Appliance labelling from a consumer's perspective Priorities in clothes' washing

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1. SYNOPSIS

New aspects in the discussion with regard to the revision of the EU clothes washers label, namely actual consumer behaviour, load- and detergent efficiency are discussed.

2. ABSTRACT

In 1995 the EU introduced its energy labelling for refrigerators and freezers, soon after followed by washing machines and clothes dryers. Within 5 years, the energy efficiency has improved by approx. 20%, by major efforts of manufacturers. Despite these developments, the energy demand for textile maintenance is still growing. It is believed that a shift in attention is needed, from factors influencing energy consumption under a standard test cycle to those influencing energy consumption in everyday life. A new reference cycle based on actual consumer behaviour might be a solution.

Factors that are discussed are: 1. the changing consumer behaviour, 2. the changing wash process and 3. the need for new definitions. Background developments in lifestyle and technology lead to different (demands on) washing processes. New definitions on aspects of efficiency then become needed. The washing machine itself can be used as an instrument to help increase the consumer's efficiency, which complicates the formulation of a new reference cycle.

In case the consumer behaviour is influenced by measures in the washing machine to improve load efficiency and detergent efficiency (which aim on the one hand at improving the consumer's wash performance and on the other hand at limiting the energy and water requirement), a definition for actual consumer behaviour in the new future technological setting might be not such a good idea after all. For now, the question remains how such a reference cycle in such a situation should look like.

3. INTRODUCTION

This paper describes some of the discussed aspects of the SAVE II study "Revision of energy labelling & targets washing machines (clothes)". The SAVE II study aims at providing factual and analytical support for EU policy action in the field of washing machines and was conducted from December 1998 until January 2001 by a group of international experts, from consumer organisations, industry, test institutes, universities and energy agencies. In 1992, the washing machines consumed approx. 350 PJ of primary energy. Apart from electricity, the washing laundry consumed 2.5 billion m^3 of drinking water and close to 4 billion kg of detergent per year. SAVE studies published in 1995/1996 identified a savings potential of 50% to be realised through both better consumer behaviour and technical efficiency improvement, each accounting for half of the potential. Policy actions were introduced for and with the industry. Since then, considerable progress has been made and this is the reason why in a second stage of policy action considerable factual and methodological difficulties have to be confronted, if the full saving potential is to be achieved. At the outset of the project, it was the general impression of all parties that the present 60°C test cycle, which is used as a basis for all quantitative policy matters, will become inadequate for its purpose in a few years. Because consumer behaviour is changing, the energy measured in this cycle does not reflect the real-life situation. Therefore the effectiveness of the manufacturers' efforts to improve upon the efficiency of this cycle in order to realise the absolute saving potential becomes questionable. Although discussion on the topic has started, it is not completely clear whether improving the 60_ C reference cycle has lead to proportional improvements of lower temperature cycles. There were serious doubts about whether the cycle and load of the reference cycle used for the label scheme reflect real-life conditions. This is a problem if the EU energy label is to inform the consumer properly and if manufacturers are to develop machines which are more efficient in real life rather than just in a standardised test. Also, it appeared that the energy saving potential for this particular cycle comes to an end (SAVE II final report, 2001).

A solution could be to develop a reference cycle that fits the consumer's actual behaviour. In order to discuss the appliance labelling from a consumer's perspective, it is first necessary to define what the important concepts in this are. The parts that follow served in the discussion within the SAVE II programme "Revision of Energy Labelling & Targets Washing Machines (Clothes)". Aspects related to wash performance and thus to (in)direct energy requirement are load and detergent efficiency, which can be viewed from a consumer as well as from the washing machine perspective. Hopefully, these aspects can be improved in future. If so, this again will have consequences for the actual consumer behaviour and thus for the definition of actual consumer behaviour, complicating the issue of which reference cycle is the proper one.

