

Innovation goals washing machines

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1 Introduction

Topten is a consumer-oriented online search tool, which presents the most energy efficient appliances in Europe in various categories of products. Crucial precondition for the meaningful and well accepted Topten market surveys are appropriate selection criteria.

Obviously the market offers in European member States differ significantly in terms of price level, configuration, finishing as well as shares of energy classes and energy consumption corresponding to levels of purchasing power and behavioural aspects (mentality, customs, etc.). From the perspective of the enhancement of the European wide Topten project, however, the higher the level of congruency within the national websites the higher will be awareness (consideration) amongst manufacturers since supply side markets are rather focused on the entire EU market or even on the international market (especially for consumer electronics and ICT).

Within the context of the German EcoTopTen project, dialogues were held with manufacturers in recent years, in which criteria for future market surveys and thus also for possible product developments were discussed. In the case of some product groups, even formal innovation goals were characterised and substantiated, and were communicated to branch associations and manufacturers, with lead times of one to two years in order to give sufficient time for product developments. The targets could also refer to product features which support low-impact and low-cost behaviour on the part of consumers, such as consumption displays in cars, automatic dosage systems for detergents in washing machines etc..

In the herewith presented paper possible innovation targets for **household washing machines** are discussed against the background of a dialogue with innovative manufacturers that took place in the forefront. After a short introduction in chapter 1, chapter 2 outlines the framework conditions concerning existing legislation, environmental labels and Topten / EcoTopTen criteria and according changes to be expected in the nearer future. In chapter 3 the possible innovation goals are presented and discussed against the background of the dialogue with the manufacturers. In chapter 4 conclusions are drawn.

2 Framework conditions household washing machines

2.1 Ecodesign process and EU Energy Label

The Ecodesign process on household washing machines is advanced but not completed yet. However draft versions of the implementing measure is available that most probably is close to the regulation that will be adopted. As this regulation naturally is of high importance for the product development undertaken by the manufacturers, its most important aspects are outlined in the following. The same is true for the EU energy label that is also outlined below.

The Ecodesign implementing measure likely to come according to the last draft available (May 2010)

For the calculation of the energy consumption and other parameters for household washing machines, the cycles which clean normally soiled cotton laundry (hereafter 'standard cotton programmes') at 40°C and 60°C shall be used at full (60°C) and at half load (40°C and 60°C).

One year after entry into force

- Energy Consumption: For all household washing machines: "A" (EEI<68) according to the expected new EU energy label. => As the calculation basis changes this classification cannot be compared to the classification in the current EU energy label.
- Washing Efficiency Index (Iw): for household washing machines with a rated capacity higher than 3 kg, the Washing Efficiency Index (Iw) shall be greater than 1.03 => this corresponds to "A" according to the current EU energy label, in the new EU energy label the Washing Index is no more included.
- Water Consumption: For all household washing machines: $Wt \leq 5xc + 35$ (with c = rated capacity) => 5kg: 60l; 6kg: 65 l; 7 kg: 70l; 8 kg: 75l per cycle
- Household washing machines shall offer a 20°C program

Three years after entry into force

- Energy Consumption: For household washing machines with a rated capacity equal to or higher then 4kg: "A+" (EEI<59), for EEI calculation see below the EU energy label
- Water Consumption: For all household washing machines: $Wt \leq 5xc/2 + 35$ (with c = rated capacity) => 5kg: 47,5l; 6kg: 50 l; 7 kg: 52,5l; 8 kg: 55l per cycle

EU Energy Label likely to come according to the last draft available (March 2010)

- Energy Consumption: EEI is calculated on the bases of:
3X 60°C, full load; 2X 60°C , half load; 2X 40°C , half load;
- Water consumption, moisture content are calculated on the same basis
- Information on noise at the washing cycle and at the spinning cycle is required as sound power.

Comment

The most important changes compared to the current approach of the EU energy label is that as well the Ecodesign implementing measure as the EU energy label will in the future refer to 40°C and 60°C programs with full and half load are basis for the calculations. As at the

moment only the 60°C standard program is included at full load this change will give a completely new picture of the market concerning the EU energy label classification of washing machines! An effective quantity control as well as an optimised 40°C program is additionally necessary in order to achieve an “A” classification.

