Country:	Republic of Korea
Technology:	Washing Machines
Sub Category:	Domestic top and front loaders

Introduction

The first stage in the Mapping and Benchmarking process is the definition of the products, i.e. clearly setting the boundaries that define the products for use in data collection and analysis. Doing this ensures that comparison between the participating countries is done against a specific and consistent set of products.

The summary definition for this product is:

Washing machines, defined as:

'An appliance for cleaning and rinsing of textiles using water which is principally designed for use within a domestic environment. The appliance may draw water from a cold and/or hot water supply and may also have a means of extracting excess water from the textiles.'

Data will be analysed for the following types of washing machine :

Technology	User intervention	All Types - Automatic, semi-automatic and manual
	Orientation	All Types - Horizontal (front loaders) and Vertical Plane (top loader)
	Configuration	All Types - Drum, Impeller, Agitator, Nutators Exclude all types of Washer/Dryer
	Coin/Card Operation	All Types
	Water intake	All Types - Hot fill/cold fill
	Spin Speed	All Speeds
Other variables	Capacity	Consider only units between 1Kg - 13kg (Use kWh/Kg as metric)

The detailed product definitions can be found at the Annex website:
http://mappingandbenchmarking.iea-4e.org/matrix

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Energy Efficiency of New Washing Machines Republic of Korea

No combined vertical and horizontal product efficiency information is shown due to the incompatibility of test methodologies used for the two machines types within Korea.

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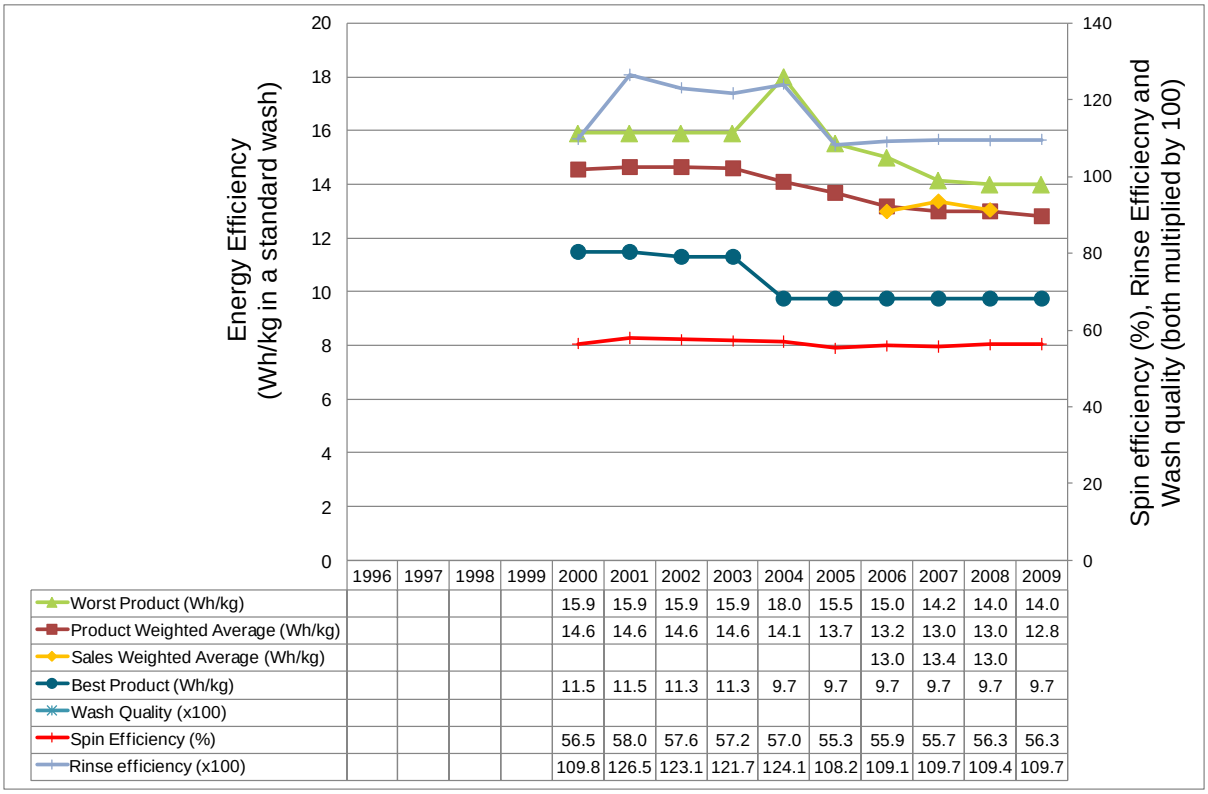
Energy Efficiency of New Top Loader Washing Machines Republic of Korea



	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Worst Product (Wh/kg)					15.9	15.9	15.9	15.9	18.0	15.5	15.0	14.2	14.0	14.0
Product Weighted Average (Wh/kg)					14.6	14.6	14.6	14.6	14.1	13.7	13.2	13.0	13.0	12.8
Sales Weighted Average (Wh/kg)											13.0	13.4	13.0	
Best Product (Wh/kg)					11.5	11.5	11.3	11.3	9.7	9.7	9.7	9.7	9.7	9.7
Wash Quality (x100)														
Spin Efficiency (%)					56.5	58.0	57.6	57.2	57.0	55.3	55.9	55.7	56.3	56.3
Rinse efficiency (x100)					109.8	126.5	123.1	121.7	124.1	108.2	109.1	109.7	109.4	109.7

Key notes on Graph (see notes section 1)

- The data source was the mandatory registration scheme database for February 2010 which includes products registered in earlier years. Products available in each year were assumed to be those registered in the given year, plus those registered in the previous three years (ie 2008 contains all products registered in 2008, 2007, 2006 and 2005). Products with registrations older than 4 years are assumed to have left the market and are removed from the dataset unless they have sales in the year being analysed.
- The database was also populated with sales figures for 2006-8 which have been used to calculate sales weighted averages for those years.
- In order to indicate a Worst performing product that reflects the broad market (as opposed to representing perhaps a single unusual or wrongly reported product), the ‘energy efficiency of worst product’ is in fact the energy efficiency of the product at the ‘worst 5%’ point of a ranked list in the dataset. The Best performing product is that with the lowest energy efficiency.
- A small number of products (approximately 30) with very high performance levels have been removed from the original data set as the registration authority believe these models to have been incorrectly reported.
- The rinse efficiency and wash quality results have been multiplied by 100 to allow better visibility on the graphic. Actual rinse efficiency values are typically between 1 and 1.1 while wash quality values are within in a scale from 0 – 1.5.

