

BNXS30: Vacuum cleaners - UK market, technologies, energy use, test methods and waste

Version 1.7

This Briefing Note and referenced information is a public consultation document and will be used to inform Government decisions. The information and analysis form part of the Evidence Base created by Defra's Market Transformation Programme.

The data presented in this Briefing Note use reference data from 2005 and 2006.

1 Summary

This Briefing Note describes the UK vacuum cleaner market, the technology of vacuum cleaners, energy consumption projections, the relevant test method and progress towards an EU Energy Label. It also outlines the waste implications of vacuum cleaners and identifies some current issues.

2 Introduction

This note provides an introduction to the issues and progress surrounding energy use and test methodologies for domestic vacuum cleaners. It considers the most common types of vacuum cleaner but does not consider other types such as wet-and-dry, rechargeable, hand-held or stick cleaners.

3 Market

The UK vacuum cleaner market for the four major types: cylinder, upright, multifunction and hand-held or stick, stands at around 6 million units per year. It is a market that has been increasing rapidly, but is showing signs of slowing (see Table 1).

Ownership is also levelling. Mintel has published estimates of ownership from 1996 to 2002, and now assumes that the majority of UK homes have a vacuum cleaner. The rise in sales is therefore caused by an increase in overall ownership, a more frequent replacement rate, and ownership of multiple units (see Table 2). GfK (a market research company) reports that in 2006 vacuum cleaners have a market penetration of 93.7%. It also reports that for 2006, 69% of sales were replacements, 29% were additional units and only 2% were first-time buyers¹.

¹ *ERT Weekly*, 13 July 2006.

Table 1 Unit sales of vacuum cleaners 1995 - 2006²

Year	000 units
1995	2,900
1996	3,070
1997	3,374
1998	3,560
1999	3,850
2000	4,475
2001	4,790
2002	5,000
2003	5,618
2004	6,109
2005	6,002
2006 estimate	6,050

Table 2 Ownership of vacuum cleaners 1996 - 2002³

Year	% household ownership
1996	72.5
1998	73.6
2000	76.6
2002	81.2

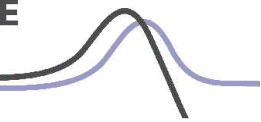
Cylinder vacuum cleaners had a 52% share of the market in 2005, and upright cleaners took 44%; the remainder was split roughly evenly between the other two types⁴. Cylinder cleaners have been increasing in popularity in the UK market that used to prefer upright cleaners. The increased popularity in hard flooring is thought to have contributed to this trend⁵. Traditionally, cylinders have been considered to be more suitable for hard floors, although cleaning heads with brushes are now used to improve the cleaning of other floor types. Uprights are generally better suited to carpeted floors, although hard floor settings are found.

² Mintel, 2000, 2002, 2004 & 2006, Market Intelligence Vacuum Cleaners Reports.

³ Mintel, 2000 & 2002, Market Intelligence Vacuum Cleaners Reports.

⁴ Mintel, 2006, Market Intelligence Vacuum Cleaners Report.

⁵ 'All Cleaned Up?' *The Independent Electrical Retailer* - March 2004.



There is also a preference for bagless vacuum cleaners, with 59% of sales in 2005 being bagless, 39% bagged cleaners and approximately 1% of cleaners could be operated with either a bag or canister⁶.

In addition to models sold for domestic use, there is also an estimated 1 million units supplied for commercial and industrial use⁷. These are not sold through retail outlets and it is not known which types are predominant.

4 Technologies

The basic design principle for a cleaner is to draw air through the cleaner and dust receptacle (bag or collection bin) using the 'draw' created by an impeller fan driven by an electric motor. The air is expelled via filter(s) to prevent small dust particles being emitted. The motor is also usually protected by a filter. Any bag also acts as a filter.

The comparative effectiveness of the cleaner depends on:

- Airflow.
- Agitation (brushes at the cleaning head).
- The design of the cleaner (including drawing air through cleaning heads, along tubes and expelling it through filters and bags).

The use and number of filters have increased over the years to address issues and concerns relating to the recirculation of dust, particularly for households with asthma sufferers. This could have contributed to the need for more powerful cleaners.

It is possible to achieve similar satisfactory performance using lower power input. Examples of cleaners using only around 600 W are available in the Far East, but have not yet been made available in the UK⁸.

