.

We also asked the suppliers how long they keep spare parts in stock, what service life they calculate for the products and how long they guarantee their products.

According to suppliers, spare parts for coffee machines, vacuum cleaners and washing machines around 10 years old can still be obtained often. Prices vary strongly. Typical repair costs were called us by manufacturer independent workshops. Spare part prices are only taken into account in cost calculations where consumers replace components themselves, e.g. dish baskets of a dishwasher.

In a further survey we asked our readers about their satisfaction with their household appliances. We received answers from more than 14,000 people. We evaluated reliability of brands and the satisfaction of the users in age groups of the brands from up to 2 years old, over 2 to 8 years old and over 8 years old.

Vacuum Cleaner: Repairing is rarely worth it

If the vacuum cleaner breaks down after warranty period, it is almost always cheaper to buy a new one instead of having the old one repaired by a professional. Only hobbyists who repair themselves can save money.

Repairing is of little ecologic use

A vacuum cleaner contains around 55 g of electronics, 5.7 kg of plastics and 2.4 kg of metals. Repairing or replacing it is almost irrelevant for environment. Electricity

consumption during vacuuming has a greater impact than production. Only with old 2000 Watt power guzzlers exchange is worthwhile in any case: new models need less than half the power thanks to European Ecodesign regulations.

New purchase is cheaper than repairing
According to our reader survey, vacuum cleaners break down on average after 8 years. Devices that have been repaired have a defect again one year later. Who buys the new device for 170 € and repairs twice, has in 10 years about 500 .. 690 € total costs (1 .. 2 hours suction/week). Those who never have it repaired but buy a new one at the first defect only pay 400 .. 580 €. Cheap repairs are only worthwhile in the first four years.

Cable winders, hoses and motors
Manufacturer-independent workshops repair broken cable winders most frequently. This costs an average of 70 €. The hose also often breaks. Fitters replace it for about 45 €. The third most common weak point is the engine. On average, this costs 120 €.

Spare parts for 5 to 10 years
Most suppliers keep spare parts in stock for about 5 to 10 years. They often don't provide any information on calculated service life. Data ranged between 500 hours and up to 20 years. Warranty is granted rarely more than 2 years, with on-line registration sometimes more.

Fully automatic coffee machines: Repair is worth it

Production of fully automatic machines is resource-intensive and their purchase price is high. Therefore, coffee drinkers who have their defective machine repaired save money and the environment.

Repairing makes sense ecologically
A fully automatic coffee machine contains around 600 g of electronics, 7 kg of plastics and 3.2 kg of metals. Because of these valuable raw materials, production pollutes the environment to such an extent that owners should use it for as long as possible and have it repaired in the event of defects.

Repairing usually saves money
On average, a fully automatic coffee machine fails three times in ten years. If you buy a new one for 810 € and have it repaired every time, you'll have spent a total of 2,500 .. 3,900 € (5 .. 10 cups/day) after 10 years, if typical defects will appear. Anyone who buys a new one at the first loss pays around 3,100 .. 4,300 €.

Heating, valves and pumps
According to independent workshops, the biggest weak point is heating. The repair costs 145 € on average. Secondly, repair shops replace defective valves most frequently. That costs on the average 100 €. A defective pump is the third most frequently repaired by fitters. They charge around 110 € for this.

Service life can be 15,000 coffee drinks
According to their own information, the suppliers keep most spare parts in stock for about 5 to 15 years. Some suppliers do not provide any information on the calculated service life. Data ranged between 15,000 coffee drinks or up to 20 years. Warranty rarely granted for more than 2 years.

Washing machines: Repairing is better for the environment

Getting broken washing machines up and running again usually doesn't save the owners much money in the long run, but it noticeably reduces their ecological footprint.

Ecologically, repairing makes sense
A washing machine contains around 900 g of electronics, 26 kg of plastics and 33 kg of metals. The production process is so energy and resource intensive that the owner protects the environment by using the machine for as long as possible and repairing it if necessary.

Repairing is not financially worth it
A washing machine needs on average two repairs in fifteen years. The typical repairs cost so much that in the long run a new purchase is only slightly more expensive than the repairs: If you buy a new machine for 600 € and have it repaired twice, you will have spent a total of 2,300 .. 3,500 € (150 .. 300 washes per year) after 15 years, if typical defects will appear. Anyone who buys a new one for the first damage pays around 2,400 .. 3,700 €.

Heating rod, pump and electronics.
Fitters change the heating rod particularly often. This costs an average of 125 €. The pump also often breaks down. Manufacturer-independent companies repair this damage for an average

of 130 €. The third most frequent and most expensive weak point is electronics: A repair costs on the average 250 €.

Calculated service life of 2,000 washes
According to their own information, the suppliers keep most spare parts in stock for about 5 to 10 years. Calculated service life data lay between 8 to 20 years or 2,000 wash cycles. Warranty typically granted for 2 years.

In the first 2 years, 7 percent defect
Devices that were older than 8 years already broke down or had faults on average in 30 percent of all cases. In the case of devices under 2 years old, the figure was only 7 percent, in the middle age group 20 percent.

User satisfaction was highest at Miele, Privileg and Blomberg: 82 to 60 percent of all users would certainly recommend their device to others. It was lowest for Constructa, Bauknecht and Whirlpool: only 44 to 41 percent would recommend it to others.