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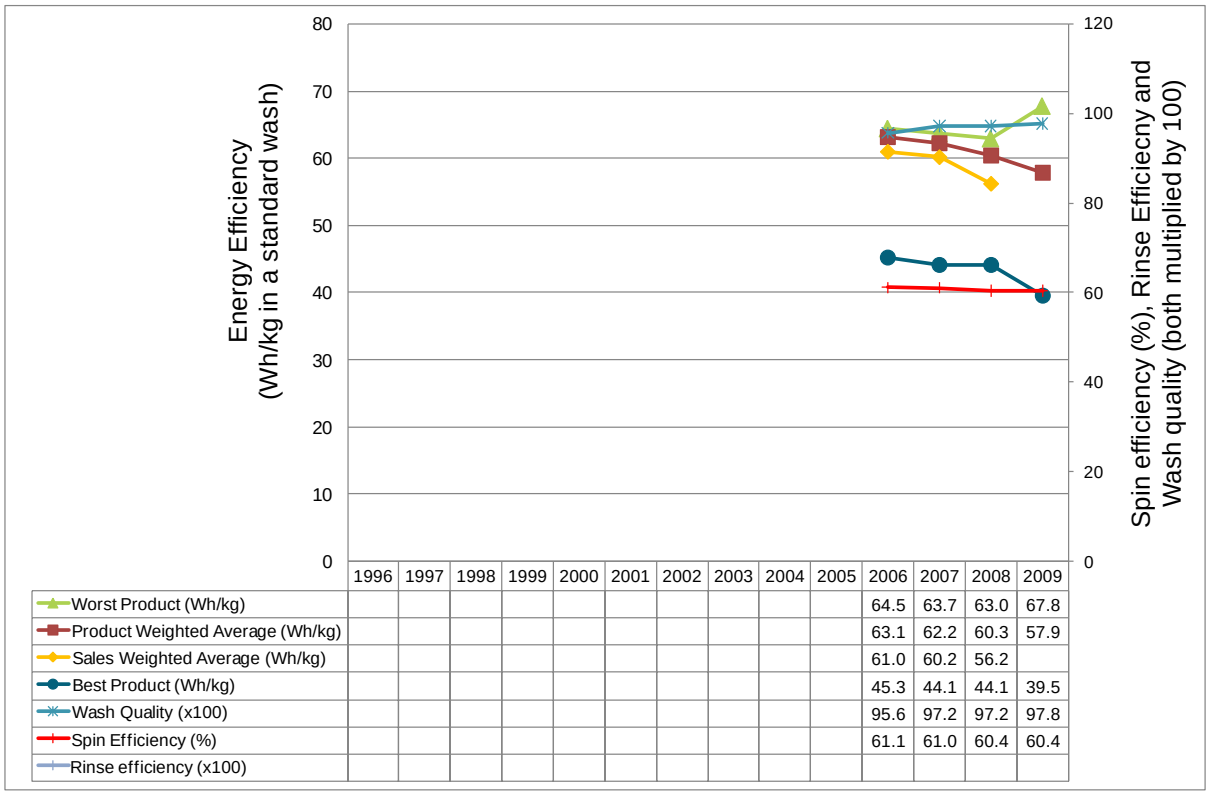
Energy Efficiency of New Front Loader Washing Machines Republic of Korea



	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Worst Product (Wh/kg)											64.5	63.7	63.0	67.8
Product Weighted Average (Wh/kg)											63.1	62.2	60.3	57.9
Sales Weighted Average (Wh/kg)											61.0	60.2	56.2	
Best Product (Wh/kg)											45.3	44.1	44.1	39.5
Wash Quality (x100)											95.6	97.2	97.2	97.8
Spin Efficiency (%)											61.1	61.0	60.4	60.4
Rinse efficiency (x100)														

Key notes on Graph (see notes section 1)

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- The database was also populated with sales figures for 2006-8 which have been used to calculate sales weighted averages for those years.
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- The rinse efficiency and wash quality results have been multiplied by 100 to allow better visibility on the graphic. Actual rinse efficiency values are typically between 1 and 1.1 while wash quality values are within in a scale from 0 – 1.5.

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Energy Consumption of New Washing Machines Republic of Korea

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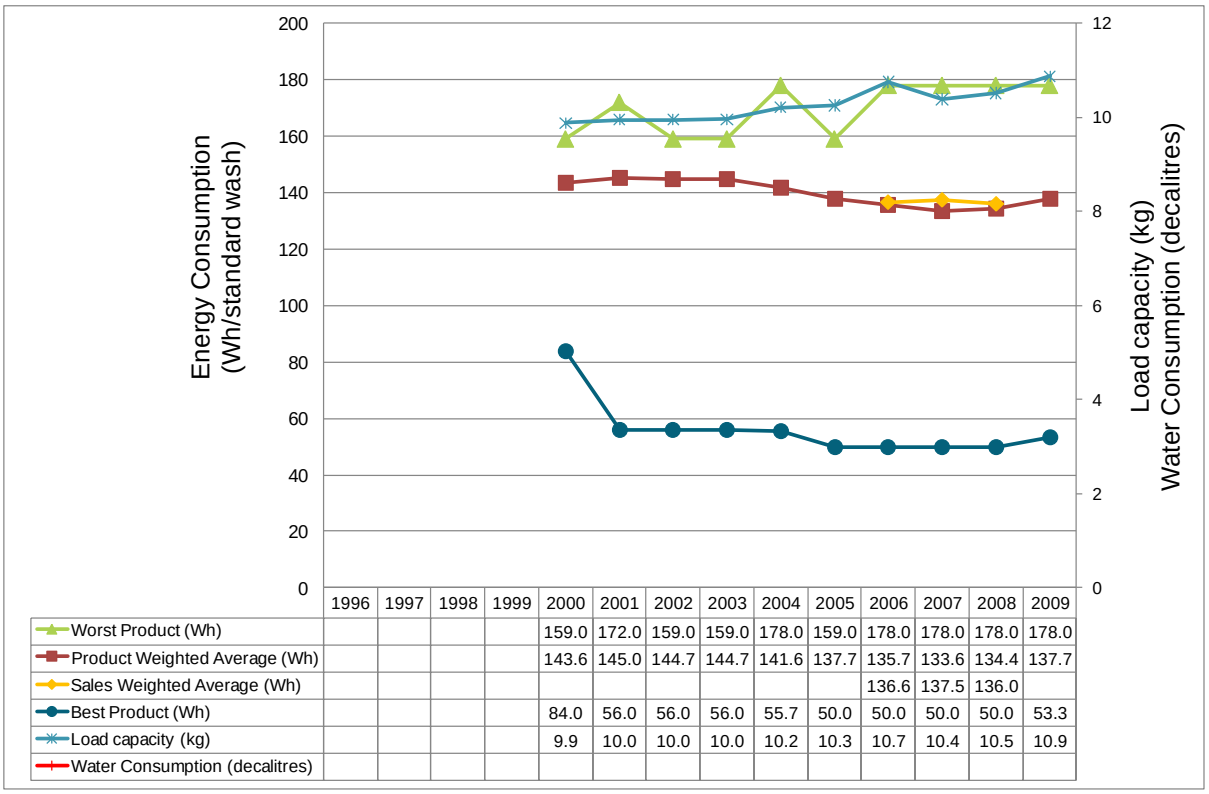
Energy Consumption of New top loader Washing Machines Republic of Korea