2.2 Minimum criteria for Blue Angel, Topten and EcoTopTen

Besides the regulations outlined above also environmental labels – like the Blue Angel in Germany – and the Topten concept

Blue Angel criteria, RAL UZ 137

- Energy Consumption: $EEI < 52$, this corresponds to “A++” in the upcoming EU energy label
off-mode: max. 0,5 Watt
left-on mode: max. 3 Watt
- Water Consumption: max. 9l/kg
=> 5kg: 45l; 6kg: 54 l; 7 kg: 63l; 8 kg: 72l
- Washing efficiency index $IW > 1,03$ / spinning efficiency “B” or better according to the current EU energy label
- Availability of (most important) spare parts for 10 years
- Materials: hazardous substances in plastic parts; insulation material; exclusion of biozide silver;
- Noise: operation mode “washing”: $\leq 52\text{dB(A)}$; operation mode “spinning”: $\leq 74\text{dB(A)}$
- Aqua Stop: guarantee for water safety for the whole product lifetime
- Instruction manual

Topten.ch => not yet adapted to new proposal for EU energy label / Ecodesign implementing measure.

- Energy Consumption: $\leq 0,17 \text{ kWh/kg}$ in 60°C program, currently corresponds to “A+” (corresponds to 1,02 kWh/cycle for 6 kg machines)
- Water Consumption: max. 8,5l/kg, one family house; max. 10l/kg, multi family house
=> one family house: 5kg: 42,5l; 6kg: 51 l; 7 kg: 59,5l; 8 kg: 68l
- Washing efficiency: corresponds to the current “A”
- Spinning efficiency: corresponds to the current “A”

EcoTopTen criteria for 5 and 6 kg washing machines, January 2009 => not yet adapted to new proposal for EU energy label / Ecodesign implementing measure.

- Energy Consumption: 5 kg: 0,95 kWh/cycle; 6 kg: 1,14 kWh/cycle; corresponds to the current “A”
- Water Consumption: 5kg: 45l; 6kg: 50 l
- Washing efficiency: current “A”, spinning efficiency: current A or B, at least 1400 rounds per minute
- Aqua Stop: guarantee for water safety for the whole product lifetime
- Quality: If a testresult from Stiftung Warentest is available, it has to be at least "good".
- For intelligent washing machines: the function “load recognition” and dosage recommendation must be available.

2.3 Market situation

State of the Market according to data from EcoTopTen Germany (04/2009) and Topten for Poland (01/2008) and Spain (11/2009):

- Energy consumption: 6 kg machines, majority: 1,02 kWh/cycle. Best: 0,9 kWh/cycle
- Water consumption: 6 kg machines, Average: 45l/cycle. Best: 37l/cycle

It must be stated that the Ecodesign implementing measure as well as the EU energy label

3 Possible innovation goals for washing machines

3.1 Energy efficiency

3.1.1 Innovation goal 1: Energy efficiency class “A++” according to the new labelling scheme

It is unclear at the moment how the market will look like after the introduction of the new EU energy label: Up to now the washing machines were optimised focussing on the 60°C declaration program with full load. Neither programs with lower temperatures nor half load were relevant concerning the classification. As the data on the 40°C program and the half load have not been collected by all manufacturers and apart from that were not published at all, it is difficult yet to draw a reasonable line. Still it can be expected that part of the market will look worse then before and differences between the different models will increase again at least for some time. Against this background the dialogue with manufacturers (Miele, BSH and Bauknecht/Whirlpool) gave different judgments: In general there was consensus that “A++” is the minimum criterion to go for in Topten. Nevertheless it was added by one manufacturer that machines with smaller rated capacities, e.g. 5 and 6 kg, might not be able to reach “A++” at all. As a consequence this would mean to exclude them completely from

Top ten recommendations if “A++” were adopted as general minimum criterion. As this size class still represents a big share of the market, the statement of the manufacturer has to be checked carefully on the basis of market figures after the introduction of the new label. Concerning 7-8 kg machines manufacturers expect that top products are able to reach “A++” right away and that after a relatively short period of time half of the market will reach “A++.”