4. CHANGING CONSUMER BEHAVIOUR

In the SAVE II study van Holstein en Kemna investigated the changing consumer behaviour and real-life energy consumption. Data was collected from various sources, including consumer organisations, test institutes, research organisations and AISE. For nine countries databases on consumer behaviour are used. These countries are the Netherlands, France, Finland, United Kingdom, Portugal, Italy, Denmark, Sweden and Austria. For 38% of the EU inhabitants (145 mn people of 343 mn), no data are available on the type of programme used, just some data about the wash temperature which were collected by AISE. These concern the countries Greece, Ireland, Germany, Belgium, Luxembourg and Spain. For Greece and Spain is assumed that the situation is the same as in Italy and Portugal: only cotton cycles. For Germany, Belgium and Luxembourg, a match is assumed with the type of programs used in the Netherlands. Finally, it is assumed that the programs used in Ireland are similar to the ones in the United Kingdom (SAVE II, 2001).

Based on these assumptions and the assumptions in the previous paragraphs, it was possible to draw up a complete table of the estimated subdivision of wash programs by temperature and by country. This is shown in table 1. The average for the 15 EU countries was weighted on the basis of the number of washes. The table shows that the 40°C cotton programme makes up almost 27% of all wash cycles and thereby is the single mostly used wash programme. It is immediately followed by the 60°C cotton cycle setting, which is used in 24,6% of all cycles. The 30°C cotton cycle is next with 20% of all washes. The 30 º and 40°C cycles amount together to 66% of the cycles (47% of cotton, 13% easy care, 6% wool and other).

Subdivided by type of textile, it appears that cotton (and mixed fibre) is by far the most popular: 79% of all washes. To a considerable extent this is due to Southern Europe where practically all wash cycles are cotton. Easy care (synthetics) programs are quite popular in the UK, a country in which almost half of all EU synthetics washes take place. Without the UK and Ireland, "easy care" would be a mere 8% of all EU washes, now it is 16%. The wool programme is fairly constant in most EU countries at a level of 3 to 5% of all washes; only in Southern-Europe people prefer to wash wool by hand.

Table 1 gives an overview of the share of each programme cycle in the total energy consumption for washing in the EU. The calculation is done on the basis of the average EU values for installed machines in the EU

1996 (AISE data, calculated by van Holsteijn en Kemna 1997/1998), not on the basis of country specific figures. It is therefore an approximation, but sufficient to give a first impression.

The energy consumption is still the highest for the 60°C cotton cycle (almost 38%) – far ahead of the 40°C cotton cycle (21.5%). Only the easy care, wool, cotton and other programs in both 30 º and 40°C together reach the same level of 38-40%. For individual countries with relatively more lower temperature washing, this may be different.

Table 1. Share of wash programs in total EU energy consumption for washing (SAVE II, 2001)

Wash programme	Frequency EU 1996 (a)	Installed in 1996 kWh/cycle (b)	Share in total energy requirement (a*b) in %
Cotton 95 °C (>61 °C)	7,3%	2,32	17,8%
Cotton 60 °C (41 -> 60 °C)	24,6%	1,45	37,6%
Cotton 40 °C	26,9%	0,76	21,5%
Cotton 30 °C	20,0%	0,44	9,3%
Subtotal cotton	78,8%		86,1%
Easy care 60 °C	2,7%	1,45	4,2%
Easy care 50 °C	2,5%	0,76	2,0%
Easy care 40 °C	10,8%	0,44	5,0%
Subtotal easy care	16,1%		11,2%
Other 40 °C	0,3%	0,76	0,2%
Other 30 °C	1,1%	0,44	0,5%
Wool 30 °C	4,2%	0,44	1,9%
Subtotal wool, other	5,6%		2,7%
TOTAL	100,0%		100,0%

The results are contradictory, in the sense that the most often used programme cotton 40°C does not account for the highest energy requirement. For most countries it is not possible to draw conclusions for the developments in programme and temperature use over past decades. For Europe, the average temperature dropped from 65°C to approx. 48-50°C in the period between the seventies and the late nineties. It is to be expected that through several influences, among which the WashRight campaign of AISE, the 30/40°C cycles will increase their share. However, from which temperature class (60°C? 90°C?) and to which programme (more easy care/wool/other?) is unclear. Then there is the question of actual load weights and actual detergent dosage. It is therefore difficult to give prognoses for future developments and the most used cycle in future. Consequently, it is difficult to give recommendations about preparing for a possible change of the labelling scheme, e.g. on the most often used or on the average consumer settings.

