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BESS - Benchmarking and Energy management Schemes in SMEs

Description of the

BESS Web based monitoring and benchmarking

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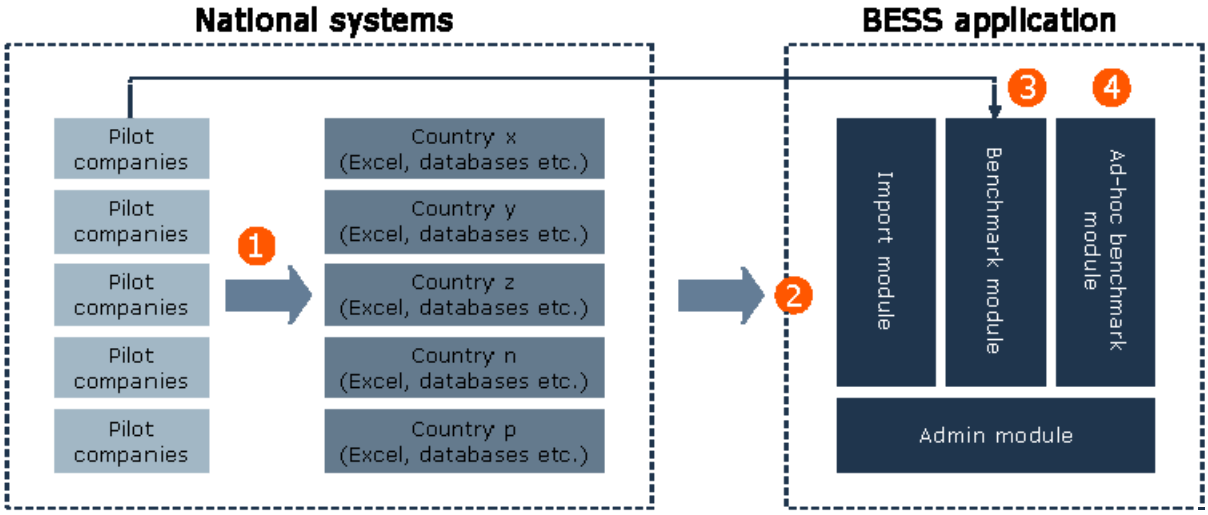
A web-based tool for international benchmarking of key indicators for selected sectors within the European food and drink industry is developed. The tool builds upon the Norwegian benchmarking system. The benchmarking tool has strong links to the e-learning module, and the benchmarking data-input will be one e-learning activity during the pilot phase.

The web-application system is designed to enable yearly benchmarking of energy data in Europe based on national data gathered by national systems. The illustration below describes how pilot companies, national systems (for energy reporting) and the BESS web application will interact.



1. Pilot companies reports energy data in to national systems
2. National systems quality assures registered data and distributes it to BESS
3. Pilot companies access BESS-application and benchmark their own energy use with other companies in the same industry (BESS registered companies)
4. Non-registered users can use an ad-hoc benchmark module

The pilot companies will use the BESS application to benchmark their own energy use with other (European pilot) companies in the same industry and they will access the BESS application with a URL based on a GUID[1] that will be generated and distributed by national administrators. By using the GUID-URL the pilot company will get direct access to correct data. Each (pilot) company will be identified in the BESS application by the GUID and will ensure access to correct data and anonymity. Company name will not be displayed in the BESS application.

Input

The pilot companies will get an Excel sheet from their national administrators, were one A4 page contains all the energy and production figures they have to report. The file also includes definitions of the energy carriers used and the classification of products.

[1] Short for Globally Unique Identifier, a unique 128-bit number that is produced by the Windows OS or by some Windows applications to identify a particular component, application, file, database entry, and/or user. (http://www.webopedia.com/TERM/G/GUID.html)

The pilot company will have to report their energy use once a year. The energy use shall be reported in to a report schema (excel sheet) distributed by the national administrator (by e-mail or downloaded from the e-learning module). When the schema is filled out it must be returned to the national administrator. The energy input data of the scheme is presented in Table 1 and it is common for all industry sectors.