As a second point it was noted by the manufacturers that a further decrease of the energy demand rather leads to very long program duration which is not consumer friendly. Currently this can be found in A-30% washing machines where the declaration program takes 4 hours. It is very probable that consumers will almost never use such a long program but rather switch to other, shorter ones that are not that as energy efficient then the declaration program.

3.1.2 Innovation goal 2: Power consumption in off-mode max. 0,5 Watt and in left-on mode max. 3 Watt

All inquired manufacturers said that a power consumption in off-mode of max. 0,5 Watt and in left-on mode of max. 3 Watt can be fulfilled. To go further down in left-on-mode would be difficult due to the power consumption of the display on the one hand and the power consumption of saving and safety features of the washing machine.

One manufacturer added that in principle both operation modes are already included in the new labelling calculation procedure. Therefore it would be double weighting to set such separate minimum criteria. Additionally he mentioned that future energy and/or water saving technologies might have higher power consumption and would be prevented this way.

3.1.3 Innovation goal 3: Quantity control (Mengenautomatik): reduction of energy demand at half load by 25 percent (30°C / 40°C / 60°C)

It was stated by all manufacturers that the efficiency of the quantity control is one of the key parameters to increase the energy efficiency of washing machines in the future. Still it is not possible at the moment to say how the performance of the washing machines concerning the quantity control on market is at the moment and will be in the nearer future. The future classification according to the expected EU energy label cannot be foreseen.

It was consensus among all inquired manufacturers that the consideration of the 30°C program makes no sense as no standard procedure is defined to measure energy demand and washing efficiency. Therefore collected data would not be comparable and also not easily available. Additionally the reduction potential in 30°C programs is considerably lower than in the other programs as a larger share is needed for mechanical work; one manufacturer expected a maximum reduction of 20 percent.

A reduction of the energy demand by 25 percent in the 40°C and 60°C program at half load was seen as ambitious goal. There are mainly two types of systems at the moment to realise quantity control: a continuous system, adjusting the water and energy demand with each added kg of clothes and a stepwise system (e.g. 1 kg, 3 kg, full load). The efficiency of the quantity control on the one hand depends on the system itself. On the other hand the quality of the sensors plays a crucial role: is only the amount of clothes weighted and the amount of water accordingly adapted or also the turbidity of the water measured? Besides that the technical solutions to achieve this were seen in more efficient motors and in the reduction of the demand of heated water.

It was mentioned by one manufacturer that it might be enough to request and display the information concerning the efficiency of the quantity control in the Topten market surveys. As the expected Ecodesign implementing measure and EU energy label will already include energy demand at half load in the calculation procedure the definition of a minimum criterion would be double weighting.

3.1.4 Innovation goal 4: Availability of 20°C program

As the requirements of the expected Ecodesign implementing measure include already the availability of a 20°C program, the latter is not an innovation goal in the narrower sense but will come anyway due to future regulation.

Still the discussion was interesting as all manufacturers stated that they are very sceptical concerning the 20°C programs. There is no standard to measure the washing efficiency in the 20°C programs. According to their experience the washing performance is at the utmost satisfying for slightly dirty clothes, takes very long and partly needs more chemicals. Therefore it would be misleading for consumers to make them believe that the washing performance in the 20°C programs is equal to the one of the programs with higher temperature. This information should also be given in Topten.

3.2 Water consumption

3.2.1 Innovation goal 5: Water Consumption Ecodesign implementing measure, tier 2

Innovation goal 5 addresses the reduction of the water demand and pre-draws the tier 2, which shall entry into force three years after the expected Ecodesign implementing measure:

$W_t \leq 5 \frac{c}{2} + 35$ with c = rated capacity

Which means

- 47,5 l/washing cycle for a rated capacity of 5 kg;
- 50 l/washing cycle for a rated capacity of 6 kg;
- 52,5 l/washing cycle for a rated capacity of 7 kg;
- 55 l/washing cycle for a rated capacity of 8 kg

