Mapping Document

Country:	China
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 :

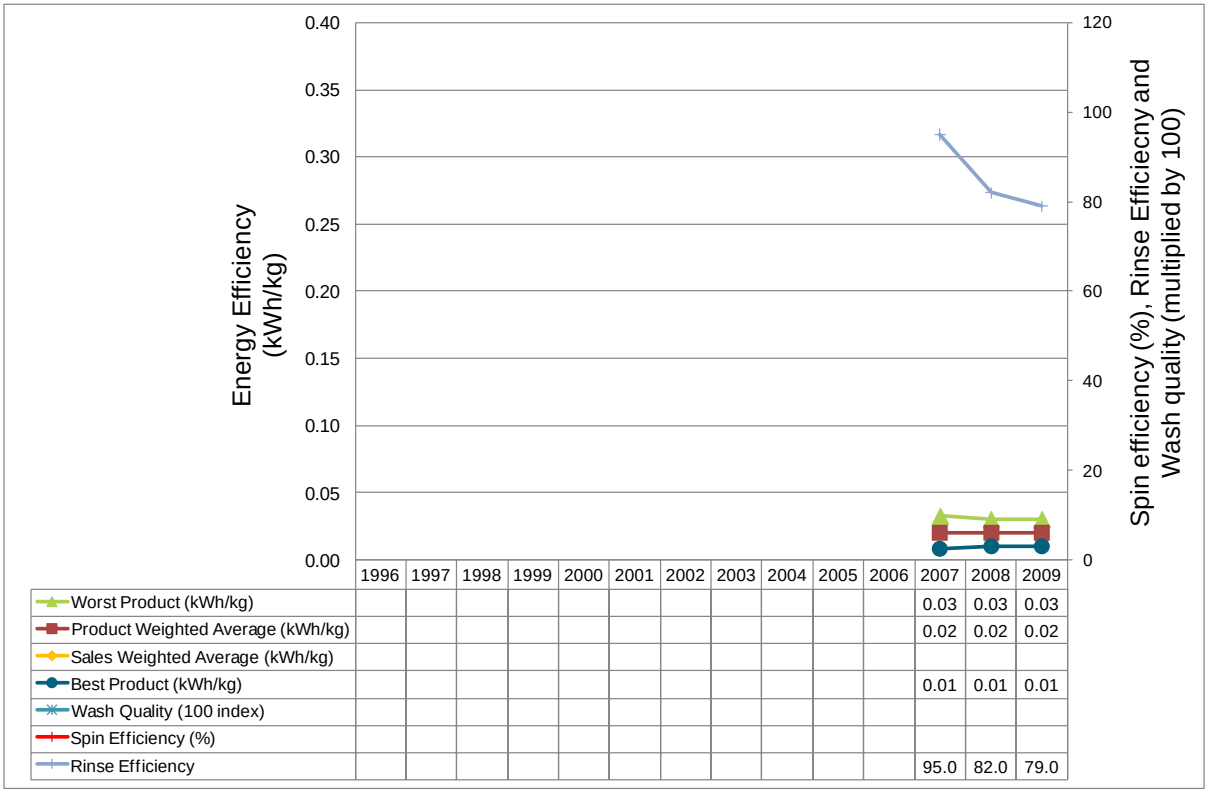
Technology	User intervention	All Types - Automatic, semi-automatic and manual
	Orientation	All Types - Horizontal (front loaders) and Vertical Plane (top loader)
	Configuration	All Types - Drum, Impeller, Agitator, Nutators Exclude all types of Washer/Dryer
	Coin/Card Operation	All Types
	Water intake	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