Apparently, a clear definition is needed of what is looked for to describe the actual user situation, which is useful to eventually adapt the labelling scheme. Either averages that describe the consumer behaviour: e.g. 2.5 or 3 kilo loads, 48-50°C, averaged programme and mixed textile materials, which is difficult for 'what is an averaged programme'; or the most often used settings: 40°C cotton cycle, load unknown but probably higher than 2.5 kg, textile materials unknown but likely to be cotton and cotton blends with synthetics. These definitions do not even take into account detergent dosage by consumers which complicates the definitions and need for consumer behaviour data even more.

The parameters of the consumer data which are needed to develop a good new definition for a possible new reference cycle are summarised in the following table.

Table 2. Parameters of consumer behaviour

- Load (kg) / type of wash load
- Distribution of types of textile materials
- Distribution of types of wash loads
- Distribution of types of programs and temperatures used
- Ratio distribution textile materials / distribution wash load (i.e. is the sorting in wash loads consistent with the textile materials present?)
- Ratio wash loads / choice of programs and temperatures

As said, other aspects that are important in a 'consumer behaviour' definition as well as in the future developments of both consumer behaviour and washing technology, are loading efficiency and detergent efficiency. These aspects have influence on wash performance and consequently on (in)direct energy requirement. In the following, a first attempt is made to define these aspects.

5. DETERGENT EFFICIENCY

Consumer detergent efficiency can be discussed on a general level and per specific detergent type. Detergent efficiency from a consumer's perspective could be defined as:

> *'The right dosage of a specific type of detergent per laundry type for clean and cared-for laundry'.*

This definition leaves out elements on the washing process level such as the dirt level of laundry, water hardness etc. For dirt level and water hardness, recommendations are given on the package. For the dirt level and water hardness, it can be questioned whether the dirt level of laundry significantly influences consumer behaviour in dosage in practice (grams/wash load) and whether actual consumer behaviour follows the regional water hardness instructions. Another point for attention is the interaction between detergent and machine (e.g. foaming and rinsing, design of the dispenser, inlet water pressure and temperature phases, dissolving behaviour of the detergent, loss of detergent through e.g. tube valve etc.) that can have an influence on consumer behaviour. For detergent efficiency from a consumer perspective, it is interesting to know whether washing machine parameters influence *dosage behaviour of consumers.* Data that are anyhow needed to discuss aspects of consumer detergent efficiency are the following (Table 3):

Table 3. Consumer parameters for the description of (specific) detergent efficiency

Average	Specific detergent type
• Grams / wash load (dosage) • Grams / kg laundry • Kg / household.year	• Grams / specific wash load (dosage) • Grams / specific kg laundry • Kg / household.year
• Distribution of detergent forms (normal, compact, super compact, tablets, gels, fluids, pearls)	• Distribution of detergent types (white, colour, fine, wool, pre-wash, hand wash, soaking) • Distribution of types of wash loads
• Grams. Detergent form / wash load	• Ratio detergent type / type of wash load (i.e. is the sorting in wash loads consistent with the use of different detergent types)

In Western Europe, the dosage of regular powders is - with rounded figures - around 240 grams per wash load (variation 130-335 grams), of compacts around 100 grams (70 – 160 grams) (TNO, 1995) and for super compact powders around 80 grams (70 – 100 grams) (TNO, 1995; Uhl *et al*. 1996; Brackmann, 2000). Of detergent tabs this is 36-43 grams (Schambil, 2000). Most other figures available are in kg / person.year.

