

Country:	Denmark
Technology:	Laundry Dryers
Sub Category:	Vented and condenser electric models

Introduction

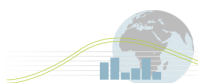
The first stage in the Mapping and Benchmarking process is the definition of the products, i.e. clearly setting the boundaries that define the products for use in data collection and analysis. Doing this ensures that comparison between the participating countries is done against a specific and consistent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

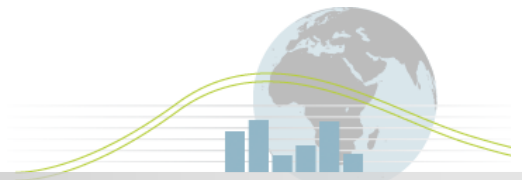
The summary definition for this product is:

<p>Laundry Dryers defined as: <i>'An energy using appliance for use in households designed to remove the moisture of a (given) load of clothing or other textiles.'</i></p>			
<p>Data will be analysed for the following types of laundry dryer:</p>			
Laundry Dryers	Heat source	Electrical	
	Mode of drying	Tumble dryer	
	Air usage	Vented (fresh air is heated, passed through textiles and exhausted from the appliance)	Condenser (noting whether air condenser, or heat pump condenser) (air used for the drying process is dehumidified by cooling and re-circulated)
Functionality	Layout	Noted whether top loader or front loader.	
	Capacity (dry load)	Less than 10 kg. Full analysis only for appliances with capacity between 4 kg and 10 kg.	
	Wash capability	Washer dryers are excluded from the analysis.	
	Automation	To be noted whether the appliance has moisture sensor, load sensor or just timer /manual control.	

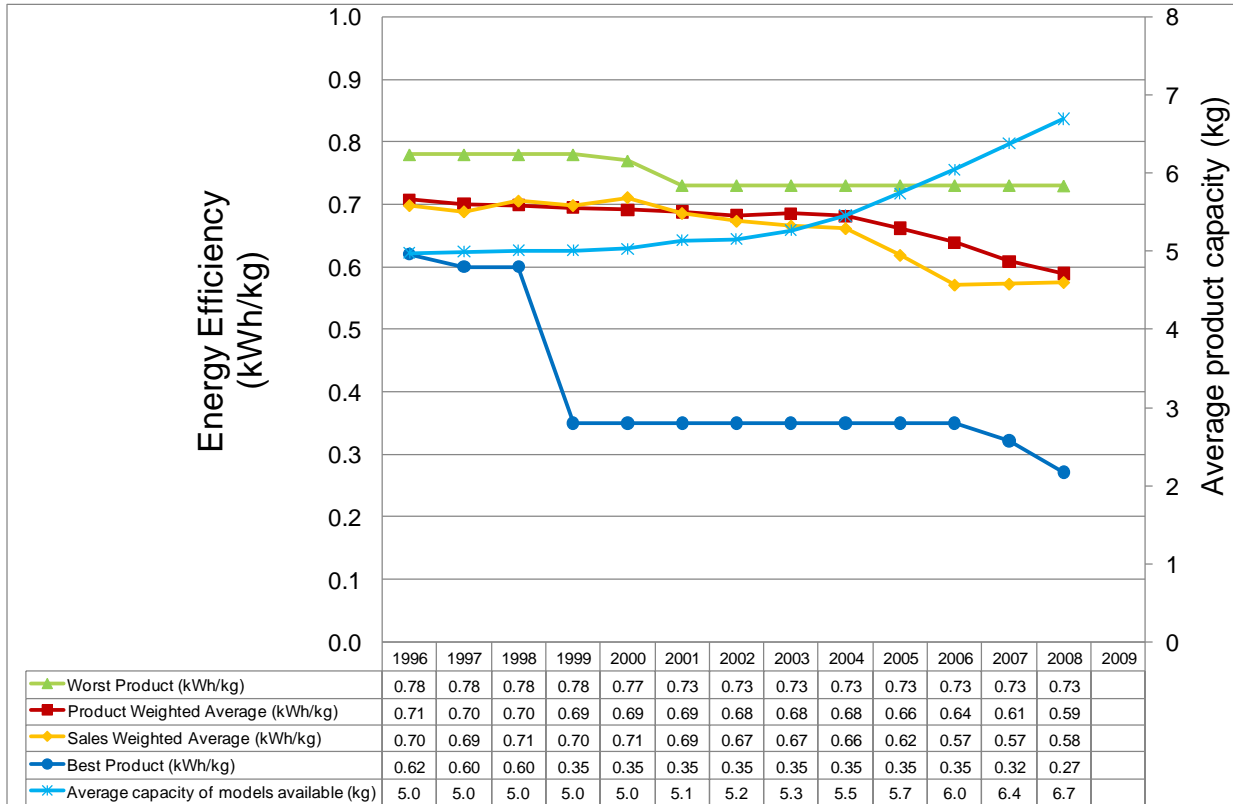
The detailed product definitions can be found at the Annex website:

