European Commission

Special Review Study Vacuum Cleaners

Article 7(2) of Commission Regulation (EU) No 666/2013 with regard to **ecodesign requirements for vacuum cleaners**

VHK for the European Commission

Energy

Project

Article 7(2) of Commission Regulation (EU) No 666/2013 on Ecodesign requirements for vacuum cleaners (hereafter the Regulation*) :

> 2. The Commission shall review the specific ecodesign requirements on the durability of the hose and the operational motor lifetime and present the result of that review to the Consultation Forum no later than 1 September 2016.

Requirements: 40 000 hose oscillations & ≥500 hours operational motor life

To be tested in accordance with EN 60312-1:2013 **

*=Commission Regulation (EU) No 666/2013 of 8 July 2013 implementing Directive 2009/125/EC of the European Parliament and of the Council with regard to ecodesign requirements for vacuum cleaners, OJ L 192, 13.7.2013, p. 24–34

**=EN 60312-1:2013 - Vacuum cleaners for household use - Part 1: Dry vacuum cleaners - Methods for measuring the performance.

Timing

Start: 14.12.2015.
IR: Draft interim report, 14.3.2016
SH: Stakeholder meeting, 25.4.2016
DFR: Draft final report, <14.6.2016
FR: Final report, June/July 2016 [End]

UAP (Unique Acceptance Procedure) :
Cenelec TC59X/WG6 deadline, 19 May 2016
CF: Presentation to Ecodesign Consultation Forum *"no later than 1 September 2016"*
EN: EN standard published according to UAP, ready for harmonisation, ca. April/May 2017
Reg: Implementation durability requirements in Regulation, 1 Sept. 2017.

Year	2015	2016									2017	
Month	*12*	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*April/*	*1*
	Dec	*Jan*	*Feb*	*Mar*	*Apr*	*May*	*June*	*July*	*Aug*	*Sept*	*May 2017*	*Sept. 2017*
Milestones contract	**Start**			**IR**	**SH**		**DFR**	**FR [End]**				
Milestones external						**UAP**			**CF**		**EN**	**Reg**

Consultation

Project website: www.ia-vc-art7.eu

Bilateral and SH meetings, electronic & phone communication, report:

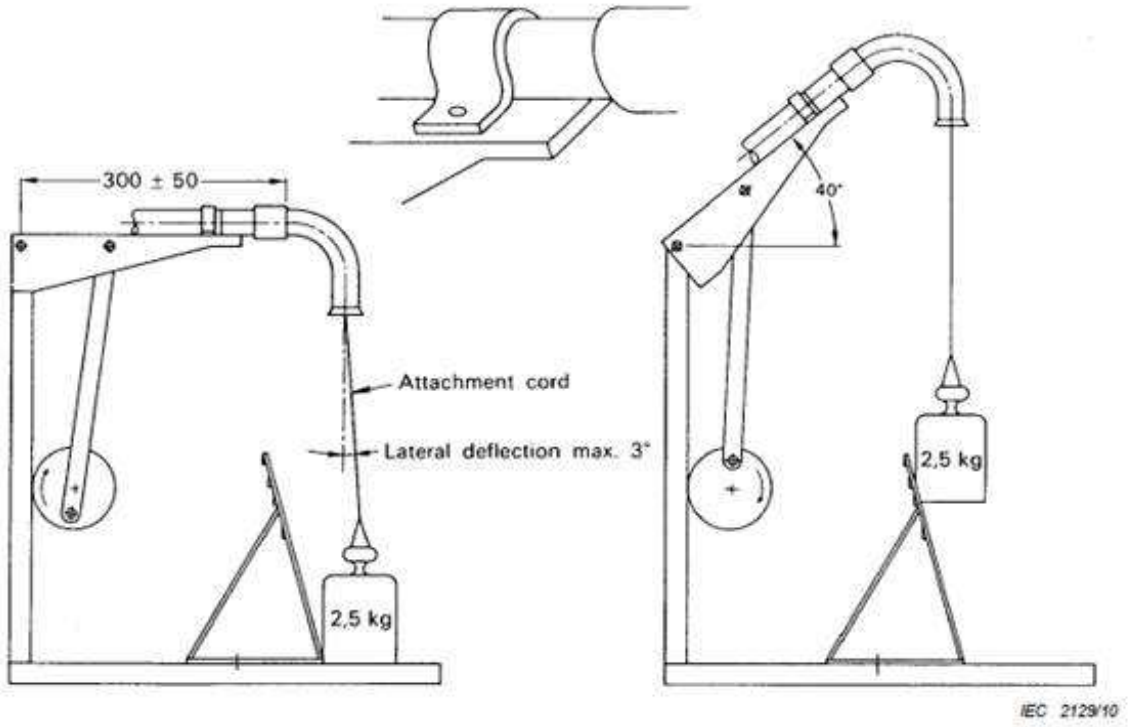
- Commission services ENER, GROW, JRC-IES
- Standardisation working group: CLC TC59X/WG 6 and others
- Industry association: CECED etc.
- Consumer associations: ANEC/BEUC, Which?, Stiftung Warentest, ICTR
- Market surveillance authorities (indirect)