On the package of a compact powder recommendations range, depending on water hardness and dirt level, from a minimum of 50 grams up to a maximum of 225 grams. The recommended range on a package apparently can be wide. More data and knowledge about dirt levels, regional water hardness and related dosage behaviour of consumers will tell whether consumers follow the recommendations or whether improvements can be made.

Parameters that deal with the definition element '… for clean … laundry' are dosage / washing performance c.q. detergency in the actual situation, dealing with aspects that relate stronger to the washing process itself, such as stain removal, yellowing and the re-deposition of dirt which results in greying.

The element '… cared for laundry' can be specified with a range of aspects such as pilling, perfume, colour bleeding, colour maintenance, stain proofing, fluidity, tensile strength, incrustation etc. These aspects are important but have such wide consequences for the discussion that this paper will first concentrate on aspects that more obviously influence consumer dosage.

Both under- and over-dosage by consumers can have its negative effects on cleanliness and care, which again can lead to environmentally unfriendly changes in consumer behaviour such as using textiles shorter, washing twice or at higher temperatures.

However, research by Roozemond (1998) and Schop (1998) shows that in general the consumer is relatively insensitive to changes in washing performance. The actual washing performance is generally 40% of what can be achieved, with a variety of also 40% within and between households (Schop, 1998). On the other hand, for approx. 1 in 10 cycles the highest possible wash performance is necessary because of the occurrence of extremely dirty articles or, formulated differently, a lot of washes are done just to freshen up clothes (Roozemond, 2000; Stamminger, 1999).

Solutions for increasing the consumer detergent efficiency can be found in consumer-related measurers, or measures that concern the interaction of 'consumer – machine - detergent' or 'consumer – detergent'. For the consumers, advice or other measures concerning consumer detergent efficiency (dosing properly) will become more and more important in the light of washing machines that increasingly adapt to varying loads.

With information, the consumer's perception about dosage can be changed. With respect to the interaction *consumer – machine – detergent*, the following solutions can be thought of:

_ feedback on displays; a signal is generated if an overdosing was detected (Stamminger, 2000), e. g., based on foam, free surfactants, conductivity, turbidity etc. at the end of the wash cycle (indirect feedback after),
_ electronically regulated dosage; e. g., a device that is linked to the load automate, that measures 1. The weight of the load 2. The amount of water and 3. The water level. This combined with either:
_ one or more containers (e.g. 1 - 2 kilos) where your own choice of washing powder or liquid can be placed and a display where the consumer can define which container to use or otherwise define the type of laundry so that dosage can be done automatically, or
_ a device that measures grams of detergent and a feedback display with an advice to dose more or less (direct feedback before),
_ 1 and 2b combined (based on McCalley, 1999).

Detergent efficiency can also be defined from a washing machine (manufacturer's) perspective. A definition for this could be:

> 'The in the free water volume available detergency potential (or washing bath concentration) for a standardised wash load right before the actual washing phase, in relation to the originally dosed amount'.

The detergent efficiency could be seen as one of the factors influencing the eventual washing performance. As the measurement of the washing performance includes indirectly many parameters, the detergent efficiency is probably part of the washing performance. When a correct definition and a measurement method for detergent efficiency is found, this will give another clear parameter with which variety in washing performance can be explained.

Aspects related to detergent efficiency from a washing machine perspective that are mentioned in the literature are: detergency loss through tube valve e.g., inlet water pressure, design of the dispenser and washing powder dispenser efficiency, and annulus space. On the other hand, there is the dissolving behaviour of the washing powder, e.g. type and amount of integrants of heavy duty detergent (HDD) tablets.

An example of the problems: HDD tabs have to disintegrate within seconds, and certainly within only a few minutes, depending on how they are dispensed, because short washing programs only last about 20 minutes. The water temperature at the start is still cold. The wash load absorbs a high proportion of the water in modern washing machines with an automatic volume control system. The anionic and non-ionic surfactants contained in heavy duty detergents may form viscous liquid crystalline phases (‘gels’) when they come into contact with water, and these gels may hamper the further quick disintegration of tabs (Schambil, 2000).