<http://mappingandbenchmarking.iea-4e.org/matrix>



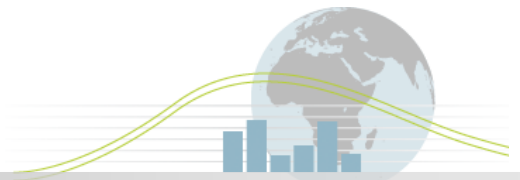


Energy Efficiency of New Laundry Dryers Denmark

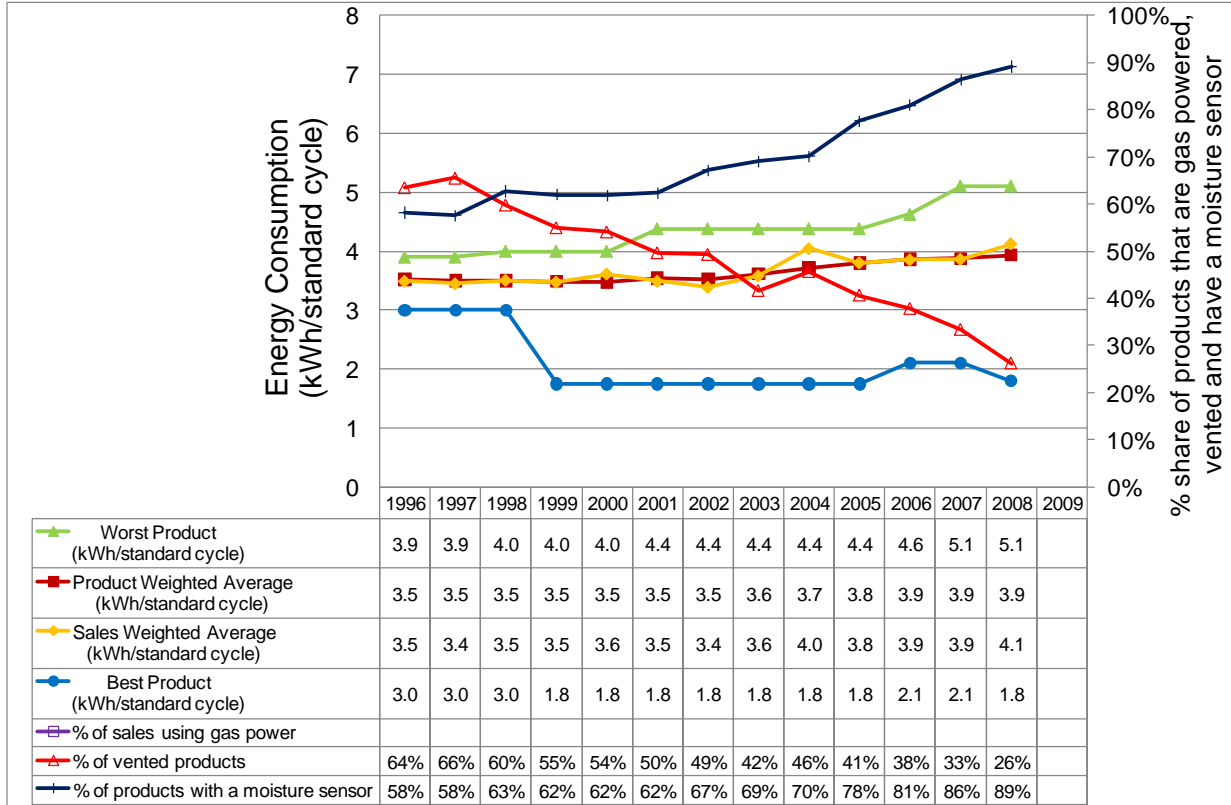


Key notes on Graph (see notes section 1)

- Sales weighted data is derived from the total number of appliances along with a distribution on energy labels of these, obtained through a questionnaire every second year. Although this data is considered to be accurate, it should be considered as model data.