Report and SH meeting:

- Member States and others (report and SH meeting)
- Stakeholder meeting 25 April 2016

Deskresearch VHK

Durability test of hose



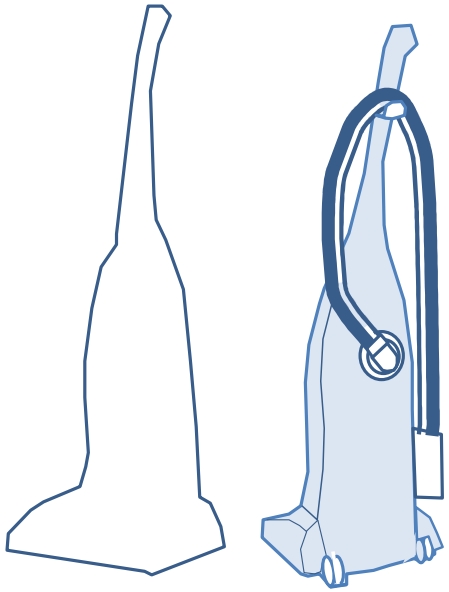
Dimensions in millimetres

7. **Durability of the hose**

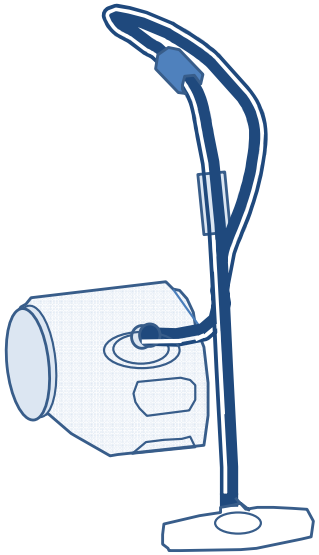
The hose shall be considered useable after 40 000 oscillations under strain if it is not visibly damaged after those oscillations. Strain shall be applied by means of a weight of 2,5 kilogram.

Problem: What hose?

The problem is not the technical test procedure (proven and uncontested), but the definition of what hose should be subject to the Ecodesign requirement: Only primary hose of cylinder vacuum cleaner or also secondary hoses e.g. of upright vacuum cleaner?