Regularly investigated aspects that influence washing performance c.q. detergency from a washing machine perspective are (GEA, background report 4, 1995):

Table 4. Regularly investigated aspects that influence washing performance and detergency

• rotation speed of drum (height fall, compression, mechanical action, exchange speed of the suds and soaking)	• number of rinsing
	• unitary volume of rinsing
• mechanical action percentage	• intermediate spinning (foam!)
• volume of water for washing	• the load
• time of washing phase	• jet system
• temperature (phases)	• washing powder

Apart from the load and the washing powder - and perhaps from the first rotations of the drum and the jet system -, these parameters do not influence the potential detergency or detergent efficiency as defined above. This leads to the question of which washing machine parameters are significantly important for detergent efficiency. Both, for washing and rinsing, the detergent amount has non-linear effects, which are even enhanced by the combined influence of the amounts of water, load and soil, not to speak of water hardness which can influence foam formation. Extensive studies done by detergent manufacturers and appliance producers have not resulted in a viable formula for optimal dosing, but only in qualitative indications (CECED, 1995). This of course complicates the discussion.

With respect to the efficiency values, determined by the use of standardised measuring methods and the reference cotton 60°C cycle, it can be said that these values do not cover all aspects of real efficiency by far and are only justified for comparing different models (washing machines). The detergent used is a test detergent which looks like a domestic every day detergent, but is different in many aspects from the real washing powders found on the market. These standardised tests provide a good reproducible comparison between appliances, but they do not necessarily give a fair image of the consumer’s reaction to the real performance of the appliance. Furthermore, for comparative testing, this reference detergent has to be kept identical for a long period. In real life, on the market, detergents are modified and improved almost every year (CECED, 1995). Solutions that can be found from a washing machine perspective are supposed to be all technical and not so much in the consumer – machine interaction.

6. LOAD EFFICIENCY

Load efficiency is likely to be either directly or indirectly influenced by a range of variables, such as household type and size, (available) types of wash load, dirt levels, sorting behaviour, washing machine characteristics, available textile stock in the household, knowledge of and ideas about the washing process, enough space to dry loads or even the availability of a tumble drier, ideas about clean clothing and household textiles (e.g. changing behaviour of clothes and bedding!), influence of recommendations by others etc., etc..

For this paper, the variables are restricted to household size, textile materials, colour, article type, types of wash loads and washing machine characteristics, under the assumption that these can provide a basis for the discussion. The supposed relevant parameters about load efficiency from a consumer perspective are summed up in Table 5.

Load efficiency from a consumer perspective can be defined as:

> 'The right amount of wash load per textile type in kilos in relation to the capacity of the washing machine'.

It might be interesting to have a look at the differences in average load size between male and female one-person households or between male and female 'washers' in larger households.

Table 5. Relevant parameters to discuss load efficiency from a consumer perspective

• Average load (kg) / household size • Load (kg) / type of wash load • Average load (kg) / gender • Load (kg) / washing machine type (drum size, front/top, weight or stability, brand, spin capacity)
• Distribution of types of textile materials • Distribution of article types • Distribution of types of wash loads (white, light or dark coloured, textile fibre, article type) (see also Table 1)
• Ratio distribution textile materials / distribution wash load (i.e. is the sorting in wash loads consistent with the textile materials present?)

Average load weight in Europe is around 3 kilos. Recommended load weights based on the available textile materials that are present in the households are likely to be much lower than 4.5 kilos as well (Based on Uitdenbogerd & Vringer, 2000).

Because washing is a diluting process (Pellerin, 1996), only little water is needed for washing itself (GEA background report 4, 1995). Washing does not happen during the washing phase, but during rinsing, when more and more detergents attached with dirt are washed away.