	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Worst Product (Wh)					159.0	172.0	159.0	159.0	178.0	159.0	178.0	178.0	178.0	178.0
Product Weighted Average (Wh)					143.6	145.0	144.7	144.7	141.6	137.7	135.7	133.6	134.4	137.7
Sales Weighted Average (Wh)											136.6	137.5	136.0	
Best Product (Wh)					84.0	56.0	56.0	56.0	55.7	50.0	50.0	50.0	50.0	53.3
Load capacity (kg)					9.9	10.0	10.0	10.0	10.2	10.3	10.7	10.4	10.5	10.9
Water Consumption (decalitres)														

Key notes on Graph (See notes section 2)

- The data source was the mandatory registration scheme database for February 2010 which includes products registered in earlier years. Products available in each year were assumed to be those registered in the given year, plus those registered in the previous three years (ie 2008 contains all products registered in 2008, 2007, 2006 and 2005). Products with registrations older than 4 years are assumed to have left the market and are removed from the dataset unless they have sales in the year being analysed.
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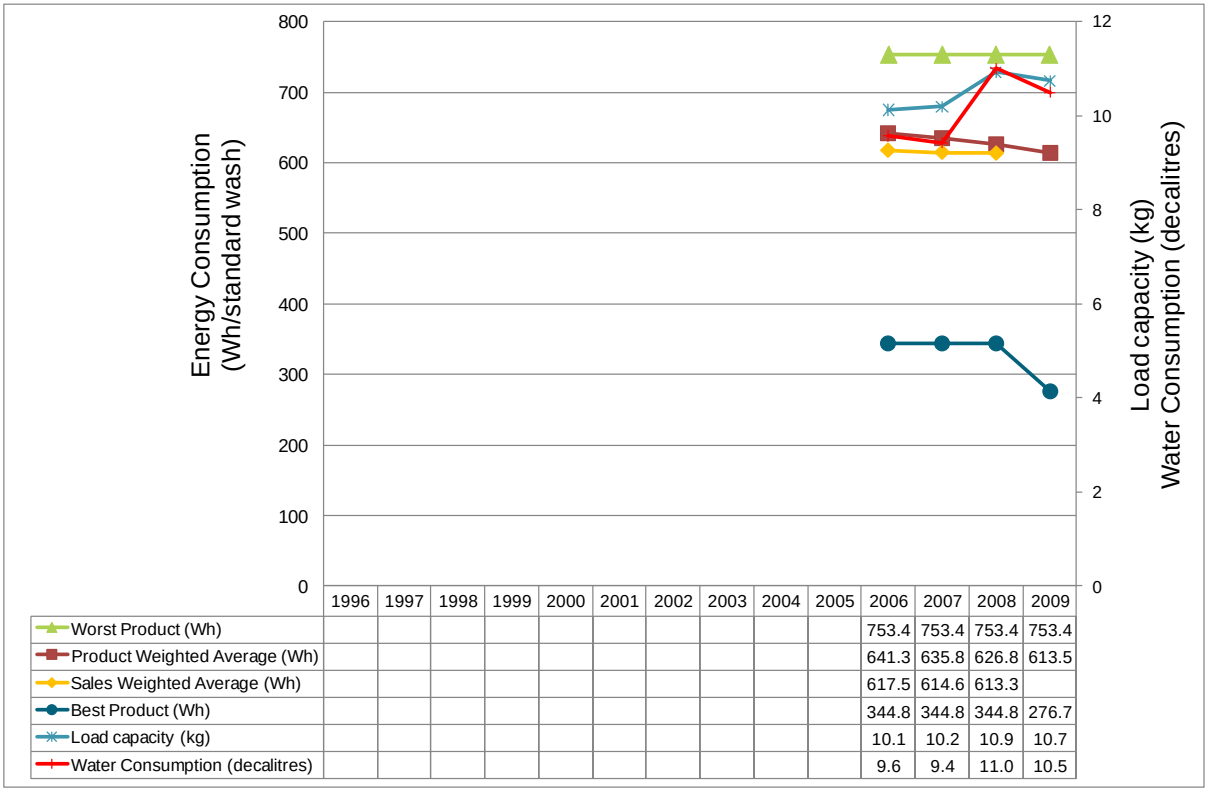
Energy Consumption of New Front Loader Washing Machines - Republic of Korea



	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Worst Product (Wh)											753.4	753.4	753.4	753.4
Product Weighted Average (Wh)											641.3	635.8	626.8	613.5
Sales Weighted Average (Wh)											617.5	614.6	613.3	
Best Product (Wh)											344.8	344.8	344.8	276.7
Load capacity (kg)											10.1	10.2	10.9	10.7
Water Consumption (decalitres)											9.6	9.4	11.0	10.5

Key notes on Graph (See notes section 2)