4.1 Energy efficient designs?

A prototype air recycling cleaner⁹ ('Captive Air-flow Cleaner', based on an upright model) has been developed which aims to reduce energy consumption and reduce the release of allergens, viruses etc into the air from dust collected by the cleaner and their disturbance by exhaust air from the cleaner.

The minimum power requirement is around 250 W¹⁰, as opposed to 1,200-2,000 W commonly found for a vacuum cleaner. The system is designed to not return air to the environment as in a typical cleaner; the air is recycled back to the cleaning head, which helps to prevent particles being released via an exhaust vent. If attachments are used, the cleaner reverts to a conventional system while the hose is attached and for best results requires a dedicated filter arrangement¹¹.

⁶ GfK sales data for 2005, figures rounded, total may not equal 100%.

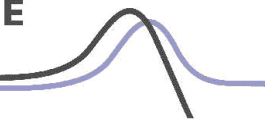
⁷ Information from Industrial Cleaning Machine Manufacturers Association (ICMMA) October 2006.

⁸ Discussion with manufacturer.

⁹ <http://www.edginton.info/cafc> patent nos. 9124437.8 and 9418018.9

¹⁰ <http://www.g0cwt.co.uk/arc/>

¹¹ Correspondence with Ben Edginton, June 2004.



A prototype of the Captive Air-flow cleaner was tested on behalf of MTP at Intertek RPT alongside two, more conventional, cleaners that were chosen as having very good and average to poor dust pick-up ability. Both of these cleaners used over 1,400 W when cleaning, whereas the Captive Air-flow cleaner had a maximum power consumption of around 650 W. The cleaners were subjected to a Dust Removal From Carpets test in accordance with EN 60312:1998 Clause 2.3. Overall, the Captive Air-flow cleaner was found to have slightly better performance than the average to poor model. At 600 and 300 W the dust pick-up was better or equal to the average to poor model on full power, and at 150 W it was only marginally worse.

In principle, this captive air system appears to work and offers the opportunity to clean using less energy. The fact that no manufacturer has yet pursued this as a possible design option presents some doubt as to its potential - although there may be reservations about marketing a low energy model in a market dominated by high wattage cleaners.

In August 2007, Electrolux launched two models in the UK in the EnviroVac range¹². They claim that the bagless upright model uses up to 30% less energy than competitive models and the bagged upright model uses 50% less energy than competitive models. Both have 800 W motors.

5 Energy use assumptions

Typical vacuum cleaning habits are thought by MTP to be around one hour per week per household, giving a typical weekly use of about 1.6 kWh, or 83 kWh per year, depending on the energy consumption of the vacuum cleaner¹³.

Assuming all households use a vacuum cleaner, then the UK energy use accountable to vacuum cleaners is nearly 2 Terawatts per year:

$$1.6 \text{ kWh} \times 52 \text{ weeks} \times 25 \text{ million} = 2 \text{ TW/year}$$

The Office for National Statistics (ONS) Time Use Survey estimates that an average of 31 minutes per person per day are spent in dwelling cleaning and tidying¹⁴. This includes vacuum cleaning, making the beds, cleaning windows, tidying up etc. From this basis it would seem possible to assume that at least one hour per week per household could be spent using a vacuum cleaner.

There is little reliable data on user habits. Mintel surveys suggest that vacuum-cleaning frequency may be declining, but it is not known how long people spend cleaning in each session (see Table 3).

¹² Electrolux Press Release August 2007

¹³ Based on a 1,600 W cleaner.

¹⁴ http://www.statistics.gov.uk/articles/nojournal/time_use_2005.pdf

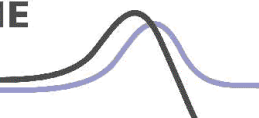


Table 3 Frequency of home vacuum cleaning¹⁵

Frequency	2004 %	2006 %
Once per day or more	34	28
Every 2 – 3 days	32	37
Once a week	27	26
Less than once a week	5	7
Never	2	2

The market trend has also been for more powerful cleaners. This could be due to all or a combination of factors, including marketing drive and a consumer perception that higher wattage implies better cleaning (however, this is not necessarily the case due to different design aspects¹⁶), or due to manufacturers aiming to improve performance with more powerful cleaners. Upright cleaners are available with wattages from 1,150 to 2,000 W and cylinder models are available from 1,200 to 2,500 W¹⁷.