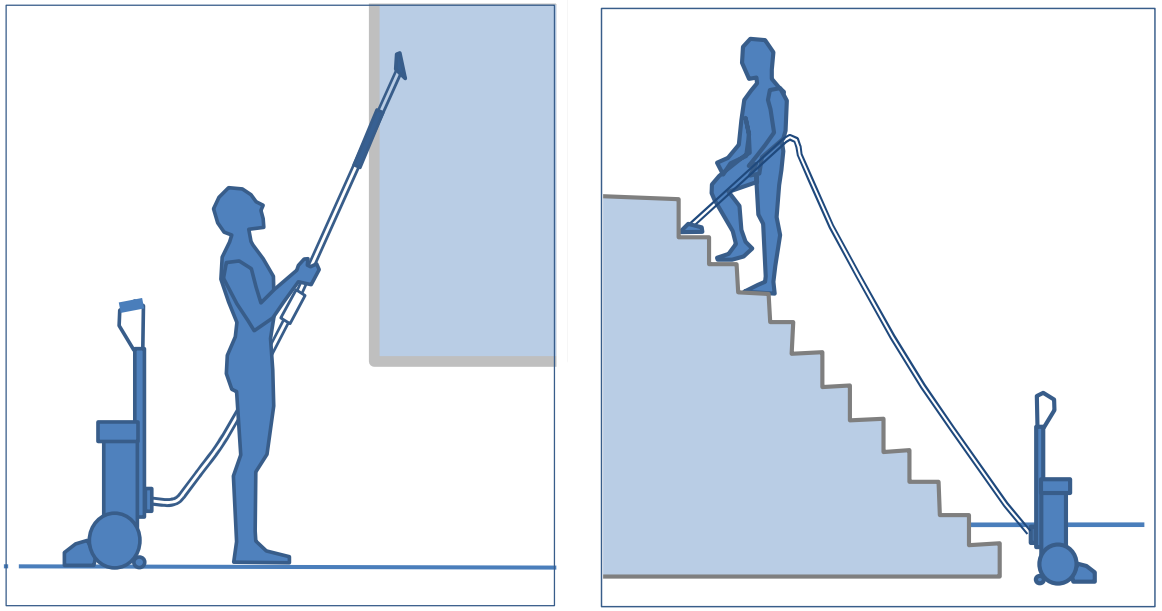


Upright vacuum cleaner with secondary hose



Cylinder vacuum cleaner with primary hose

Secondary hose



Upright vacuum cleaner with secondary hose used for curtains (left) and stairs (right).

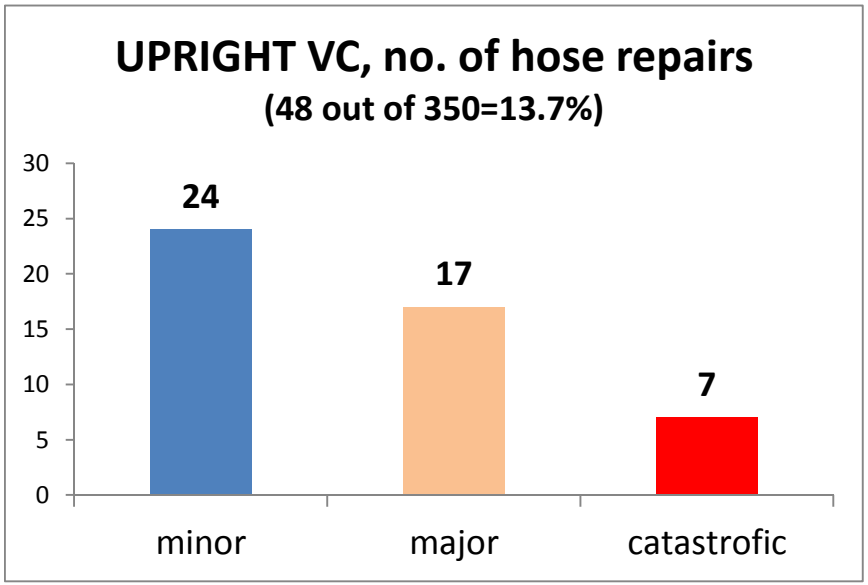
Consumer Fault Reports (UK 2015)