Looking from this perspective, one could say that the consumer, who has the perception that laundry needs to be washed freely in plenty of suds, loads too low because of his wrong perception of the present washing process. A solution for this could be information to change perceptions about washing processes. In fact, the laundry rubs itself with a detergent 'slurry' during the wash phase. A comparable example are two different

ways of doing dishes: in a tub with 5-10 litres of suds, *or* rub the dishes and cutlery with washing up liquid and a little water, that can be rinsed of with (plenty of) running water.
On the other hand, it appears that in practice, with loads of around 3.5-3.7 kilos, washing performance for machines without a load automate is the best, so one could say that households naturally ‘find’ the optimal load for a good wash performance. With machines that have load automates, on their turn adapting to load weight, this good actual optimum and satisfactory wash performance for households then would diminish in practice (see also Humala, 1999). This could as well lead to unexpected consumer reactions (such as overdosing), and thus to the questions: what are the perceptions about laundering processes and experiences of consumers in varying loads?, and: do load automates diminish washing performance in practice?

However, an increasing variety of materials and clothing articles that are used for specific occasions, e.g. sports clothing, gives an increasing variety in laundry types which nevertheless would plead for increasing use of electronics such as fuzzy control, clean detection and other load automate devices.

Solutions for load efficiency from a consumer perspective are general information and different sorts of feedback on displays on the washing machine. These measures can be integrated with solutions for consumer detergent efficiency.

The following will discuss load efficiency from a washing machine perspective.

The load efficiency from a washing machine perspective can be defined as:

> ‘The extent to which the washing machine adapts its energy and water use to the actual load with an equal wash performance’.

This ratio can be seen as an elasticity measure. Measures up to now have been the optimisation of the washing liquor, less and optimised rinsing steps, spin-drying after the main washing step and exact inclusion of the amount of laundry (Laue, 1996) by electronic techniques.

However, there are problems in practice related to machines that adapt to low loads and low suds levels, e.g. pilling, stain removal, greying, white dust (Humala, 1999), besides the already mentioned problems with dissolving detergents at the beginning of the washing process. A question is how the development towards larger drums will influence both consumer load behaviour and load efficiency.

Besides adapting the washing machine to the load, the washing machine can also facilitate consumers in loading properly. Said more generally, the interaction ‘machine – user’ can perhaps play a larger role:
when the energy labels (and wash programs) are adapted to a reference cycle based on consumer behaviour of 3.5 kilos cotton, 40°C and perhaps a longer cycle; displays that advice the user in how to come close to this standard load might be extra valuable.
in that case the accuracy of the advice could become an item on the energy label as well as it is something that can be measured.

Apart from the suggested displays and consumer advice, load efficiency seems to be primarily a problem to be solved from a washing machine perspective, rather than a problem to be solved from a consumer perspective, especially when developments in (the use of) textile materials are taken into account. However, a more detailed study of the available literature on consumer perceptions and other variables that influence consumer load efficiency could give new insights. In that case the development of interfaces between consumer and machine can get more meaning. Presently the solutions in washing machines lead to challenging new problems.

7. CONCLUSIONS

The formulation of the definitions of actual consumer behaviour and load and detergent efficiency is such that they can be quantified. Quantification of the definitions will show the actual problems. Therefore data is needed.

From an energy-saving perspective it might be an idea to take into account the wash performance and the interaction 'machine – user' more strongly by linking the energy efficiency of a reference cycle to the wash performance.

However, when reference cycles and standard wash cycles with a lower wash performance are developed, and the consumer is advised to meet this optimally, it is also important to give the user the opportunity to increase the wash performance on a continuous scale (in stead of in steps such as the choice for a different programme or a button for more water). This again could give interesting opportunities for display information to the user about efficiency of the wash process, such as relative water use, energy requirement and wash performance. Formulated differently: when load automates are further developed, or reference cycles for the energy label are linked with wash performance, and standard wash cycles are adapted to consumer standards, the user should also have the opportunity to do the opposite and still be informed about the efficiency of his choice.