- The data source was the mandatory registration scheme database for February 2010 which includes products registered in earlier years. Products available in each year were assumed to be those registered in the given year, plus those registered in the previous three years (ie 2008 contains all products registered in 2008, 2007, 2006 and 2005). Products with registrations older than 4 years are assumed to have left the market and are removed from the dataset unless they have sales in the year being analysed.
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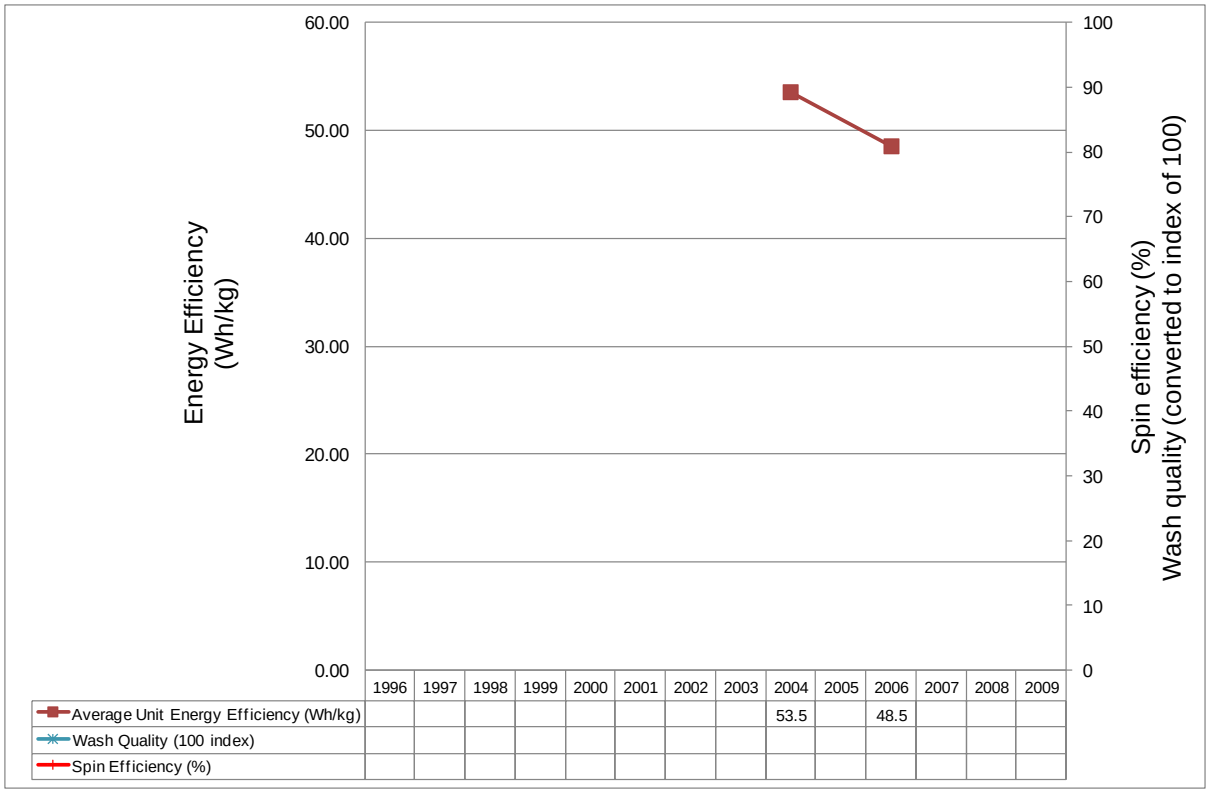
Unit Energy Efficiency of Washing Machines Installed in the Stock - Republic of Korea



Key notes on Graph (See notes section 3)

- Efficiency of stock is based on average consumption of units in stock and average load capacity of products in stock, *not* the average efficiency of individual units.

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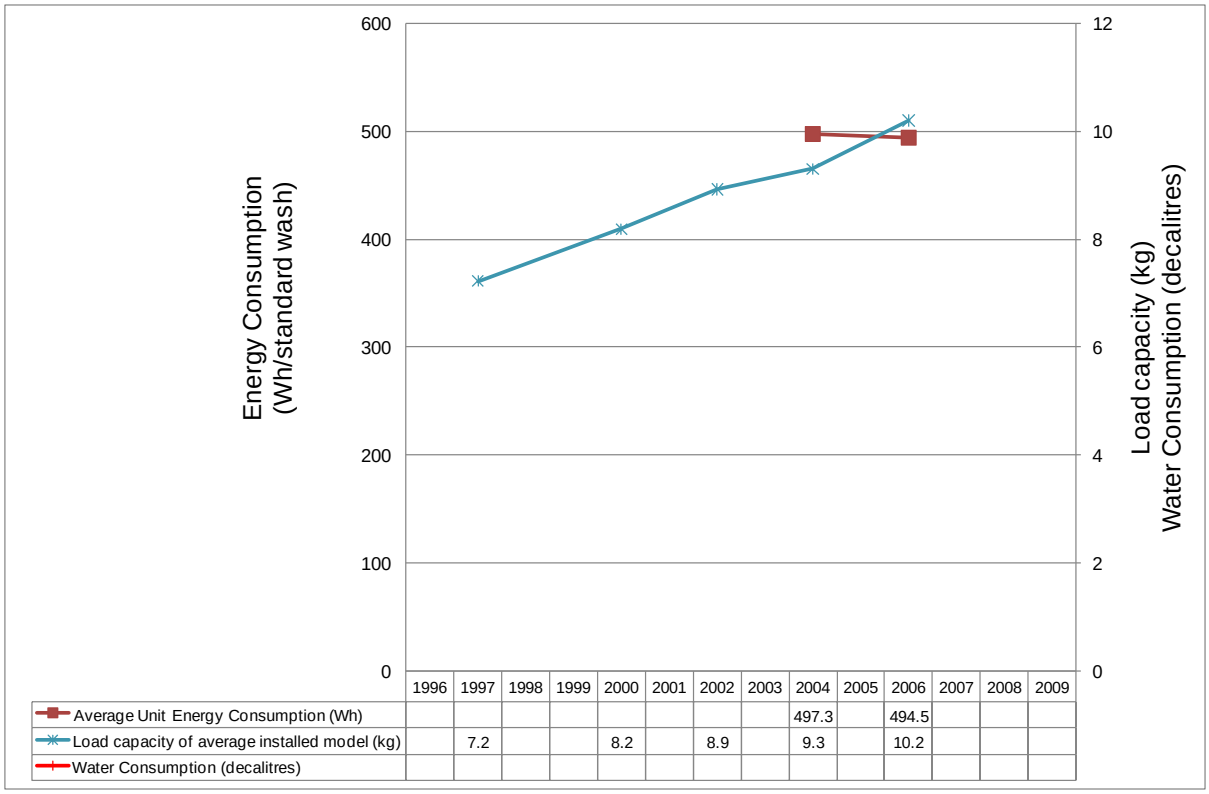
Unit Energy Consumption of Washing Machines Installed in the Stock - Republic of Korea



Key notes on Graph (See notes section 3)

- Consumption and load capacity of installed units in the stock is based on market survey data.
- Load capacity is a full market survey average in 2004 and 2006 but is calculated from a survey of numbers in a number of “capacity ranges” for earlier years. This early year data should therefore be treated with slight caution.