Many models, particularly cylinder models, also have variable power to reduce suction when curtains and upholstery or different floor types are cleaned. It is not known if owners use these options. There is also thought to be a trend towards households having a second, smaller cleaner, but the total time using a vacuum cleaner is likely to be the same.

There are two estimates of lifespan for vacuum cleaners. Mintel estimates the lifespan of vacuum cleaners at around ten years, although it reports that this may be falling towards eight years¹⁸. GfK estimates that the lifespan of a vacuum cleaner has dropped from 11 years in 2002 to 6.3 years in 2006¹⁹. Mintel also reports that cylinder cleaners are replaced more frequently than upright cleaners. The trend is therefore towards more frequent replacement and disposal of vacuum cleaners, which will impact on the amount of waste generated by these products.

The use patterns and lifespan of commercial and industrial vacuum cleaners is not known. However, they may be used for longer periods each working day so their individual energy consumption is higher than domestic cleaners²⁰. The total number in use is not known so it is not possible to calculate the total energy use of commercial and industrial cleaners.

¹⁵ Mintel, 2006, Market Intelligence Vacuum Cleaners Report.

¹⁶ Intertek RPT consumer tests.

¹⁷ Argos catalogue Autumn/Winter 2006.

¹⁸ Mintel, 2006, Market Intelligence Vacuum Cleaners Report.

¹⁹ *ERT Weekly*, 13 July 2006.

²⁰ Information from Industrial Cleaning Machine Manufacturers Association (ICMMA) October 2006

6 Test methodologies

The current test method is EN 60312 (incorporating Amendment No. 1) *Vacuum cleaners for household use - Methods for measuring the performance*. Discussions at Eco-label meetings have suggested that the tests in this standard are not considered entirely appropriate to characterise a cleaner's performance²¹.

EN 60312 includes a test for energy consumption but this must be considered in conjunction with cleaning performance. There are separate performance tests including efficiency of dust removal. Technical experts at Eco-label meetings (including certain manufacturer representatives) have suggested that a more thorough test method, representative of real operating conditions, needs to be developed.

As an addition to the performance tests in the current standard, a test to consider the effectiveness of a cleaner with a partially filled dust receptacle is being finalised.

The test method is described as applicable to vacuum cleaners for household use. It is not clear whether it could be applied to industrial and commercial cleaners.

7 Energy labelling

The European Commission has issued a mandate²² to the standards committees for the elaboration and adoption of a measurement standard for cleaners, to be used for energy labelling. This proposes adoption of a standard including the specified criteria in the mandate (energy, cleaning performance, dust emission, usable receptacle size, radius of operation) by the end of December 2005. Progress has been delayed owing to agreements on the test method and no scheme is expected to be agreed upon until around 2008²³.

The most recent edition of the test standard to which EN 60312 is harmonised was published in April 2007. It includes methods for calculating energy consumption for vacuuming carpets and for vacuuming hard floors with crevices, and a method to measure performance with a filled (or loaded) receptacle.

MTP will be involved in the consultation process and feed back relevant comments. Issues regarding the development of a test standard, which have already been expressed at Eco-label meetings, will also contribute to the consultation process.

It is not known whether the labelling scheme will extend to products for industrial and commercial use.

²¹ Information from Phil Dolley (MTP Eco-label expert), March 2003.

²² Mandate to CEN and CENELEC for the elaboration and adoption of measurement standards for household appliances: Vacuum Cleaners. M/353-EN 25th June 2004.

²³ Grahame Capron Tee (chairman of IEC SC59F Standards committee), June 2006.

8 Eco-design of energy using products (EuP) study

Under the EuP Directive the European Commission has commissioned a range of studies in order to recommend ways to improve the environmental performance of products. A specific study started in 2007 to investigate vacuum cleaners²⁴. The tasks within the study will consider definitions and current standards as well as calculating the contribution vacuum cleaner power consumption makes to total energy use. It will identify ways of reducing total energy consumption. The study has established a website to inform stakeholders of progress and invite comments and contributions <http://www.ecovacuum.org>.