Energy Efficiency of New Washing Machines China

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

Energy Efficiency of New Top Loader Washing Machines China

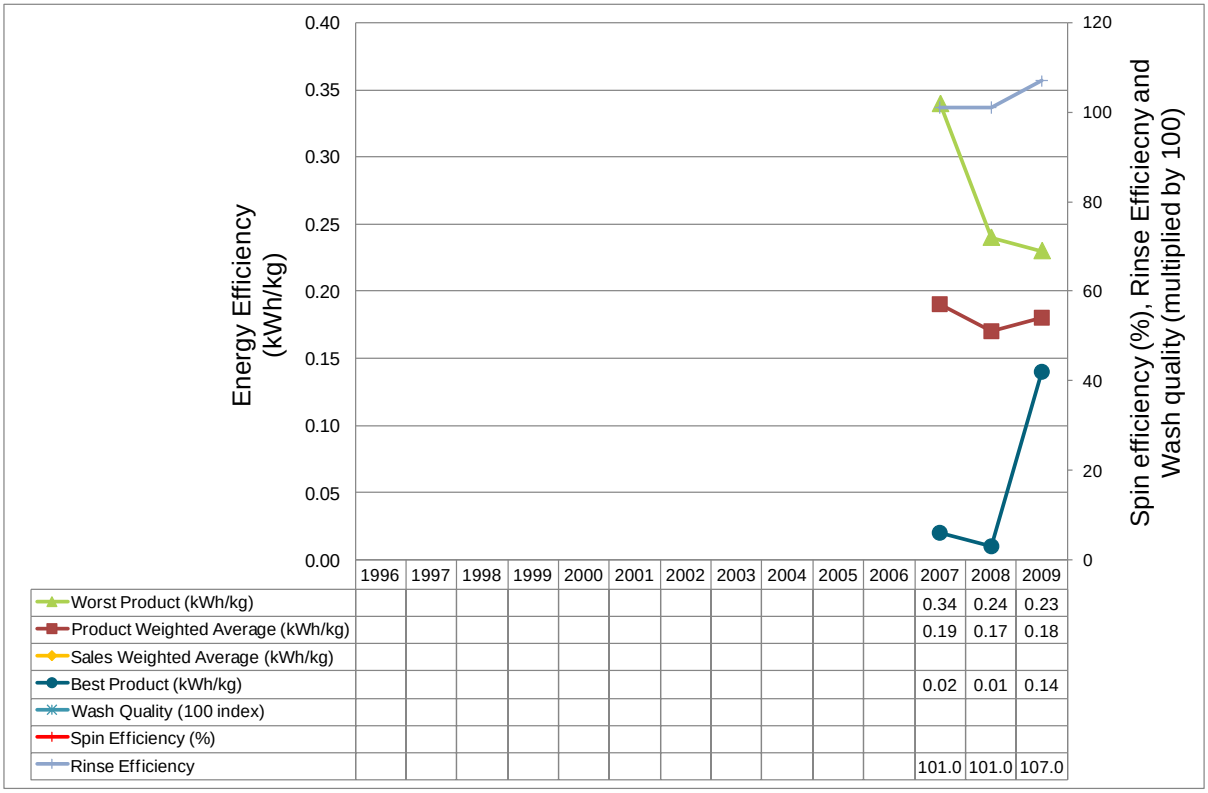


	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Worst Product (kWh/kg)												0.03	0.03	0.03
Product Weighted Average (kWh/kg)												0.02	0.02	0.02
Sales Weighted Average (kWh/kg)														
Best Product (kWh/kg)												0.01	0.01	0.01
Wash Quality (100 index)														
Spin Efficiency (%)														
Rinse Efficiency												95.0	82.0	79.0

Key notes on Graph (see notes section 1)

- Data supplied by the China National Institute of Standardisation (CNIS) and based on all products registered to carry the energy label (see notes in section 1.2 and 5).
- Data supplied was **summary data** only (as shown in data tables under graphics), not individual product data.
- (Note almost all units are without heating devises with water input test temperature at 30^{o}C)

Energy Efficiency of New Front Loader Washing Machines China



	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Worst Product (kWh/kg)												0.34	0.24	0.23
Product Weighted Average (kWh/kg)												0.19	0.17	0.18
Sales Weighted Average (kWh/kg)														
Best Product (kWh/kg)												0.02	0.01	0.14
Wash Quality (100 index)														
Spin Efficiency (%)														
Rinse Efficiency												101.0	101.0	107.0