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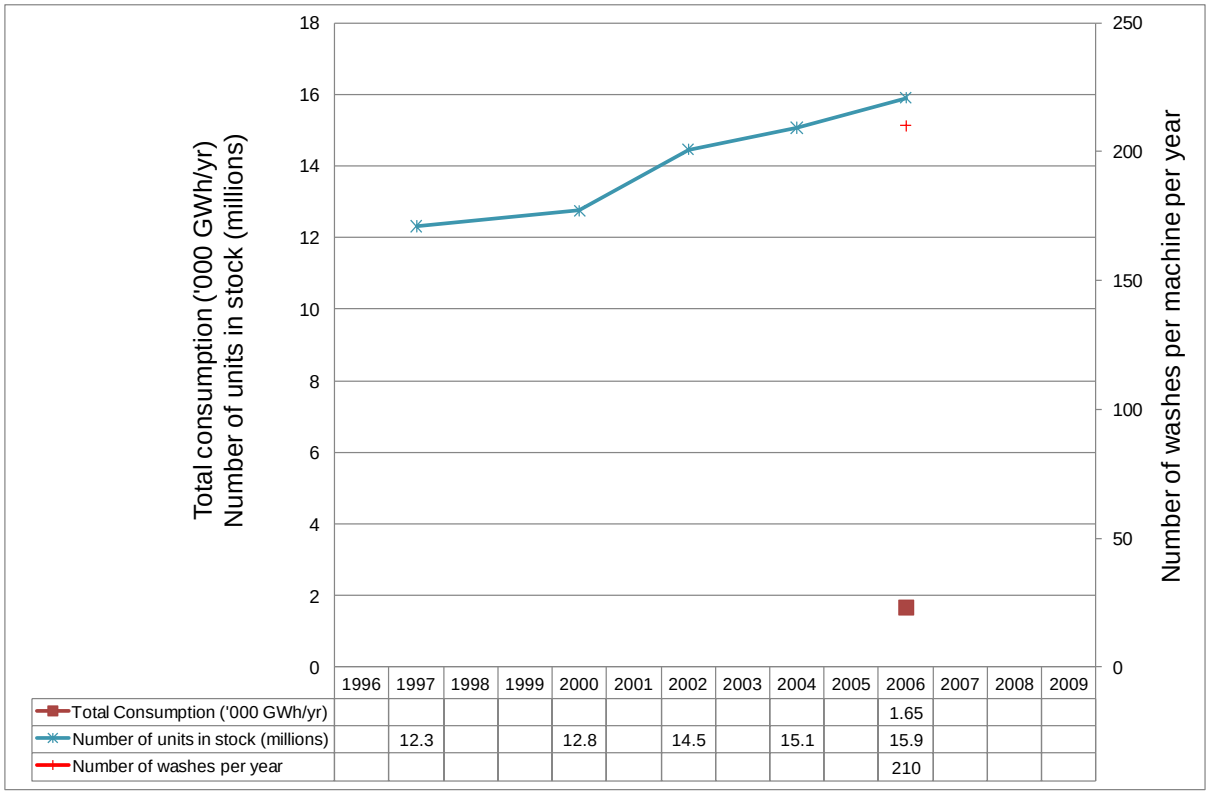
Energy Consumption of the total stock of Installed Washing Machines - Republic of Korea



Key notes on Graph (See notes section 4)

- Number of washes and number of units in stock are based on a market survey. Total consumption is calculated from a market survey of number of units installed, average unit energy consumption and number of washes per year.

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Major Policy Interventions (See notes Section 5)

Korea has two primary policies targeting washing machines:

- **Mandatory Energy Labelling:** The Energy Labelling of Washing Machines has been mandatory for all new products manufactured or sold in Korea since January 2001 (Vertical Axis units) and January 20061 (Horizontal Axis units). Over time the label has evolved in appearance with the most recent label below becoming mandatory in January 2009. Key features on the label are:
    - Power Consumption per Kg load
    - Water efficiency index (for horizontal units only)
    - Water consumption per complete cycle (for horizontal units only)
    - Water extraction ratio
    - Rinsing Index (for horizontal units only)
    - Rated Washing Capacity
    - Power consumption during a complete cycle
    - Stand-by Power (from January 2007)
    - Power Consumption per 1 hour
    - CO^2 emissions per cycle
    - Energy Efficiency Level (1-5 scale, 1 being most efficient)

- **Minimum Energy Performance Standards:** MEPS for Washing Machines has been mandatory for all new products manufactured or sold in Korea since January 20012 (Vertical Axis units) and Jan 2006 (Horizontal Axis units). Over time the MEPS level has been strengthened several times with the most recent requirements becoming mandatory in January 2009 (note all new product data appearing follow the testing requirements in the 2009 regulations).

Both these policies sit within an overall framework of energy efficiency policies that target over 40 products3.

[1] Updated Regulation: (MOICE 20050-50, 6 May 2005) “Regulations on Energy Efficiency and Standards”, 2009.7.30, Ministry of Knowledge Economy, Korean Energy Management Corporation (see MKE Notification 2009-317, 2009.12.28)
[2] Updated Regulation: (MOICE 2000-101, 23 September 2000) “Regulations on Energy Efficiency and Standards”, 2009.7.30, Ministry of Knowledge Economy, Korean Energy Management Corporation (see MKE Notification 2009-317, 2009.12.28)
[3] See presentation “Korea's SL and Market Intervention (LeeKiHyun).ppt”

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Cultural Issues (See Notes Section 6)

- Average load capacity of the products in the market is increasing steadily because of consumers' preference for products with larger capacity (see also notes section 3). This tendency that affects the energy consumption can be noticed in almost every white goods in Korea.
- Sales of horizontal axis machines were increasing rapidly after their release into Korean market as a brand new washing machine. However, the growth in market share of these products has slowed considerably recently..
- Almost every washing machine on the Korean market (approximately 98% of market) has the capacity for cold water intake and hot water intake separately. (Maybe 98% or more of whole market)

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Notes on data

Section 1: Notes on New Product Efficiency

1.1 Test methodologies and Performance Standards

1.1.1 Regulatory Scope

Washing Machines (vertical axis and shortened) and Horizontal Drum Washing Machines are subject to different regulations in Korea. The scope is defined as follows:

- Vertical Axis Units (referred to in local regulations as “Washing Machines”) are agitator and impeller units with capacity of 2-15Kg. Wash only and spin only units are excluded.
- Horizontal Drum Washing Machines is defined as a household unit of 2-13Kg and has a heater, spin extractor and dryer. Non-detergent models where the unit simply boils the laundry or dries it are excluded.