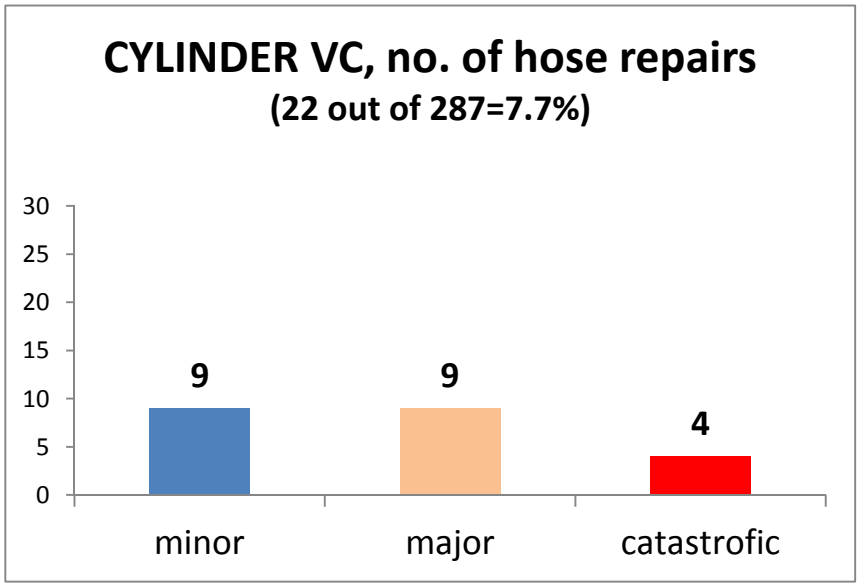
Upright vacuum cleaners (source: Which? 2015)			Cylinder vacuum cleaners (source: Which? 2015)	
Suction deteriorated	24.3%		Suction deteriorated	19.5%
Blocked filters	21.7%		Blocked filters	17.8%
Belt broken	16.9%		Other	15.7%
Split hose	**13.7%**		Broken accessories	12.2%
Motor broken	**13.4%**		Brush not working properly	10.8%
Brush not working properly	12.0%		Casing cracked/chipped/broken	10.1%
No suction	10.0%		Overheating	8.7%
Brush not working at all	9.4%		**Split hose**	**7.7%**
Casing cracked/chipped/broken	8.9%		**Motor broken**	**6.6%**
Other	8.6%		Power cutting out	5.2%
Broken accessories	8.3%		Power cable faulty	5.2%
Overheating	6.3%		No suction	5.2%
Power cable faulty	5.1%		Brush not working at all	4.9%
Wheels/castors broken	4.9%		Handle broken	3.8%
Handle broken	4.6%		Power not working at all	3.8%
Power not working at all	3.7%		Controls broken	2.4%
Power cutting out	3.1%		Wheels/castors broken	2.4%
Handle loose	2.3%		Belt broken (drive-belt rotating brush)	2.1%
Controls broken	.6%		Handle loose	1.7%

Field research Which? members 28.8-15.9.2015. Uprights n=1042 (upright penetration rate 45%) , Cylinders n=1304 .

Split hose fault classification (UK 2015)

Vacuum cleaner fault classification UK 2015. Source: Which? Feb. 2016.





Hose repair 'catastrophic' in 2% (upright) or 1.4% (cylinder) of repairs.

Scope options for durability test of hose

1. Primary hose of cylinder type VC (misses 5% of market)

2. Also secondary hose of upright type VC with the same bending test as for primary hose of cylinder type (possibly futile test)

3. Also secondary hose of upright type VC with a new dedicated test, i.e. directed more to (takes time to develop, not in UAP but could be Commission mandate to CLC TC59/WG6)

Preference SH meeting: Option 1 to be included in the UAP-procedure (standard per available March 2017). Option 3, new dedicated test for secondary hose of upright VC, to be included in the standardisation work programme for 2018.