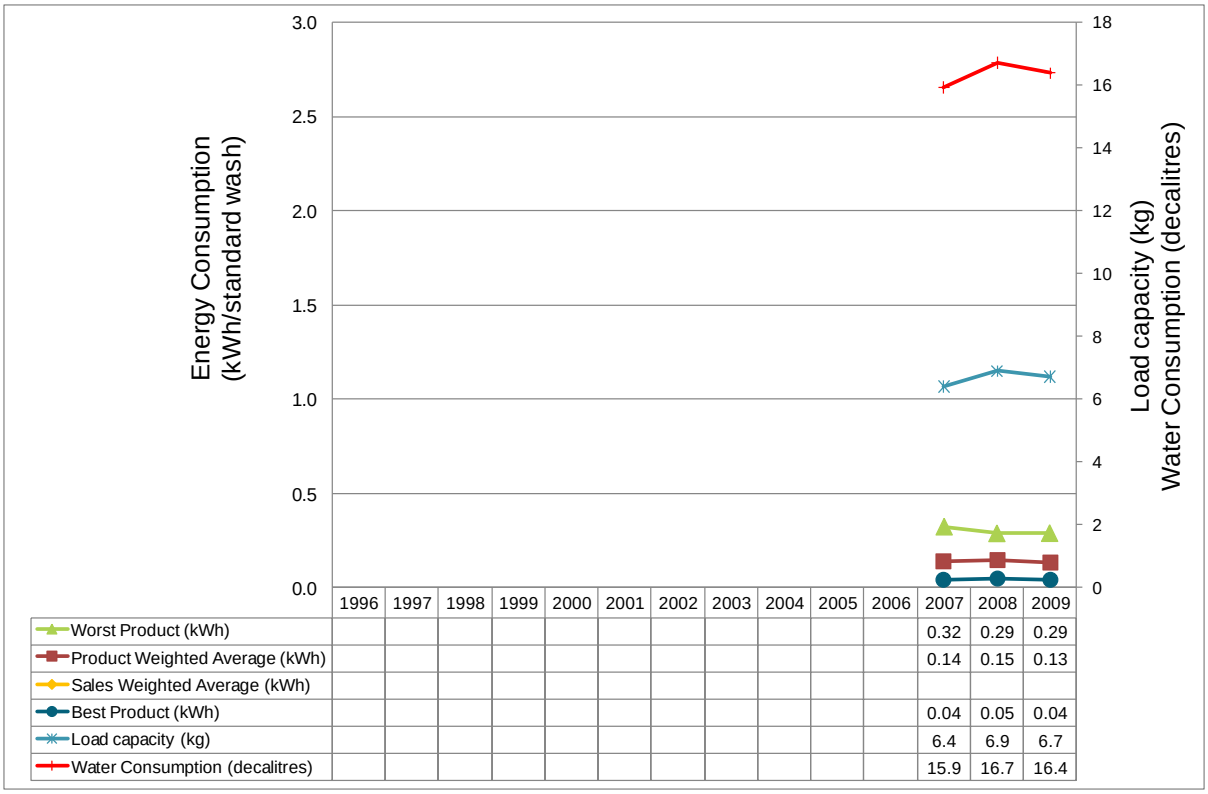
Key notes on Graph (see notes section 1)

- Data supplied by the China National Institute of Standardisation (CNIS) and based on all products registered to carry the energy label (see notes in section 1.2 and 5).
- Data supplied was **summary data** only (as shown in data tables under graphics), not individual product data.