Into the same scheme, the pilot companies also have to report their production the last two years. The list of products that has to be reported is designed for each industry sector. As far as possible, the products are defined by use of international standards like the PRODCOM list, but some modifications has do be done. The production to be reported by the pilots in the dairy, bakery and meat industry is presented in Table 3-8.

The application has options for four different kinds of adjustment; boiler efficiency, climate, production utilization and production mix. The users of the international web benchmarking have the possibility to choose, whether or not to use adjustment factors. A description of the methodology for the different adjustments is available at the web site.

In order to be able to do these adjustments, some additional data has to be reported. These data are optional, the companies do not have to report them, but it would be of great interest if as many as possible could report also such data, since the benchmarking will gain a lot in quality especially when those data represent subbstantial influences. The optional data to report are presented in table 9 and a detailed description of them are to be found in the Adjustment factor.pdf file.

Table 1 Energy input

ENERGY	Unit	2004	Boiler eff. (%)	2005	Boiler eff. (%)	Extra information
Electricity (firm power)						(Line 1 and 2 are total elec.-used)
Electricity used by el.boiler						
Light fuel oil						
Middle distillates						
Heavy fuel oils						
Natural gas						
LPG (Propane, butane)						
Coal						
Bio energy						
District heat etc.						
Other energy						Specify:

Table 2 Definitions of energy sources

Energy source	**Definitions**	**PRODCOM**
Electricity (firm power)	Electricity not used for heat/steam production in electricity boilers	40.11.00.00
Electricity used by el.boiler	Electricity used for heat/steam production in electricity boilers	40.11.60.00
Light fuel oil	Fuel oil with density 0.84 kg/litre	23.20.15.00
Middle distillates	Fuel oil with density 0.88 kg/litre	23.20.16.00
Heavy fuel oils	Fuel oil with density 0.98 kg/litre	23.20.17.00
Natural gas	Natural gas, liquefied or in gaseous state	40.22.10.00
LPG (Propane, butane)	Propane and butane, liquefied	23.20.20.00
Coal	Hard coal + Lignite	10.10.00.00.+ 10.20.00.00
Bio energy	Wood, saw dust, bark, straw etc	20.10.40.00
Heat	Steam and hot water supply services	40.30.10.00
Other energy	Energy not defined elsewhere (should be specified)	
Boiler efficiency	Average annual boiler efficiency (%)	

Table 3 Input of production figures for the dairy industry

PRODUCTION	Unit	2004	2005
Processed milk	litre		
Sweet milk products	litre		
Sour milk products	litre		
Cup products	litre		
Hard cheese	kg		
Brown cheese	kg		
Other cheeses	kg		
Casein	kg		
Dried products	kg		
Butter /butter oil	kg		
Preserves	kg		
Supplemental milk delivered	litre		
Juice	litre		

Table 4 Definition of dairy products

PRODCOM	PRODUCTION	Unit	Definition
01.21.2 + 01.22.2	Processed milk	litre	Raw milk from bovine cattle, sheep and goats
15.51.10.00	Sweet milk products	litre	Processed liquid milk and cream, not concentrated
15.51.52.AA	Sour milk products	litre	Yoghurt and other fermented or acidified milk or cream (if in cups, reported as "cup products" instead of as "sour milk")
15.51.52.BB	Cup products	litre	Products delivered in cups (should not be included elsewhere!)
15.51.40.50	Hard cheese	kg	Hard cheese, matured
15.51.40.30	Brown cheese	kg	Brown whey cheese
15.51.40.00	Other cheeses	kg	Other cheese than matured hard cheese and brown cheese
15.51.53.00	Casein	kg	Casein
15.51.20.00	Dried products	kg	Dried milk, whey etc, delivered as powder
15.51.30.00	Butter /butter oil	kg	Butter and dairy spreads
15.51.51.00	Preserves	kg	Milk and cream, concentrated, other than in solid forms
15.51.00.SS	Supplemental milk delivered	litre	Milk delivered to other dairies without other processing than chilling
15.32.00.00	Juice	litre	Fruit and vegetable juices