Ad all options: Require new definitions of VC (cylinder, upright) and/or hose type in the test standard [currently discussed in WG6]

Durability test of motor

CR 666/2013, Annex I, point 1 (b):

— operational motor lifetime shall be greater than or equal to 500 hours.

CR 666/2013, Annex II, point 8:

8. Operational motor life-time

The vacuum cleaner shall run with **a half-loaded dust** receptacle intermittently with periods of 14 minutes and 30 seconds on and 30 seconds off. Dust receptacle and filters shall be replaced at appropriate time intervals. The test may be discontinued after 500 hours and shall be discontinued after 600 hours. The total run-time shall be recorded and included in the technical documentation. Air flow, vacuum and input power shall be determined at appropriate intervals and values shall, along with the operational motor lifetime, be included in the technical documentation.

Problem: Half-loaded dust receptacle

- Makes the motor durability test expensive (requires special equipment, manual intervention every X hours and special test dust DM 8 → ca. 5000 EUR/test reported);
- Makes the motor test less reproducible (deviations in test loading, definition problems for bagless VCs, etc.);
- Is opposed by all consulted stakeholders that have to test: industry, consumer associations and market surveillance authorities (MSAs).
- Makes spot-checks by consumer associations and MSAs very unlikely
- Uses implicitly a clause in the EN test standard that was not designed to test motor durability, but to test suction maintenance over life
- Better, simpler and 'proven' alternative is available: testing with empty receptacle. (e.g. used by Stiftung Warentest and others)

Options motor durability

1. **No action**→ problems persist → no option
2. **Amendment** of Annex II, Point 8 of Regulation→ long time (1 year?) + heavy administrative burden → not a preferred option
3. **Transitional method** (Commission Communication) that defines a number of **X** hours testing at empty receptacle is equivalent to 500 hours at half-loaded receptacle
4. **Harmonised EN-standard** that defines a number of **X** hours testing at empty receptacle is equivalent to 500 hours at half-loaded receptacle → to be incorporated in the UAP timeline (harmonised standard available March 2017)

Majority SH meeting: Preference for combination of options 3 and 4, whereby the standard (option 4 hints at the equivalence (option 4) and the transitional method actually allows the alternative test method at empty receptacle (option 3)

Problem: **What is X ?**

Industry information (VHK summary)