Energy Consumption of New Washing Machines China

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

Energy Consumption of New top loader Washing Machines China

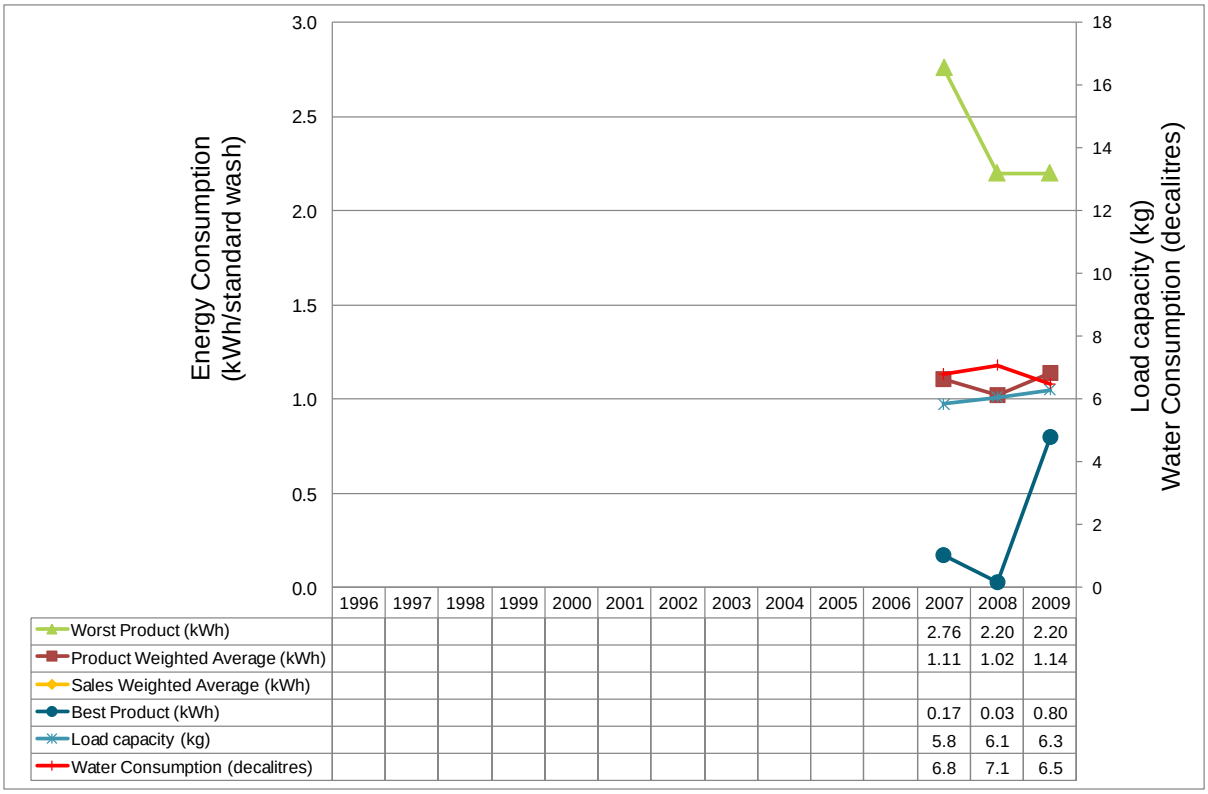


	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Worst Product (kWh)												0.32	0.29	0.29
Product Weighted Average (kWh)												0.14	0.15	0.13
Sales Weighted Average (kWh)														
Best Product (kWh)												0.04	0.05	0.04
Load capacity (kg)												6.4	6.9	6.7
Water Consumption (decalitres)												15.9	16.7	16.4

Key notes on Graph (See notes section 2)

- Data supplied by the China National Institute of Standardisation (CNIS) and based on all products registered to carry the energy label (see notes in section 1.2 and 5).
- Data supplied was **summary data** only (as shown in data tables under graphics), not individual product data.
- (Note almost all units are without heating devises with water input test temperature at 30^{o}C)

Energy Consumption of New front loader Washing Machines China



	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Worst Product (kWh)												2.76	2.20	2.20
Product Weighted Average (kWh)												1.11	1.02	1.14
Sales Weighted Average (kWh)														
Best Product (kWh)												0.17	0.03	0.80
Load capacity (kg)												5.8	6.1	6.3
Water Consumption (decalitres)												6.8	7.1	6.5

Key notes on Graph (See notes section 2)

- Data supplied by the China National Institute of Standardisation (CNIS) and based on all products registered to carry the energy label (see notes in section 1.2 and 5).
- Data supplied was **summary data** only (as shown in data tables under graphics), not individual product data.

Energy Efficiency in the Installed Washing Machines Stock China

Insufficient data is available to plot average stock efficiency *or* average stock unit consumption

Energy Consumption in the installed Washing Machines Stock China

No data is available on overall stock consumption and therefore graphic cannot be created. Limited data is available on number of units in use (and produce). Refer to Notes Section 4)

Major Policy Interventions (See notes Section 5)

Major policy actions for washing machines in China fall into 5 categories

- Mandatory Labelling: Mandatory Labelling of products in China began in 2005 with cold appliances and air-conditioners, with washing machines requiring mandatory labels from 1 March 2007. The labelling system is a 1-5 unit. Originally wholly self certified, the requirements are gradually migrating to a requirement for all product claims to be supported by a test certificate from a certified laboratory, with both laboratory certification and granting of label authority based on the test report managed by the China National Institute of Standardisation (CNIS).