- 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 best energy efficiency.

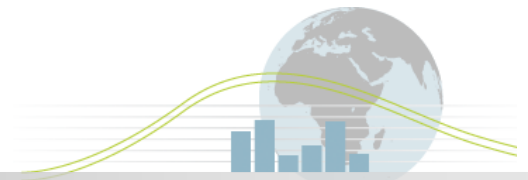


Energy Consumption of New Laundry Dryers Denmark



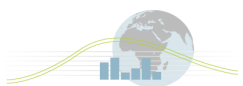
Key notes on Graph (see notes section 2)

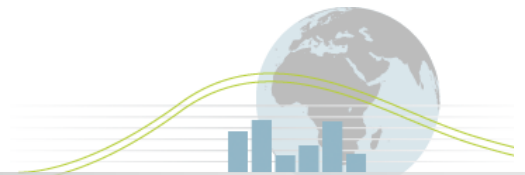
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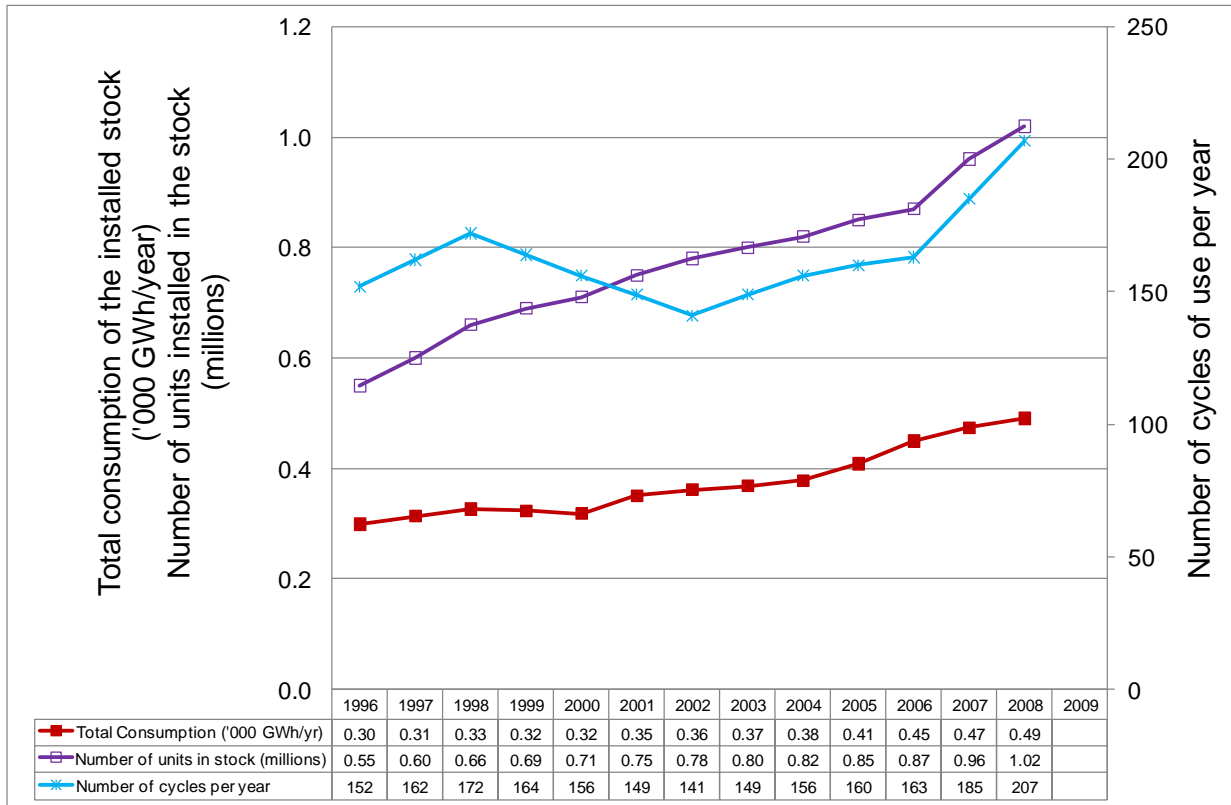
Energy Efficiency in the Installed Laundry Dryers Stock Denmark