Table 5 Input of production figures for the bakery industry

PRODUCTION	Unit	2004	2005
Flour	tons		
Bread	tons		

Table 6 Definition of bakery products

PRODCOM	PRODUCTION	Unit	Definition
15.61.20.00 +15.61.30.00	Flour	tons	Grain mill products
15.81.00.00	Bread	tons	Bread, fresh pastry goods and cakes

Table 7 Input of production figures for the meat industry

PRODUCTION	Unit	2004	2005
Slaughtered bovine animals	tons		
Slaughtered swine	tons		
Slaughtered other animals	tons		
Produced cooked/fried meat	tons		
Produced cured meat	tons		
Other preparations of meat	tons		
Frozen volume	tons		

Table 8 Definition of meat products

PRODCOM	PRODUCTION	Unit	Definition
15.11.11.00	Slaughtered bovine animals	tons	Meat of bovine animals
15.11.13.00	Slaughtered swine	tons	Meat of swine
15.11.10.AA	Slaughtered other animals	tons	Meat of other animals
15.13.90.00	Produced cooked/fried meat	tons	Cooking and other preparation services for the production of meat products
15.13.11.00	Produced cured meat	tons	Meat and edible meat offal, salted, in brine, dried or smoked
15.13.10.AA	Other preparations of meat	tons	Preserves and preparations of meat, meat offal or blood
15.11.FR.OZ	Frozen volume	tons	Volume frozen

Table 9 Optional input needed in order to adjust for differences

Other information	Unit	2004	2005
Capacity utilization	%		
Basic energy consumption	%		
Heating degree days			
Heating dependent share			

The heating degree-days of a year are obtained by subtracting the average temperature of a day by the "base temperature" and accumulate this for all the days during the year. In this project we use 18°C as the "base temperature". Cooling degree-days can be calculated in a similar way, but there is no officially designed base temperature and CDD are not implemented within the BESS-application.

Specific energy consumption often increases when the production capacity isn't fully used because of basic energy use are being spread over less units of production than at full production rate. The objective to adjust for reduced production capacity utilization is to separate the effect of a production rate change from other variables and energy efficiency changes. Adjustment should only be used for external factors (beyond the influence of the company itself).

When adjusting for capacity utilization, the basic energy consumption is reduced in the case of lower production utilization to match the share of basic energy consumption at full capacity utilization. If e.g. the basic energy consumption at full capacity utilization is 30%, it might increase to 35% at the level of 80% production utilization. The basic energy consumption then represents a too large part of the total energy consumption that ought to be reduced to the same level as in the case of full production capacity utilization.

Production capacity utilization may be defined as the production capacity the plant is designed for, at normal working hours. A practical way of calculating the production capacity utilization may be the actual raw material input divided by the designed input. For dairies this would then be treated raw milk, for bakeries consumption of flour and for the meat processing industry the received tons of meat.

A way of calculating the non-production dependent share is to plot the energy consumption against productions using data that have been collected at regular intervals (daily, weekly, monthly…). Most processes will exhibit a pattern through which a straight line (best fit line) can be drawn. This line indicates the relationship between energy consumption and its driver (in this case, production). The intercept with the y-axis shows the non-production dependent energy use in absolute figures.

Output

When the pilot companies have reported energy and production data to their national administrators, and all the data have been imported to the international benchmarking solution, the pilot companies will be able to compare themselves with other European companies in the BESS benchmarking web site.

There are a number of different diagrams showing the pilot company marked as green compared to the rest in the group marked in gray. The following diagrams are presented at the web site:

- Specific energy consumption for all companies in the selected industry sector (one diagram for each year) – see figure 1.
- Development in specific energy consumption (% change since last year, one diagram for each year) – see figure 2.
- Average for the industry sector and the company during all reported years. See figure 3.
- Quantitative benchmarking based on the energy management benchmarking checklist in the e-learning part. See figure 4.