Data for the discussion on loading and detergent efficiency is not complete and the discussion did not come to a conclusion. From the discussion is derived that when load automates are further developed and/or reference cycles for the energy label are linked with wash performance and standard wash cycles are adapted to consumer standards, the user should also have the opportunity to do the opposite and still be informed about the efficiency of his choice by e.g. information on a display about the relative water use, energy requirement and wash performance. It is recommended to study the aspects of detergent and load efficiency further and to investigate possibilities to improve these by means of the washing machine (or washing machine interface).

On the other hand, the making of non-discrete programs has consequences for the formulation of a reference cycle. Assuming that consumer behaviour and the 'optimal machine behaviour' become closer, it is necessary to create a reference cycle based on an agreed upon advice for consumers based on washing performance, and not on actual consumer behaviour alone (i.e. without taking into account washing performance).

The discussions in the Working Group also showed that a thorough definition of a single EU 'real-life' condition is not easily possible, but would be a prerequisite to be able to perform adequate comparative testing. Following the results, the Group did not recommend to change the reference cycle of 60ºC as it still uses the most energy and the frequency compared to 40ºC cotton is not significantly lower (yet). On the other hand it is recommended to identify an accurate 'consumer behaviour' definition as well as making sure that time series with data about used programs, temperature choice and load weight exist, so that involved parties can prepare on future changes in the label scheme and related legislation.

In the just presented aspects related to the revision of the reference cycle, it is described how actual consumer behaviour is dealt with in the discussion at present. It became clear that a better defined definition is needed. However, taking into account future measures to improve loading and detergent efficiency (which deal with wash performance) it is likely that the 'machine-man' interaction intensifies, even more complicating the discussion on how to formulate 'actual consumer behaviour' in future. It is likely that the consumer choice on temperature will disappear, while three programs based on textile type (wool, synthetics, cotton) are left over whereby sensors and interfaces take care of the rest.

It is proposed to focus action on the following:

- knowledge of the variety in textile stock and of what future developments in (the use of) textile materials are,

- data about detergent and load efficiency from both consumer and washing machine perspective in the actual use situation,
- integration of measures for consumer detergent and load efficiency, backed up by data about consumer practices technical measures for improving detergent and load efficiency in the washing machine,
- a discussion on adapting the EU labelling scheme and link energy performance with wash performance.

8. RECOMMENDATIONS IN THE FINAL SAVE II REPORT

A lot of the above described discussion points are used as new points for attention at the end of the SAVE II document and the recommendations. These are as follows (SAVE II final report):

"Following the results it is not recommended to change the reference cycle of 60°C as it still uses the most energy and the frequency compared to 40°C cotton is not significantly lower (yet). It is recommended to identify an accurate 'consumer behaviour' definition as well as making sure that time series with data about used programs, temperature choice and load weight exist, so that all involved parties can prepare on future changes in the label scheme and related legislation.

The consumer behaviour analysis indicates a trend towards lower wash temperatures and other (than cotton cycles). At the moment, the 60°C cotton cycle is still very relevant for the EU market. This single type of cycle (still) uses the most energy and is the only cycle that is well analysed. It is therefore recommended to keep this cycle for coming years, but to closely monitor developments in consumer behaviour and define a new reference for future use. For this, more detailed and robust research into wash conditions like load size and composition is recommended.

Identify an accurate 'actual consumer behaviour' definition; with aspects as chosen wash programs and temperatures, detergent consumption, load weight and load composition; as a basis for a future update of the EU policy on washing machine efficiency.

The promotion of correct dosage of detergents, by means of communications, by indications or tools on the machine and/or detergent manufacturers' instructions to assist the consumer and the promotion of lowering wash temperatures and correct load size, when applicable, by means of communications or by indications on the machine. It is recommended that this promotion is supported by national policy.

In case the consumer behaviour is influenced by measures in the washing machine to improve load efficiency and detergent efficiency (to on the one hand improve the consumer's wash performance, and limit energy and water requirement on the other hand) a definition for actual consumer behaviour in the new future technological setting might be not such a good idea after all. In that situation, actions that are optimal for an optimal wash performance and the actual consumer behaviour become closer. For now, the question remains how such a reference cycle in such a situation should look like.

9. REFERENCES

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