1.1.2 Test methodology

Washing Machines (vertical axis and shortened) and Horizontal Drum Washing Machines are subject to different regulations and have differing test methods in Korea. The test methods are:

Vertical Axis Washing Machines: KS C 9608 (A modification of IEC 60335-2-7:2000)

Horizontal Drum Washing Machine: KS C IEC 60456 (Identical to IEC 60456:2003)

1.1.3 Key Testing Parameters and Regulatory Requirements

1.1.3.1 Vertical Axis Units

Ambient Temperature	15-30 ^{o}C
Voltage	220V, 60Hz
Load	Rated Kg, with material/size as defined in Annex 1 KS C 9608
Measurement of Water Volume	Not known at time of preparation, refer Annex 2 KS C 9608
Test Cycle	One washing cycle, one water spin extraction cycle, two rinse cycles (except in fully automated units where manufacturer selects cycle). Watts/cycle.
Water Test Temperature	Ambient (not changed during test)

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Energy Consumption	Average of 3 Cycles (refer to section 5.1.1 for MEPS levels)
Cycle Efficiency	Energy Consumption of Model under test devided by rated load (Wh/cycle/kg)
Water Extraction Ratio	Average of 4 Cycles (must be >=45%)
Rinsing Index	Average of 4 Cycles (must be >=1)

1.1.3.2 Horizontal Axis Units

Voltage	220V, 60Hz
Ambient Temperature	20°C +/-2°C
Load	Rated Kg, with material/size as defined in KS C IEC 60456 including base load and soil strips. See Tables 1 and 2 below for load qualities and loading order.
Detergent	Type as defined in KS C IEC 60456. Quantity: 54g + (16g x rated load capacity in Kg)
Water Supply	15°C +/-2°C If the inlet temperature varies from 15°C, the following correction is made to the Energy Consumption Calculation: $E_c = \frac{Q_c \times (t_c - 15)}{860}$ Where, E_c is the cold water energy correction in kWh during a complete test t_c is the measured inlet temperature of the cold water in degree Celsius, 13~17℃ Q_c is the volume of the cold water used during the prewash and main wash only, in ℓ
Reference Unit	As defined in KS C IEC 60456 with 5Kg load and operating on a 40°C cotton cycle.
Water Test Temperature	40°C (or where not possible, “a programme the manufacturer indicates to be used”. It is believed the average wash temperature during test is 37°C[4]

[4] Source: Mr K H Lee - KEMCO

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Energy Consumption	Consumption in Wh of model under test when undertaking a full wash, rinse and spin cycle. Average of 3 cycles by each of 2 units.
Cycle Efficiency	Energy Consumption of Model under test divided by rated load (Wh/cycle/kg).
Measurement of Water Volume	Complete volume of water used during energy consumption test (litres). Average of 3 cycles by each of 2 units.
Spin Extraction Ratio	Must be >=40% derived by ((Mass of Dry Load)/(Mass of Extracted Load)) x 100. Average of 3 cycles by each of 2 units.
Rinsing Index	Average of 4 Cycles (must be >=1). Average of 3 cycles by each of 2 units.
Wash Quality Index	>0.6 as a ratio of average reflectance measured (compared with reference unit). Average of 3 cycles by each of 2 units.

Base load and test strips shall be used for prescribed by KS C IEC 60456 and number of the test load for rated washing capacity (kg) is given in [Table 1]. If the test load is not specified in [Table 1], the number of sheet and pillowcase are loaded at lower level and the rest load needed is loaded with hand-towels.

[Table 1] Test load for rated washing capacity.

Capacity	Rated capacity(kg)																
load	13.0	12.0	11.0	10.0	9.0	8.0	7.0	6.5	6.0	5.5	5.0	4.5	4.0	3.5	3.0	2.5	2.0
test strips	8	8	8	8	8	8	7	7	6	6	5	5	4	4	3	3	2
hand-towels	31	26	26	23	23	23	23	23	23	18	18	14	14	11	11	9	6
pillowcases	30	28	24	22	18	14	12	10	8	8	6	6	4	3	4	3	2
sheets	3	3	3	3	3	3	2	2	2	2	2	2	2	2	1	1	1

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[Table 2] Loading order of test load for rated washing capacity

load order	Items	13.0	12.0	11.0	10.0	9.0	8.0	7.0	6.5	6.0	5.5	5.0	4.5	4.0	3.5	3.0	2.5	2.0
1	pillowcase	5	4	4	3	2	1	1	1	1	1	1	1	1				
2	hand-towel	6	5	5	4	4	4	4	4	4	3	3	2~4	2~5	3			
3	hand-towel+ test strip	1	1	1	1	1	1	1	1	1	1	1	1	1				
4	pillowcase	5	5	4	4	4	3	3	2	2	2					1	1	1
5	hand-towel+ test strip	1	1	1	1	1	1	1	1	1	1				1			
6	Sheet	1	1	1	1	1	1	1	1	1	1	1	1	1	1			
7	hand-towel+ test strip	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
8	pillowcase	5	5	4	4	3	3	2	2	1	1	2	2	1	1	1		
9	hand-towel	1~6	1~4	1~4	1~4	1~4	1~4	1~4	1~4	1~5	0~3	0~4				2~4	2~3	2~3
10	hand-towel+ test strip	1	1	1	1	1	1	1	1			1	1					
11	Sheet	1	1	1	1	1	1									1	1	1
12	hand-towel+ test strip	1	1	1	1	1	1									1	1	1
13	hand-towel	1~5	1~4	1~4	1~3	1~3	1~3	1~4	1~4	1~4	0~3	0~3				2~4	3	1
14	pillowcase	5	5	4	4	3	3	2	2	1	1	2	2	1	1	1	1	
15	hand-towel+ test strip	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
16	Sheet	1	1	1	1	1	1	1	1	1	1	1	1	1	1			
17	hand-towel+ test strip	1	1	1	1	1	1	1	1	1	1				1			
18	pillowcase	5	5	4	4	4	3	3	2	2	2				1	1	1	1
19	hand-towel+ test strip	1	1	1	1	1	1	1	1	1	1	1	1	1				
20	hand-towel	6	5	5	4	4	4	4	4	4	3	3	2~5	2~5	1~4			
21	pillowcase	5	4	4	3	2	1	1	1	1	1	1	1	1				

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1.2 Product Consumption Graphics

No combined vertical and horizontal product efficiency information is shown due to their fundamental difference in test methodologies.

1.2.1 Data Source: Korean Energy Management Company (KEMCO) product registration database (see http://www.kemco.or.kr)

1.2.2 Data Clarifications

All new product data appearing follows the testing requirements in the 2009 regulations[5].

Proportion of data set included

Korean regulations[6] for vertical axis units apply to load capacities of 2-15Kg and for horizontal units apply to load capacities of 2-13Kg. Data on units below 2Kg is now available and data on units above 13Kg has been excluded from this analysis in line with original product definition.

Almost every Korean Horizontal Axis unit has heaters for water (approximately 98% of the market). However, in approximately 40% of these units, heaters are also used for an additional dryer function. Although excluded from the original Mapping and Benchmarking product definition, these products are included in the analysis as there is insufficient recorded data to identify these units within the overall data set supplied. However, the dryer function is not included in the test for energy consumption or other test cycles.

A small number of products (approximately 30) with very high performance levels (approximately 10Wh per standard wash) have been removed from the original data set as the registration authority believe these models to have been incorrectly reported.