Dishwashers: Repairing benefits the environment

The production of a dishwasher requires a lot of energy and resources. Repairing a dishwasher instead of buying a new one pays off for the environment. Financially, it only pays off for expensive models

Repairing makes sense
Dishwashers contain around 1.3 kg electronics, 16.8 kg plastics and 20.5 kg metals. Environmental cost of 4 repairs in 15 years is lower than material and energy for production. Consumers therefor should repair. Greatest harm to the environment is caused by the use of the product, which is why it should only be switched on fully loaded, detergents should be dosed as low as possible.

Hardly any financial difference
If the dishwasher breaks down 4 times and is repaired, the costs will only just exceed the average price of a new one of around 600 €. The more expensive the machine, the more worthwhile it is to repair it: if you buy a new appliance and have it repaired 4 times, you will have spent a total of around 2,200 .. 3,000 € (150 .. 300 cycles per year) after 15 years, if typical defects will appear. Anyone who buys a new one at the first damage pays around 2,100 .. 2,900 €.

Defective pumps, electronics, door parts
Pumps are vulnerable. Repairing a drain pump costs on average 151 €, a circulation pump even 238 €. Electronic parts are also frequently repaired by workshops, around 268 €. Door components (seal, lock, hinge springs) follow in third place the frequency of defects. Spare parts are quite cheap. Users can exchange the dish basket themselves for around 110 €.

Warranty rarely longer than 2 years
According to their own information, the suppliers keep most spare parts in stock for about 5 to 15 years. The suppliers state the calculated service life between 8 and 20 years or 10,000 hours or 2,500 rinsing cycles. Warranty rarely granted for more than 2 years.

Reliability of brands scatters considerably
Devices that were older than 8 years already broke down or had faults on average in 33 percent of all cases. In the case of devices under 2 years old, the figure was only 6 percent, in the middle age group 25 percent.

User satisfaction was highest at Miele, Bosch and Privileg: 74 to 50 percent of all users would certainly recommend their device to others. It was lowest for Whirlpool, Gorenje, and Zanussi: only 30 to 22 percent of their users would safely recommend it to others.

Investigation of reparability: Dishwashers

With our own test program, we have for the first time investigated the reparability of this product group. We selected 3 devices from different price and energy consumption classes and examined three dimensions of repairability:

- Instructions (e.g. precise product identification, detailed description of the meaning of all fault indications, availability of the manufacturer's service centre, and nine further test points).
- Practical investigations on reparability (e.g. safe accessibility for troubleshooting purposes, detachability of connections and a further eight test points)
- Facilitation of possible repair cases by the supplier (e.g. the exact model designation

is permanently attached to the device, all requirements on the type plate are met, and a further three test points).

This showed that typical and frequent repairs on the selected models are easily feasible for authorised workshops. Suppliers provide them with detailed documentation such as design and connection diagrams. They can also access a test mode detecting device defects.

The situation is quite different for independent workshops without a contract with the suppliers: They often don't have access to important information, so they can't repair larger defects. This is annoying for consumers because independent repairers can be cheaper than after-sales services.

Conclusions

The question whether a defective product should be repaired or replaced by a new one can be answered in detail with the help of cost balances, life cycle assessments and some other data we got from user surveys.

Individual consumers do not have this information for the respective repair cases. However, they can use our statements valid for the product group. With knowledge of the individual purchase price, the actual intensity of use and the previous service life and repair history, the cost and environmental consequences for the individual case become visible and the decision for or against a repair can be made on an objective basis - depending on the ecological and financial preferences of the decision-maker.

In order to carry out these analyses for other product groups in future, and perhaps in more detail, we have gained experience that at least the following data are required:

- Mass and material balance of typical devices of the respective product group. Component determination after disassembly of products must be carried out in such detail that all parts can be recorded with the LCA database used, including all auxiliary and operating materials as well as the electricity mix. In the case of large household appliances, the electricity mix should be forecast over the service life of the appliance if relevant.
- Usage profiles that map the consumption of all auxiliary and operating materials for at least two different usage intensities.
- Scenarios showing different repair behaviour of consumers for at least 2 variants.
- Overall service life of the appliances and mean times of occurrence of the most frequent defects.
- Life cycle assessments using the above material balances, usage profiles, repair scenarios and service lives.
- Costs for the consumer: range and mean of the equipment purchase price, all auxiliary and operating materials, the repair prices of workshops, the prices of spare parts.
- Cost balances, calculated for the same boundary conditions as the life cycle assessments.

With regard to environmental impacts, results we obtained with these data for 4 product groups show that the longevity of large household appliances can still be significantly improved and this would have a major positive effect on the environment.
In contrast, the financial impact for consumers who opt for repairs and durable equipment is not always clearly positive today, but can be advantageous or disadvantageous depending on the product group.

In order to move closer to significantly more durable devices, further steps are needed in at least the following 3 aspects:

- Improve the reparability of the products so that they especially can also be easily repaired by independent workshops.
- Increase the durability of individual components, especially those that currently limit the service life most frequently.
- Enlarge profitability of repairs, so that the consumers financial decisions are more often in line with environmental benefits.

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