- Voluntary Certification (premium) Labelling: Known as the certification label, products are required to reach a minimum level of efficiency with third party checking of independent test lab reports and verification of production reliability through factory checks and requirements for quality system to be in place. Introduced for cold appliances in 1999 under the management of the China Standards Certification Centre (CSC, formerly CECP) with management transferred to the China Quality Certification Centre (CQC) in 2008.

- Minimum Energy Performance Standards: Washing Machines have had Minimum Energy Performance Standards (MEPS) since 1989. However, requirements were initially limited and applied only to units below 5kg. The most recent update in the MEPS now applies to all units with washing capacity between 1.0kg to 13kg.

- 6A Certification: As of 1 September 2009, a new certification for washing machines has been introduced. 6A means all the six principle measures of performance (washing quality, evenness of washing, water consumption, moisture content, noise, and failure-free operation) meet A Level requirements

- Promotional Policies: Various promotional policies have been enacted within the last 10 years, particularly at the local level where electricity supply is a problem. Normally these promotional policies are subsidy based with government providing incentives for the purchase of more efficient appliances. In 2009, in response to the global economic crisis, central government instituted a number of stimulus measures. One such measure was the support of energy efficient appliances including cold appliances. The support offered was scaled, but provided subsidy for cold appliances carrying level 1 and 2 labels, with level 1 products receiving the highest subsidy (typically around $90/product).

- Home appliances going to countryside: In 2007, Chinese government started a program named “Home appliances going to countryside”, which aims to promote sales and usage of home appliances in countryside by using fiscal subsidies. Washing machine are one of the promotional product groups, but energy performance must be at least label level 2 or better to qualify.

Cultural Issues (See Notes Section 6)

Limited information is available on cultural factors related to washing machines other than:

- The proportion of Drum type (horizontal) washing machines are gaining market share in both towns and cities despite on entering the market relatively recently. This trend seems to be driven by consumer desire for washing machines of larger capacity but smaller size.
- Lower income families focus on energy and water conservative products. However, wealthy families prefer ones with multiple and fashionable functions, such as with dryer, low abrasion, high rate of washing ability, and health technologies.

Notes on data

Section 1: Notes on Product Efficiency

1.1 Test methodology

Standards	Date in force	Major changes to the former version
GB/T4288-1992	***1993.03***	***Initial Test Methodology***
GB/T4288-2003	***2004.03***	• *Rated washing capacity range covered by the standard changed to no heavier than 13kg (clause 1);* • *Rate of washing ability changed to 0.70 (clause 5.5)* • *Rinsing ability changed to 0.04*10^{-2} mol/L (clause 5.7)* • *Noise value limit changed to 72dB (A weighted) (clause 5.8)* • *Extractor ability changed to less than 115% (clause 5.9)* • *Draining time changed respectively (clause 5.11)* • *Vibration character changed to 0.2mm less (clause 5.13)* • *Failure-free operation changed respectively (clause 5.14)* • *Added the maximum allowable value for energy consumption (clause 5.17)* • *Added the maximum allowable value for water consumption (clause 5.18)* • *Added some clauses of test conditions (clause 6.1.4; clause 6.1.5; clause 6.1.6; clause 6.1.7; clause 6.2.5; clause 6.2.6)* • *Added the test and calculation methods of energy consumption (clause 6.4.1)* • *Added the test and calculation methods of energy consumption (clause 6.4.2)* • *Added the method of preparing two kinds of contaminated cloth (Appendix A.2)* • *Adjusted the ingredients of the second kind of detergent (Appendix A.5)* • *Adjusted the limited value of the hardness of water used in the test (Appendix A.6)* • *Added the rating criteria of rate of washing ability, energy consumption, water consumption, rate of moisture content, noise, and failure-free operation time (Appendix D)*
GB/T4288-2008 (Household and similar electric washing machines)	***2009.09***	*Test method References IEC60456* ***but is NOT equivalent*** • *Added terms and definitions of wool washing items* • *Deleted safety (clause 5.1), water consumption of washing and rated capacity (clause 5.4), error of timing (clause 5.10), draining time (clause 5.11)* • *Rinsing ability changed to "detergent leftover after rinsing, with regard to the alkalinity of water used in the test, should be no denser than 0.06*10-2 mol/L" (clause 5.5)* • *Bent-over times of drainage pipe changed to 600 times less. (clause 5.8)* • *Added wool washing performance (clause 5.15)* • *Added evenness of washing (clause 5.16)* • *Added spinning rate of extracting (clause 5.17)*