There were 4 font loader models listed for 2005 but these have not been included in the analysis as this is too low a number to be considered representative of the Market.

1.2.3 Key calculations undertaken:

Declared Unit Load Capacity: Unit load capacity in Kg is defined by local regulations and declared by manufacturers.

(Note: This capacity is defined using the mixture of materials defined in the local regulations which is not necessarily in line with the mixture of material used elsewhere (for local load mix, refer to Section 1.1 on “Notes on Data”)).

Model Energy Consumption: Model Energy Consumption is the energy consumed by the unit to complete one wash cycle as defined by local test conditions (kWh/wash).

[5] Source: “Regulations on Energy Efficiency and Standards”, 2009.7.30, Ministry of Knowledge Economy, Korean Energy Management Corporation (see MKE Notification 2009-317, 2009.12.28)
[6] Source: “Regulations on Energy Efficiency and Standards”, 2009.7.30, Ministry of Knowledge Economy, Korean Energy Management Corporation (see MKE Notification 2009-317, 2009.12.28)

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Sales Weighted Energy Consumption of New Models: Value calculated by [Sum of (Model Energy Consumption multiplied by sales volume of Model in year) for all Models] divided by [Sum of (sales volume of all Models in year)]. Unit kWh/wash.

Model Weighted Consumption of New Models: Value calculated by [Sum of (Model Energy Consumption for all models sold in year)] divided by [Sum of (Number of Models sold in year)]. Unit kWh/wash.

Derived Model Energy Efficiency: Value calculated by dividing Model Energy Consumption by Declared Unit Load Capacity (kWh/Kg/Wash).

Sales Weighted Energy Efficiency of New Models: Value calculated by [Sum of (Derived Model Energy Efficiency multiplied by sales volume of Model in year) for all Models] divided by [Sum of sales volume of all Models in year]. Unit kWh/Kg/Wash.

Model Weighted Energy Efficiency of New Models: Value calculated by [Sum of Model Energy Efficiency for all models sold in year] divided by [Number of Models sold in year]. Unit kWh/Kg/Wash.

Spin Efficiency: The efficiency of removal of water from the test load as defined in local test conditions (refer to Section 1.1 on “Notes on Data”).

Wash Quality: The efficiency of cleansing of test load as defined in local test conditions (refer to Section 1.1 on “Notes on Data”). Wash quality is presented as declared value multiplied by 100 so that it is more clearly viewable on the graphic.

Rinse Efficiency (Rinse Index): The efficiency of removal of detergent, softener or other additive from the test load as defined in local test conditions (Unit: comparative percentage). Rinse Efficiency is presented as declared value multiplied by 100 so that it is more clearly viewable on the graphic.

Spin Speed: The highest spin speed attainable by the unit (Unit: revolutions per minute – rpm).

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Section 2: Notes on New Product Consumption

2.1 Test methodologies and Performance Standards

Refer to section 1.1

2.2 Product Efficiency Consumption

Refer to section 1.2.

No combined vertical and horizontal product consumption information is shown due to their fundamental difference in test methodologies.

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Section 3: Notes on Efficiency of Stock

Source : Survey on Electricity Consumption Characters of Home Appliances (KPX(Korea Power Exchange), 2006)

Number of products in stock			
year	*products per household*	*products in use (1,000)*	*Remarks*
1996	0.96		
1997	0.95	12,310	
1998	0.95		
1999	0.96		
2000	0.96	12,750	
2001	0.96		
2002	0.96	14,459	
2003	0.96		
2004	0.96	15,068	
2005	0.96		
2006	0.98	15,905	
2007	0.99		estimated
2008	1.00		estimated
2009	1.00		estimated
2010	1.00		estimated

Proportion of load capacity in stock (%)							
year	*~4.5kg*	*4.6kg~5.5kg*	*5.6kg~6.5kg*	*6.6kg~7.5kg*	*7.6kg~8.5kg*	*8.6kg~9.5kg*	*9.6kg~*
1995	15.8	13.3	22.3	27.3	8.1	7.3	5.9
1997	6.8	12.8	16.1	28.5	10.9	7.3	17.6
2000	2.4	9.3	10.3	17.1	14.7	5.6	40.6
2002	1.0	3.4	4.9	16.9	8.7	5.2	59.9
2004	0.1	1.6	2.6	10.7	11.0	3.5	70.5
2006	0.5	1.4	1.8	6.4	6.8	3.0	80.4
(models)	85,203	219,094	279,954	994,038	1,075,184	470,646	12,780,486
* Year 2006 : average - 10.2kg, min. - 5kg, max. - 15kg							
* Year 2004 : average - 9.3kg							

Power consumption of products in stock (W)							
year	*~4.5kg*	*4.6kg~5.5kg*	*5.6kg~6.5kg*	*6.6kg~7.5kg*	*7.6kg~8.5kg*	*8.6kg~9.5kg*	*9.6kg~*
2006	314	415	488	470	505	514	515
* Year 2006 : average - 494.5W, min. - 120W, max. - 700W							
* Year 2004 : average - 493.7W							

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Annual power consumption			
year	*power consumption (W)*	*operation time (hour/year)*	*annual power consumption (wh/year)*
2006	494.5	218	107,577

Operation pattern		
year	*monthly operation (days or times)*	*daily operation time (minutes)*
2006	17.5	88

Average Lifetime	
year	*lifetime (year)*
2006	6.6

Number of household	
year	*households*
2006	16,251,875

3.1 Stock Efficiency Graphic

Efficiency of stock is based on average consumption of units in stock and average load capacity of products in stock (both shown in previous section), *not* the average efficiency of individual units.

3.2 Stock Consumption Graphic

Consumption and load capacity of installed units in the stock is based on market survey data.

Load capacity is a full market survey average in 2004 and 2006 but is calculated from a survey of numbers in a number of “capacity ranges” for earlier years as show in the Proportion of load capacity in stock table above.

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Section 4: Notes on Consumption of Stock

Data on the number of washes and number of units in stock is based on a market survey. Total consumption is calculated from market survey data as follows:

number of units installed * average unit energy consumption * number of washes per year

For details of survey data, refer to Section 3

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Section 5: Notes on Policy Interventions

5.1 Energy Efficiency Standards and Labelling Program

5.1.1 Mandatory Energy Efficiency Standards (MEPS)

MEPS for Washing Machines has been mandatory for all new products manufactured or sold in Korea since January 2001[7] (Vertical Axis units) and Jan 2006 (Horizontal Axis units). Over time the MEPS level has been strengthened several times with the most recent requirements becoming mandatory in January 2009 (note all new product data appearing follow the testing requirements in the 2009 regulations).