The discussion on this innovation goal was controversial among the manufacturers. In general the goal was seen as ambitious, not all manufacturers are able to fulfil the criterion at the moment. Part of the manufacturers stated that it is not reasonable at the moment, part supported the goal. The main reason to reject it, is the therewith connected possibly reduced rinsing performance. Quality tests, e.g. from Stiftung Warentest indeed showed that – according to their test procedure – rinsing performance of washing machines often is dissatisfying. Unfortunately at the moment there is no standard available that would allow the measurement of the rinsing performance. Such a standard is under development but it might take another 3-4 years before it is completed. In order to give reasonable advice to consumers in fact both parameters should be achieved: low water demand and good rinsing performance. Only a relatively small share of the water (about 12-13 litres per washing cycle) actually is heated up. For the rest (e.g. moistening, rinsing) cold water is used. As the sheer water demand is only problematic in some southern countries (e.g. Spain) but not in most of Europe, a solution in between tier 1 and tier 2 could be reasonable for the near future. Still it is clear that three years after entry into force of the Ecodesign implementing measure the stricter limits will be requested anyway.

3.2.2 Innovation goal 6: Quantity control (Mengenautomatik): reduction of water demand at half load by 25 percent (30°C / 40°C / 60°C)

Concerning the quantity control in the 30°C program the same is true as for the reduction of the energy demand (see chapter 3.1.3): As no standard is available to measure water demand and washing efficiency it is not advisable to include the 30°C program within the criteria. Also the remark was made concerning the double weighting of this criterion as it is already taken into account in the Ecodesign implementing measure and the EU energy label.

Similar to the general reduction of the water demand described in the previous chapter, the position of the manufacturers is different concerning this goal: part of the manufacturers rejected it as too ambitious and part of the manufacturers supported it. In order to not only favour one manufacturer it might be recommended to lower the reduction of the water demand to 20 percent at half load.

3.3 Other criteria

3.3.1 Innovation goal 7: Noise operation mode “washing”: $\leq 52\text{dB(A)}$; operation mode “spinning”: $\leq 74\text{dB(A)}$

As noise is an important parameter for consumers when purchasing and using a washing machine an innovation goal on noise is included here. The proposed limits unanimously were rejected by all manufacturers involved as only the models in the upper top segment fulfil them. The efficient machines in the middle class, reaching “A++”, would not be included.

Also it was made clear that in principal (not necessarily true for single models) the larger the rated capacity of a washing machine is the more noise it makes. Therefore the goal is even more difficult to achieve for the bigger machines.

Against this background it was proposed by one manufacturer to lower the noise limits to

- mode “washing” $<55\text{ db}$ and
- mode “spinning” $<75\text{ db}$.

An alternative would be to only display the noise values within the Topen surveys but to set no separate criterion on noise. That way, consumers are able to include the parameter noise in their purchase decision but would not automatically be restricted to the “silent segment” of the market.

3.3.2 Innovation goal 8: Guarantee for water safety for the whole product lifetime

Basing on the existing criteria for EcoTopTen washing machines and the Blue Angel criteria it was discussed with producers to expand the criterion AquaStop to other countries also.

The reaction was mostly negative: most manufacturers stated that only in a few countries, mainly Germany, Austria and the Netherlands, Water safety / Aqua stop is such an important issue to consumers that manufacturers offer accordant models. In the other countries consumers are not interested in this feature.

Against this background, it seems to be more to the point to leave the decision to include the parameter “guarantee for water safety” or not to the single countries. Depending on the attitude of the consumers and the market situation it should be included or not.

3.3.3 Innovation goal 9: Automatic dosage of detergents

In order to prevent over dosage of detergents, which is current practise by consumers, it was proposed to set the innovation goal automatic dosage systems. That way the amount of chemicals released to the environment could be reduced. At the moment there is one manufacturer on the market that offers several models with automatic dosage of liquid

detergent¹. From September 2010 a second manufacturer will also offer such a system. It is difficult to predict the future but it seems improbable that many other manufacturers will follow with similar systems.

Against the background of the very few product models with automatic dosage system on the market today and in the near future, it is not advisable to set here a strict criterion. Still, it would be worth to consider the opening of a new Topten product category “washing machines with automatic dosage system”. In the German EcoTopTen this has already been done for the “intelligent washing machines”.