9 Waste

Vacuum cleaners are covered by the Waste Electrical and Electronic Equipment (WEEE) Directive under Category 2 - Small household appliances. Small household appliances, including vacuum cleaners, account for about 80,000 tonnes of waste or 8% of the electronic and electrical waste in the UK (2003 figures). Of this, it is estimated that 60% of the weight is vacuum cleaners (48,000 tonnes), assuming an average weight of 12 kg²⁵. This may be an overestimate of the weight of individual products, a recent study also suggests a weight of 6.3 kg per unit for items collected at the Lewisham Civic Amenity site during April 2005 to March 2006²⁶. Vacuum cleaner weights may be increasing, a recent Which? report gave a range of 6.6 kg to 12.9 kg for 22 tested models²⁷.

A study of the composition of the different WEEE categories carried out in early 2007 suggested that numerically vacuum cleaners accounted for 63% of the Category 2 waste that was processed. The study did not process each product individually, but the overall composition of the Category 2 appliances was measured as 59% plastic, 38.2% metal, 2.7% other and 3% PCB²⁸. The majority of metal was noted as coming from the motors in the vacuum cleaners. Vacuum cleaners may be over represented in this survey because the samples were collected from local authority amenity sites and consumers may not typically dispose of their smaller products, such as kettles, at these sites.

The WEEE Directive sets a target of 50% by an average weight per appliance for re-use or recycling and 70% by an average weight per appliance for recovery of small household items²⁹. The Axion study of WEEE flows in London estimated that only

²⁴ http://ec.europa.eu/energy/demand/legislation/eco_design_en.htm#second_round

²⁵ <http://www.icer.org.uk/InterimStatusReport2005FinalWeb.pdf> Website no longer available.

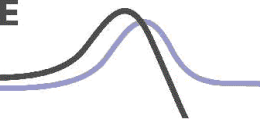
²⁶ Axion Recycling Ltd, 2006. *WEEE Flows in London* Table 2

<http://www.capitalwastefacts.com/Portals/0/WEEE%20Flows%20in%20London%20v1.2.pdf>

²⁷ Which? October 2006 Vacuum cleaners report.

²⁸ Mayer Environmental Ltd, 2007. *Trial to establish waste electrical and electronic equipment (WEEE) protocols* <http://www.defra.gov.uk/environment/waste/topics/electrical/pdf/weee-protocol-report-070412.pdf>

²⁹ The Waste Electrical and Electronic Equipment Regulations 2006
<http://www.berr.gov.uk/files/file35992.pdf>



10% of vacuum cleaners are currently being recycled³⁰. A recent study suggests that there is no hazardous material in vacuum cleaners (as defined by the WEEE Directive and the Hazardous Waste List)³¹.

Waste industrial and commercial vacuum cleaners will be treated as business or commercial WEEE.

10 Issues

The MTP assumptions used for this Briefing Note are based on limited information. Further information on consumers' habits in terms of time spent cleaning and the use of second (perhaps less powerful) vacuum cleaners would help in projecting and calculating more data regarding the energy consumption of vacuum cleaners.

Further information about the industrial and commercial market, use patterns, energy consumption and waste disposal would help in projecting and calculating more data regarding the environmental impact of this type of vacuum cleaners.

It is yet to be seen if the introduction of an Energy Label will affect product development, marketing, and the purchasing decisions of consumers.

There are no data available about the end-of-life disposal of vacuum cleaners.

Related MTP information

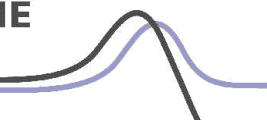
There is no other MTP information on vacuum cleaners.

Changes from version 1.6

Addition of link for EuP study.

³⁰ Axion Recycling Ltd, 2006. *WEEE Flows in London* Table 4
<http://www.capitalwastefacts.com/Portals/0/WEEE%20Flows%20in%20London%20v1.2.pdf> Table 4

³¹ <http://www.defra.gov.uk/environment/waste/topics/electrical/pdf/weee-aeatreport-june06.pdf>



Consultation and further information

Stakeholders are encouraged to review this document and provide suggestions that may improve the quality of information provided, email **info@mtprog.com** quoting the document reference, or call the MTP enquiry line on +44 (0) 845 600 8951.

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