No data on the efficiency of units installed in the stock was made available to the Annex at the time of publication.



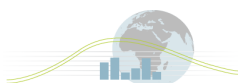


Energy Consumption in the Installed Laundry Dryers Stock Denmark



Key notes on Graph (see notes section 4)

- All results are based on ELMODEL-bolig data (Danish Government energy model).



Major Policy Interventions (See notes Section 5)

There is one directly relevant regional policy:

1. EU energy labels for electrically heated laundry dryers were established in 1996¹, allocating a label A to G based on drying a cotton load sized to the maximum capacity of the appliance. The label class thresholds are different for vented and condensing dryers, with condensing dryers allowed to consume slightly more energy within each label class (see section 5 Notes on Policy Interventions for further information). Changes were made to the test methodology for tumble dryers that underpins the EU label scheme in 2005, reducing the starting moisture content and adjusting the ambient temperature and humidity. In order to ensure that products did not shift classes as a result of these changes, the calculation of the efficiency index C was adjusted to compensate. There are no EU energy label requirements for gas tumble dryers.

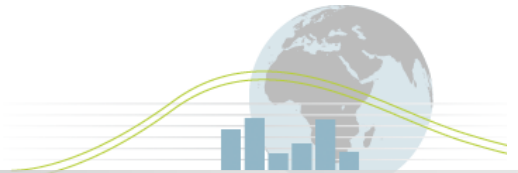
There have been no EU regulatory minimum standards nor an EU ecolabel category for laundry dryers in Europe up to time of publication in December 2010.

However, a new EU ecodesign regulation and a revised EU energy label for laundry dryers are expected during early 2011, following a three year ecodesign study² and policy consultation process. It is not yet decided whether or not the new ecodesign regulation will include MEPS. The new energy label will include additional energy classes A+, A++ and A+++ above the existing classes.

During the 90's the Danish energy saving trust launched a campaign to promote A-labeled laundry dryers and laundry dryers with heat pumps. The campaign consisted of two main elements: first the construction of a webpage (www.hvidevarepriser.dk) listing the best available white goods including laundry dryers and prices. And secondly, in the first 9 weeks of the campaign a grant of 135 EUR was given if the suppliers would introduce laundry dryers with heat pumps to the market and ensure a low price both during and after the campaign has ended.

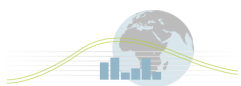
¹ Under Commission Directive 95/13/EC of 23 May 1996.

² See <http://www.ecodryers.org/>.