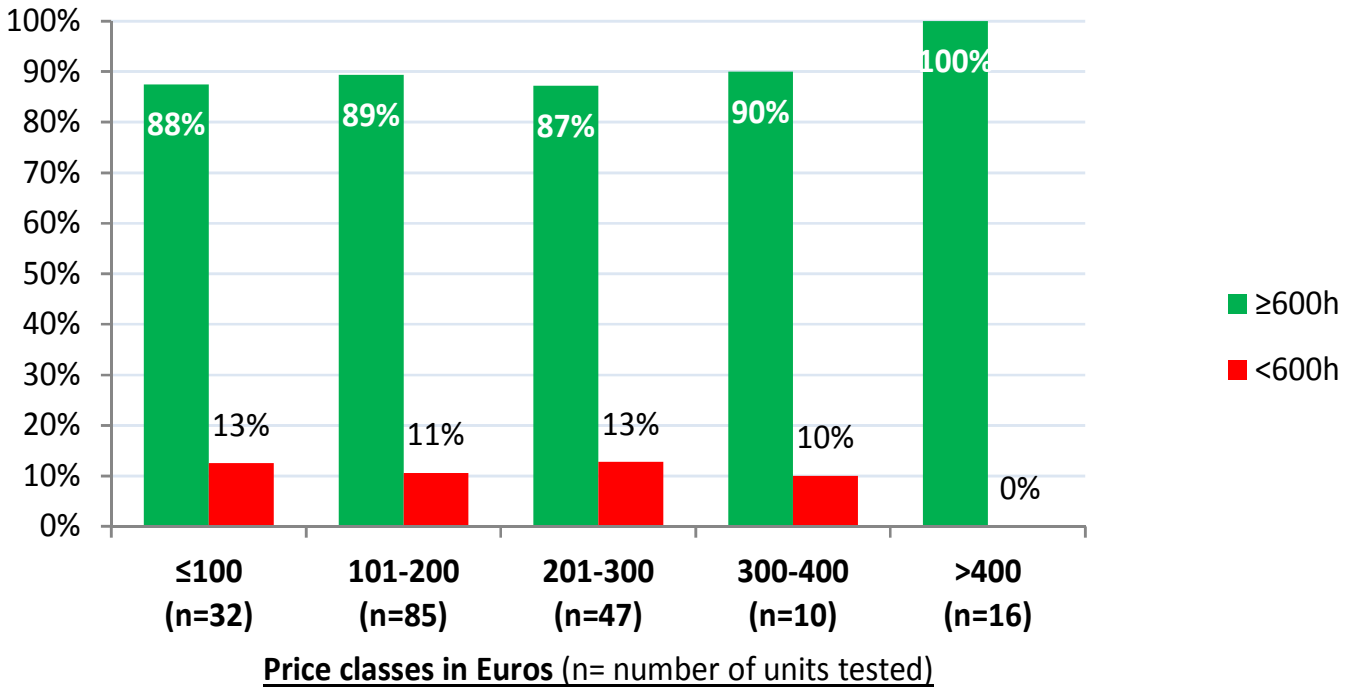
- Today, an empty receptacle may be and often will be a heavier load for motor life than a half-loaded receptacle so there is no reason to increase minimum number of hours. It all depends on individual design parameters used (including motor type).
- However, industry is prepared to take a pro-active stand and accept equivalence for 550 h at empty = 500 h at half-loaded receptacle
- Basic formulation to be taken from FDIS IEC 62885-2:
  - empty receptacle (=no loading action or filter change)
  - normal operation (nozzle energised, nozzle 1 cm above floor, handle at 800±50mm above floor)
  - cycle 14 minutes 30 seconds on/ 30 seconds off
  - end-of-life when suction motor stops operating (no hours specified)

Consumer association StiWa

German consumer association **Stiftung Warentest** has tested with empty receptacle since 2003→ 170 of 190 models tested (89%) passed >600 hours, almost independent of price and moment in time.

Vacuum cleaner motor durability in hours vs. price

(source Stiftung Warentest, n=190)



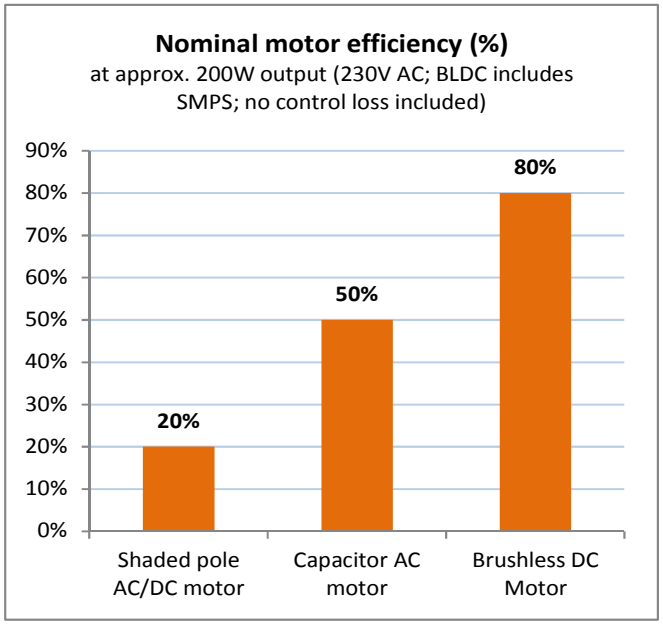
Price classes in Euros (n= number of units tested)