		• *Added allowed error of rated values (clause 5.18)* • *Content in Clause 7 changed to test regulation* • *Added Clause 8, marks, packages, transportation and storage.* • *"Energy consumption" in Form D.1 in Appendix D changed to "evenness of washing"* • *Appendix E changed to wool washing program performance test*

1.2 Key Testing Parameters and Regulatory Requirements

1.2.1 Performance Standard

Standards	***Date in force***	***Type***	***Major changes to the former version***
GB 12021.4-1989	*1990.12*	*MEPS*	*Minimum wash quality*
GB 12021.4-2004 (The maximum allowable values of the energy consumption and Energy efficiency grade for household electric washing machines)	*2005.05*	*Performance requirements for MEPS, Labeling and Certification*	• *Changed the maximum allowable values of energy consumption of all kinds of washing machines (clasue 4.2) and addressed requirements for water consumption and rate of washing ability;* • *Added criteria for energy efficiency grades (clause 5)* • *Added the evaluating values of energy conservation (clause 6)*

Summary of requirements (GB 12021.4-2004)

For washing machines, the technical requirement that three indexes have to meet at the same time (Energy consumption(kWh/cycle / Kg)+ water consumption(L/cycle / Kg)+Wash Performance) for Clothes washers, Efficiency rating 1 to 5 (1 best).

Limiting values are shown in the table below:

	Impeller type (vertical)			Drum type (Horizontal)		
Label Value	Electricity consumption (kWh/cycle/kg)	Water consumption (L/cycle/kg)	Rate of washing ability	Electricity consumption (kWh/cycle/kg)	Water consumption (L/cycle/kg)	Rate of washing ability
1	≤0.012	≤20	≥0.90	≤0.19	≤12	≥1.03
2	≤0.017	≤24	≥0.80	≤0.23	≤14	≥0.94
3	≤0.022	≤28	≥0.80	≤0.27	≤16	≥0.94
4	≤0.027	≤32	≥0.70	≤0.31	≤18	≥0.70
5	≤0.032	≤36	≥0.70	≤0.35	≤20	≥0.70

Calculation of energy consumption

$E=E_1/m$

Where

E=electricity consumption for every kilogram clothing, unit: kWh/kg
E_1=total electricity consumption during the test, unit: kWh;
m=rated washing capacity, unit: kg

For those with water heating device, the following equation applies

$E_1=Et+Ec$

Where

Et= total electricity consumption during the test, unit: kWh;
Ec=adjusted value of electricity consumption during the test, unit: kWh;

Ec=Vc*(tc-15)/860
Vc=water volume heated during the test, unit: Litre
tc=temperature of the water at the entry, unit

Calculation of water consumption

W=W1/m

Where

W=water consumption for every kilogram clothing, unit:L/kg
W1=total water consumption during the test, unit: L
m=rated washing capacity, unit: kg

Typical Fill and Wash Temperatures

a. For the top-loader washing machines – temperatures differ by machine type and functionality, but typically:
    a. With heating device: Washing\Rinsing\Dewatering\ Abrasion Function: 15±2 ^{o}C
    b. Without heating device: Washing\Rinsing\Dewatering\ Abrasion Function: 50±2 oC (40±2 oC for woollen)
b. For the top-loader washing machines:
    a. Without heating device: Washing\Rinsing\Dewatering\ Abrasion Function: 30±2 ^{o}C

1.3 Product Efficiency Graphic

1.3.1 Data Source

Data supplied by the China National Institute of Standardisation (CNIS) and based on all products registered to carry the energy label (see notes in section 1.2 and 5).