The MEPS levels for vertical axis washing machines are (effective from January 2007):

5.1 MEPS (Minimum Energy Performance Standard)

(unit : Wh/kg)

Type	MEPS
	From 1st of January, 2007
Washing Machine	23.0

5.2 Energy Efficiency Level Standards

A. Energy Efficiency Level Index

Electric Power Consumption during a complete cycle [Wh] per Rated Washing Capacity [Standard program] and standby power.

$$R(\text{Energy Efficiency Level Index}) = \frac{\text{Electric Power Consumption during a complete cycle [Wh]}}{\text{Rated Washing Capacity [kg]}}$$

Standby power shall be tested in off-mode, which means a tested sample shall be in power-off manually or automatically.

B. Energy Efficiency Level

1) Without network function

R	Standby power (Off mode power consumption)	Level
$R \leq 14.5$	≤ 1.0 W	1
$R \leq 14.5$	N/A	2
$14.5 < R \leq 17.0$	N/A	3
$17.0 < R \leq 20.0$	N/A	4
$20.0 < R \leq 23.0$	N/A	5

[7] Regulation update: (MOICE 2000-101, 23 September 2000) “Regulations on Energy Efficiency and Standards”, 2009.7.30, Ministry of Knowledge Economy, Korean Energy Management Corporation (see MKE Notification 2009-317, 2009.12.28)

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2) With network function

R	Standby power	Level
R ≤ 14.5	≤ 1.0 W (off mode) ≤ 3.0 W (active standby mode)	1
R ≤ 14.5	N/A	2
14.5 < R ≤ 17.0	N/A	3
17.0 < R ≤ 20.0	N/A	4
20.0 < R ≤ 23.0	N/A	5

C. Definitions

Without network function

With network function :
It has a network function in a body, which is enable to exchange data between a body and external network by wire or wireless. If it is get to 1st level, standby power shall be less than 3 W for active standby mode, and 1W for off mode.

Off mode : The power state when the product is switched off or auto off.

Active standby mode :
When an appliance is switched to off/standby and is not performing its primary functions while still connected to a power supply but can be activated by a remote control or other internal signals. In addition, it can also be activated into other power modes by receiving external signals or when it is receiving minimum level of data from service providers.

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The MEPS levels for horizontal axis washing machines are (effective from January 2009):

6.1 MEPS (Minimum Energy Performance Standard)

(unit : Wh/kg)

Type	MEPS
	From 1st of January, 2009
The rated washing capacity Less 7 kg	120
7kg≤The rated washing capacity≤15kg	115

6.2 Energy Efficiency Level Standards

A. Energy Efficiency Level Index

Electric Power Consumption during a complete cycle [Wh] per Rated Washing Capacity [Water temperature 40℃]

$$R(\text{Energy Efficiency Level Index}) = \frac{\text{Electric Power Consumption during a complete cycle [Wh]}}{\text{Rated Washing Capacity [kg]}}$$

Standby power shall be tested in off-mode, which means a tested sample shall be in power-off manually or automatically.

B. Energy Efficiency Level

i. The rated washing capacity less 7 kg without network function

R	Standby power (off mode)	Level
R ≤ 60	≤ 1.0 W	1
R ≤ 60	N/A	2
60 < R ≤ 80	N/A	3
80< R ≤ 100	N/A	4
100 < R ≤ 120	N/A	5

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2) The rated washing capacity less 7 kg with network function

R	Standby power	Level
R ≤ 60	≤ 1.0 W (off mode) ≤ 3.0 W (active standby mode)	1
R ≤ 60	N/A	2
60 < R ≤ 80	N/A	3
80< R ≤ 100	N/A	4
100 < R ≤ 120	N/A	5

3) 7kg ≤ The rated washing capacity ≤ 15kg without network function

R	Standby power (off mode)	Level
R ≤ 55	≤ 1.0 W	1
R ≤ 55	N/A	2
55 < R ≤ 75	N/A	3
75< R ≤ 95	N/A	4
95 < R ≤ 115	N/A	5

4) 7kg ≤ The rated washing capacity ≤ 15kg with network function

R	Standby power	Level
R ≤ 55	≤ 1.0 W (off mode) ≤ 3.0 W (active standby mode)	1
R ≤ 55	N/A	2
55 < R ≤ 75	N/A	3
75< R ≤ 95	N/A	4
95 < R ≤ 115	N/A	5

C. Definitions

Without network function

With network function :
It has a network function in a body, which is enable to exchange data between a body and external network by wire or wireless. If it is get to 1st level, R shall be met with above tables and standby power shall be less than 3 W for active standby mode, and 1W for off mode.

Off mode : The power state when the product is switched off or auto off.

Active standby mode :
When an appliance is switched to off/standby and is not performing its primary functions while still connected to a power supply but can be activated by a remote control or other internal signals. In addition, it can also be activated into other power modes by receiving external signals or when it is receiving minimum level of data from service providers.

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5.2 Mandatory Energy Labelling

The Energy Labelling of Washing Machines has been mandatory for all new products manufactured or sold in Korea since January 2001 (Vertical Axis units) and January 2006[8] (Horizontal Axis units). Over time the label has evolved in appearance with the most recent label below will become mandatory in 2010[9]. Key features on the label are:

- Power Consumption per Kg load
- Water efficiency index (for horizontal units only)
- Water consumption per complete cycle (for horizontal units only)
- Water extraction ratio
- Rinsing Index (for horizontal units only)
- Rated Washing Capacity
- Power consumption during a complete cycle
- Stand-by Power (from January 2007)
- Power Consumption per 1 hour
- CO^2 emissions per cycle
- Energy Efficiency Level (1-5 scale, 1 being most efficient)
- (and new for the 2010 an indication of the cost of electricity to run the appliance)

Washing Machine (Vertical Axis)

Washing Machine (Horizontal Axis)

[8] Regulation update: (MOICE 20050-50, 6 May 2005) "Regulations on Energy Efficiency and Standards", 2009.7.30, Ministry of Knowledge Economy, Korean Energy Management Corporation (see MKE Notification 2009-317, 2009.12.28)
[9] For more information see "*Korea's Energy Labels Standards(final).ppt"* posted on the Mapping and Benchmarking Annex website.

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5.3 Reporting Procedure of Energy Efficiency Labelling:

Energy efficiency labelling tests are conducted on request at designated national testing institutes (or self certified testing institutes) to determining the energy efficiency grades of products (imported goods included). Manufacturers or importers receive the test performance report from the designated testing institutes. The reports are sent to Korean Energy Management Company (KEMCO) and made publicly available on the internet (http://www.kemco.or.kr). The latest regulations also include a requirement to submit annual sales figures.

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Section 6: Notes on Cultural Issues

No additional notes

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