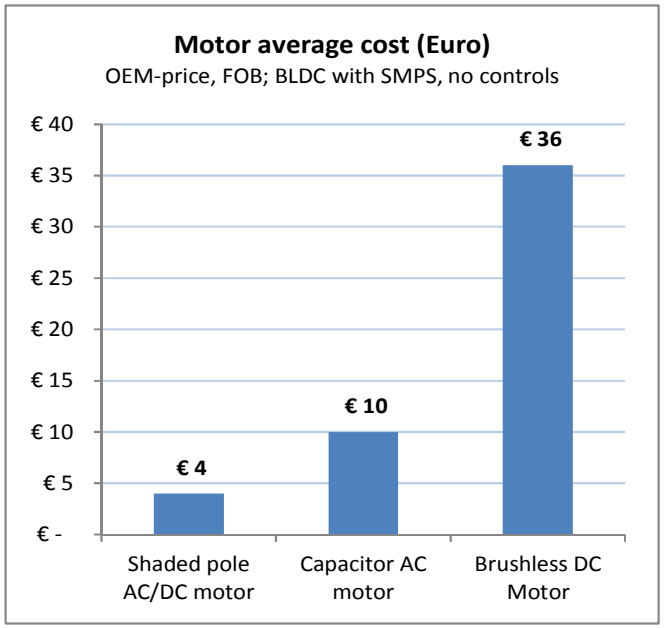
Consumer association ICRT

- **ICRT** (International Consumer Research & Testing) has tested motor life over 1100 vacuum cleaners from 6 EU countries over the years.
- Motor life tests were conducted for 550 hours and 90% of models passed, thus confirming StiWa finding of 91% of models passing 550 hours motor life (at empty receptacle).
- In an ongoing comprehensive research on vacuum product life ICRT is testing life of motors, hoses, nozzles and electrical parts until failure. First results will be available in July

Additional considerations

- Long term: motor design for vacuum cleaners is moving and it is difficult to predict how long universal motors (with brushes) will still be the industry standard practice for VCs. New balances between price and performance may be found. Motor-life may well become a visible commercial factor.





Motor 200W output; nominal efficiency and average OEM costs. Source: VHK 2016, based on publicly available prices and declared efficiencies [motor efficiency only, not whole VC]

Additional considerations

- This special review study concerns only one aspect (durability); a full review (including again durability, but possibly also other circular economy aspects) is to be presented in Aug. 2018, meaning that the study for this will start probably within a year.
- Outcomes of consumer association tests concern testing of one model and thus there is the risk of outliers ('Monday morning models'). In the regulation, if one model fails, the average life of three other models is measured and should comply (within verification tolerance 5%).
- The new UAP-version of the test standard, especially in clause 4.6, also aims to align the so-called 'related tests': cleaning performance, energy, noise and –by reference– the operational motor life-time test. This is to ensure that for all related tests (differentiated between 'hard floor' and 'carpet') the same nozzle and the same settings are used. For universal vacuum cleaners, suitable for both floor types, the standard makes a 50/50 split between settings/nozzle for hard floor and settings/nozzle carpet in the motor durability test (Clause 6.17).

Conclusion

- For the majority of the SH-meeting an equivalence of 550 hours at empty receptacle (X=550 h, versus 500 h at half-loaded) seems acceptable
- The standardisation WG will prepare the draft-UAP accordingly, i.e. hint at 10% increase of hours for empty receptacle testing
- The transitional method is expected to echo the standard on this point, but will actual allow testing at empty receptacle and 550 hours.
- Confirmation of decision making on the transitional method and its tekst should be as soon as possible (CF, RegCom)
- Official publication of the transitional method in the OJ should take place immediately after the positive vote on the UAP is known (4.12.2016), so there is no uncertainty for industry anymore and they can start testing, to be ready for implementation of the 2nd tier of the Regulation per 1.9.2017.