Cultural Issues (See Notes Section 6)

During a span of 6 years the household penetration of domestic laundry dryers has increased by 15 percent, from 43% in 2004 to 58 % in 2008. The most rapid growth has happened between 2006 and 2008. Over 99 percent of products sold are electric dryers with less than 1 percent gas tumble dryers.



Notes on data

Section 1: Notes on Product Efficiency

1.1 Test methodologies, Performance Standards and Labelling Requirements

Laundry dryers in Europe are tested to EN61121 as amended in 2005. This test methodology is also the basis of EU energy labelling for laundry dryers. The key elements of the test methodology including those that impact on energy consumption are summarised in the table below:

Test methodology	IEC61121:2005
Capacity metric	kg dry weight of load
Ambient temperature for test	23°C±2°C
Ambient relative humidity for test	55%
Test cloths	All 100% Cotton
Load during test	Rated capacity
Initial moisture content	60% remaining moisture content
Final moisture content	0% remaining moisture content
Metric for efficiency arising from local test	kWh/cycle and kWh/kg

Significant changes were made to test methodology in 2005 that affect the energy consumption and efficiency data derived from it:

- The initial moisture content was changed to 60% (previously 70%)
- The ambient test temperature was changed to 23°C (previously 20°C)
- The ambient humidity was changed to 55% (previously 65%)

The calculation of the applicable EU energy label was modified, however, at the same time to compensate for the energy advantage gained by vented dryers due to the increased temperature and reduced humidity of the air they draw in from the test room. This compensation also means that labels earned after 2005 should be directly comparable to those earned afterwards. In this analysis therefore, data based on EU energy label or energy efficiency index should be continuously comparable. In contrast, kWh/cycle data as declared on the energy label, and kWh/kg efficiency data derived from the test methodology will not be comparable before and after 2005 without normalisation.

The EU energy label requires an A to G classification, declaration of kWh per cycle and classification as vented or condensing. A declaration of noise performance is optional.

1.2 Product Efficiency Graphic

1.2.1 Data Source:

Efficiency data: ELDA(Danish suppliers organization).

- Consumption data: FEHA (Danish suppliers organization) combined with energy consumption of new products in the given energy classes (ELDA).

1.2.2 Data Clarifications

Original Data Limitations

Model specific data is based on a list of products supplied by the year that they were introduced to the market. As most machines will remain on sale for a number of years, the data for any given year is not a representation of the total market for that year. With a general trend for increasing consumption/ improving efficiencies, this is likely to underestimate the product weighted values for average consumption and overestimate them for average efficiency in any given year.

Due to the significantly better efficiency of heat pump dryers, it becomes very obvious to spot years in which a heat pump dryer is not introduced (much reduced energy efficiency, as data only includes products introduced in that year). The data from these years (1996-98, 2001-04 and 2006) have therefore been removed from the plot of 'best product'.

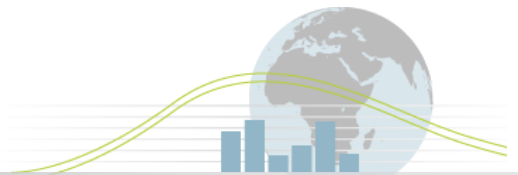
The sales weighted data is based on a modelling approach that has the following characteristics:

- Sales data derived from the total number of appliances along with a distribution on energy labels of these.
- This data is obtained through a questionnaire of 2000 households which is undertaken second year. Stratification is used to weight the answers so that the distribution of household type, person age and other features resemble that of the entire country. Odd years are interpolated.
- The consumption for each rated category is taken as an average of the available appliances from that year with that energy label (taken the data sheets).

1.2.3 Glossary of energy metrics for laundry dryers:

The key metrics for laundry dryers and the key calculations undertaken in the wider Annex analysis are described below. Some metrics and/or calculations are not relevant to all data sets due to absence of data or for other reasons.

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 (for local load mix, refer to Section 1.1 on “Notes on Data”).