Data supplied was **summary data only** (as shown in data tables under graphics), not individual product data. It is reported the following information is the mechanism for calculation:

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

(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).

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

Sales Weighted Energy Consumption of New Models: Not declared

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.

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: Not declared

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: Not delared

Wash Quality: Not declared

Rinse Efficiency: The efficiency of removal of detergent, softener or other additive from the test load as defined in local test conditions (Unit: comparative percentage).

Spin Speed: Not declared

Section 2: Notes on Product Consumption

2.1 Test methodologies, Performance Standards and Labelling Requirements

Refer to section 1.1 and 1.2

2.2 Product Consumption Graphic

Refer to section 1.3

Section 3: Notes on Efficiency of Stock

Insufficient data is available to plot average stock efficiency *or* average stock unit consumption

Section 4: Notes on Consumption of Stock

No data available on overall stock consumption.

Number of units in stock sourced from National Bureau of Statistics of China as follows:

Year	Number of products used in every 100 families in towns and cities	Family number in towns and cities (calculated as there are three people in one family) (million)	Units Installed in towns and cities (millions)	Total Units Installed National Wide	Number of Production (million)
1990	78.41	99.90	78.33		6.6268
1991					6.8717
1992					7.0793
1993					8.9585
1994					10.9424
1995	88.97				9.4841
1996					10.7472
1997					12.5448
1998					12.0731
1999	91.44				13.4217
2000	90.50	152.81	138.29		14.4298
2001					13.4161
2002					15.9576
2003					19.6446
2004					25.3341
2005					30.3552
2006	96.77			276.09	35.605
2007	96.77			276.09	40.051

Section 5: Notes on Policy Interventions

5.1 China Energy Label

Mandatory Labelling: Mandatory Labelling of products in China began in 2005 with cold appliances and air-conditioners, with washing machines requiring mandatory labels from 1 March 2007. The labelling system is a 1-5 unit. Originally wholly self certified, the requirements are gradually migrating to a requirement for all product claims to be supported by a test certificate from a certified laboratory, with both laboratory certification and granting of label authority based on the test report managed by the China National Institute of Standardisation (CNIS).

For washing machines, the technical requirement that three indexes have to meet at the same time (Energy consumption(kWh/cycle / Kg)+ water consumption(L/cycle / Kg)+Wash Performance) for Clothes washers, Efficiency rating 1 to 5 (1 best).

5.2 China Energy Conservation Product Certification Label

Voluntary Certification (premium) Labelling: Known as the certification label, products are required to reach a minimum level of efficiency with third party checking of independent test lab reports and verification of production reliability through factory checks and requirements for quality system to be in place. Introduced for cold appliances in 1999 under the management of the China Standards Certification Centre (CSC, formerly CECP) with management transferred to the China Quality Certification Centre (CQC) in 2008.

5.3 Minimum Energy Performance Standards:

Minimum Energy Performance Standards: Washing Machines have had Minimum Energy Performance Standards (MEPS) since 1989. However, requirements were initially limited and applied only to units below 5kg. The most recent update in the MEPS now applies to all units with washing capacity between 1.0kg to 13kg.

(See also Notes Section 1.1)

5.4 6A Certification:

As of 1 September 2009, a new certification for washing machines has been introduced. 6A means all the six principle measures of performance (washing quality, evenness of washing, water consumption, moisture content, noise, and failure-free operation) meet A Level requirements

5.5 Promotional Policies

Various promotional policies have been enacted within the last 10 years, particularly at the local level where electricity supply is a problem. Normally these promotional policies are subsidy based with government providing incentives for the purchase of more efficient appliances. In 2009, in response to the global economic crisis, central government instituted a number of stimulus measures. One such measure was the support of energy efficient appliances including cold appliances. The support offered was scaled, but provided subsidy for washing machines carrying level 1 and 2 labels, with level 1 products receiving the highest subsidy (typically around $90/product).

5.6 Home appliances going to countryside: In 2007,

Chinese government started a program named “Home appliances going to countryside”, which aims to promote sales and usage of home appliances in countryside by using fiscal subsidies. Washing machine are one of the promotional product groups, but energy performance must be at least label level 2 or better to qualify.

Section 6: Notes on Cultural Issues

No additional notes