3.3.4 Innovation goal 10: Feedback function on the energy and water demand of the chosen washing cycle

Consumers have a significant influence on the energy and water demand of their washing machine by choosing the temperature, putting more or less detergents and fill in more or less clothes. In order to more directly address this consumer behaviour, one manufacturer developed a feedback function that (1) shows the energy and water demand to be expected with the program chosen by the consumer and (2) shows the actual energy and water demand achieved after the washing cycle. That way consumers are able to integrate energy and water demand better in their decision on which program to use. It does not automatically lead to a reduction of energy and water demand but allows for a (playful) learning process.

The discussion with manufacturers gave the result that apparently there are no other manufacturers having a model in the pipeline with feedback function. Therefore it is not to be expected that such a criteria should be set in the future. Nevertheless the potential of this function is so interesting that it may be worth while to point out such models in the Topten product surveys.

3.4 Conclusions

In the following table the discussion of the innovation goals is summarised and conclusions are drawn concerning their suitability as future Topten criterion resp. what other option is possible.

¹ Miele: W 1949 WPS LiquidWash, W 5989 WPS LiquidWash, W 6749 WPS LiquidWash

Tabelle 3-1 Overview on the proposed innovation goals for washing machines, their suitability as Topten criterion and other options

Possible innovation goal	Suitable as future Topten criterion?	Other options
Innovation goal 1: Energy efficiency class "A++" according to the new labelling scheme	In principle yes, but consumption data according to the new labelling scheme should be collected before, in order to get an impression of the market situation.	An eye should be kept on the 5 - 6 kg machines: if there will be no models that achieve "A++", different criteria for the smaller and the bigger machine might be the better option then to exclude the smaller ones.
Innovation goal 2: Power consumption in off-mode max. 0,5 Watt and in left-on mode max. 3 Watt	In principle yes	As power consumption in left-on-mode and in off-mode are already included in the EU energy label a separate criterion is not absolutely necessary, the display of the figures may be sufficient.
Innovation goal 3: Quantity control: reduction of energy demand at half load by 25 percent (30°C / 40°C / 60°C)	Important criterion, but only for 40°C and 60°C program	Display of the figures for the 40°C and 60°C program in the Topten product surveys on the website
Innovation goal 4: Availability of 20°C program	No, will shortly be requested by regulation.	General information on the 20°C program, the best use of it and its limitations.
Innovation goal 5: Water Consumption Ecodesign implementing measure, tier 2	In principle yes, but rather to strict.	Ease limitations for 7-8 kg machines in the first step, e.g.: 55 l/washing cycle for a rated capacity of 7 kg; 60 l/washing cycle for a rated capacity of 8 kg
Innovation goal 6: Quantity control (Mengenautomatik): reduction of water demand at half load by 25 percent (30°C / 40°C / 60°C)	Important criterion, but only for 40°C and 60°C program and rather to strict.	Alternatively: (1) Set less strict limits, e.g. 20 percent reduction at half load or (2) Display of the figures in the Topten product surveys on the website but do not set criterion.
Innovation goal 7: Noise operation mode "washing": ≤ 52dB(A); operation mode "spinning": ≤ 74dB(A)	Rather not, as the proposed values are very strict, excluding most of the efficient middle class models	Alternatively: (1) Set less strict limits, e.g. mode "washing" <55 db and mode "spinning" <75 db or (2) Display of the figures in the Topten product surveys on the website but do not set criterion.
Innovation goal 8: Guarantee for water safety for the whole product lifetime	Country specific decision is necessary: If consumers ask for such feature and there is a reasonable number of efficient models on the market that offer this feature, yes. Otherwise not.	
Innovation goal 9: Automatic dosage of detergents	Not as general criterion.	Alternatively: (1) Opening of a new product category of washing machines with automatic dosage system or (2) Prominent information about models that offer such features.
Innovation goal 10: Feedback function on the energy and water demand of the chosen washing cycle	No, there are too few models on the market and – as it seems – in the pipeline of manufacturers' planning.	Prominent information about models that offer such features.