All diagrams may be shown with different filters, where the company can select which countries to compare with, the energy unit to be displayed, and which adjustment factors to use. By ticking each box, different diagrams will be presented. The following options exist:

- Countries
- Energy units
- Use net energy (with reported boiler efficiencies)
- Adjust for differences in product mix
- Adjust for differences production utilization
- Adjust for differences in climate

The benchmarking results can be influenced by specific production procedures, the type of companies and other circumstances differing from country to country. Companies taking part in the benchmarking are in the optimum position to interpret their results best and to identify key opportunities to improve their own energy efficiency.

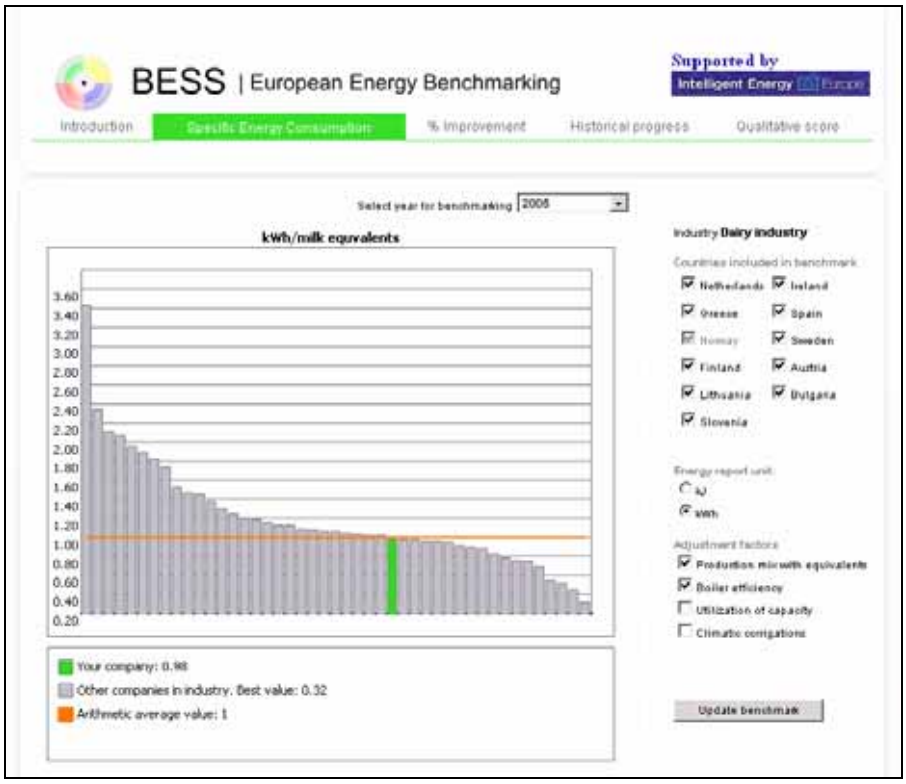


Figure 1: Specific energy consumption for all companies in the selected industry sector (one diagram for each year).