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

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

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

Unit Energy Efficiency (UEE): Value calculated by dividing UEC by Declared Unit Load Capacity (kWh/kg/cycle).

Sales Weighted UEE of New Models: Value calculated by [Sum of (UEE 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/cycle.

Product Weighted UEE of New Models: Value calculated by [Sum of UEE for all models sold in year] divided by [Number of Models sold in year]. Unit kWh/kg/cycle.



Section 2: Notes on Product Consumption

2.1 Test methodologies, Performance Standards and Labelling Requirements

No further information available.

2.2 Product Consumption Graphic

No further information available.

Section 3: Notes on Efficiency of Stock

No further information available.

Section 4: Notes on Consumption of Stock

Source: ELMODEL-bolig³ (Danish Government energy model).

Section 5: Notes on Policy Interventions

5.1 Requirements of Commission Directive 95/13/EC with regard to energy labelling of household electric tumble dryers of 23 May 1995.

A new EU energy labelling regulation for electric tumble dryers is expected in early 2011, but this section describes the current requirements. The energy efficiency of each appliance is based on the specific energy consumption (C) in kWh per kg of load measured for a dry cotton cycle according to the conditions and test methodology described in Notes section 1.1.

For air **vented dryers**, the energy efficiency class is determined in accordance with the following table:

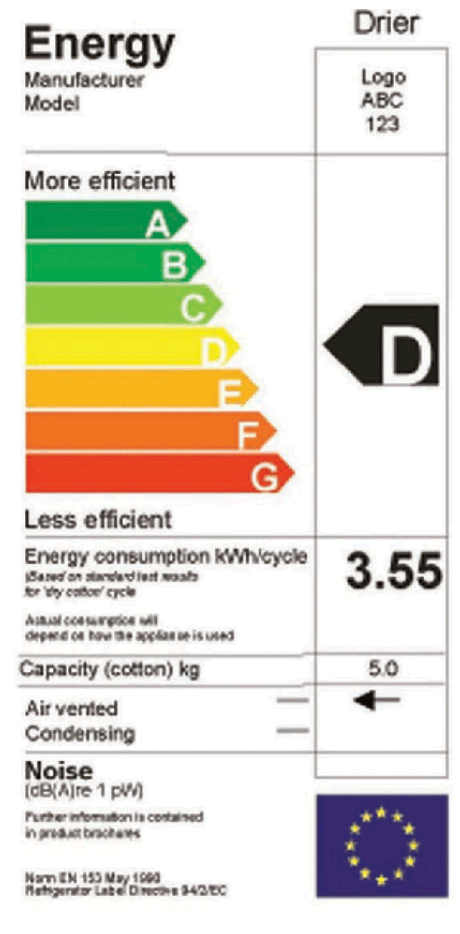
Energy efficiency class	Energy consumption C
A	$C \leq 0.51$
B	$0.51 < C \leq 0.59$
C	$0.59 < C \leq 0.67$
D	$0.67 < C \leq 0.75$
E	$0.75 < C \leq 0.83$
F	$0.83 < C \leq 0.91$
G	$C > 0.91$

³ ELMODEL-housing. Danish Government and energy agency forecasting tool for the Danish housing sector's electricity consumption. Uses data on households' stock of electrical appliances collected biannually since 1974 for approx. 2000 households.

For **condenser dryers**, the energy efficiency class is determined in accordance with the following table:

Energy efficiency class	Energy consumption C
A	$C \leq 0.55$
B	$0.55 < C \leq 0.64$
C	$0.64 < C \leq 0.73$
D	$0.73 < C \leq 0.82$
E	$0.82 < C \leq 0.91$
F	$0.91 < C \leq 1.00$
G	$C > 1.00$

The label itself is shown below⁴



Section 6: Notes on Cultural Issues

None.

⁴ Source from: http://www.clasponline.org/clasp_online_worldwide.php?programinfo=54