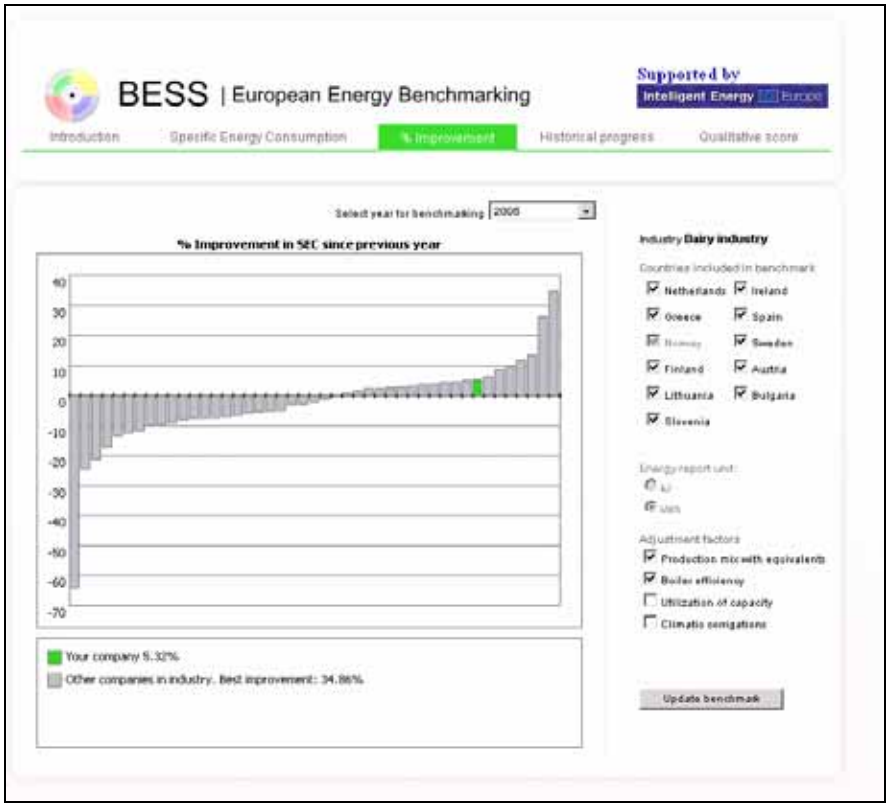


Figure 2: Development in specific energy consumption (% change since last year, one diagram for each year).

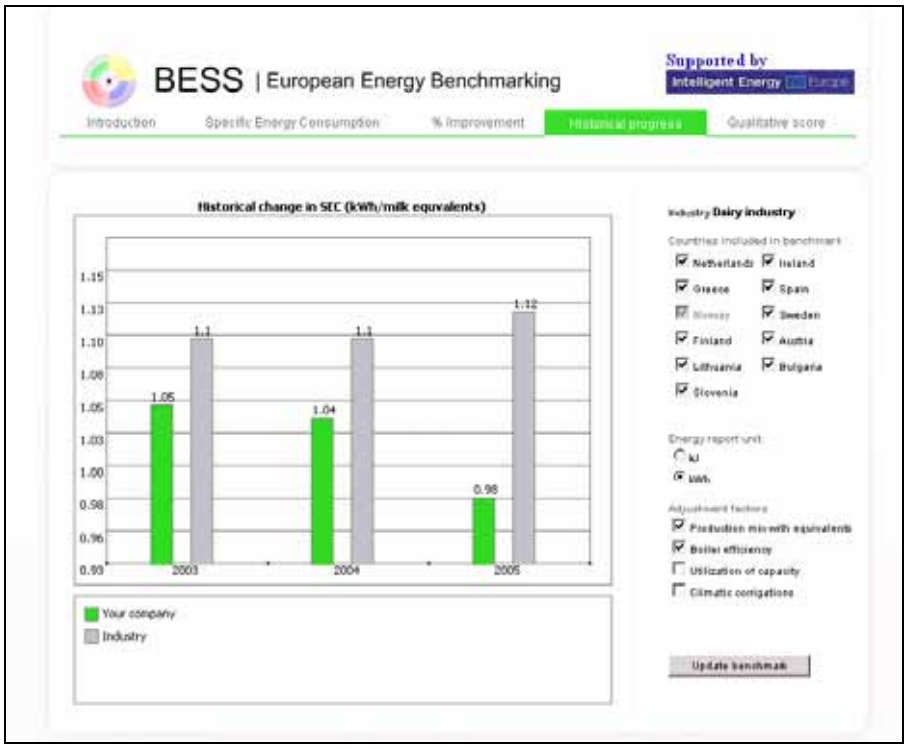


Figure 3: Average for the industry sector and the company during all reported years.

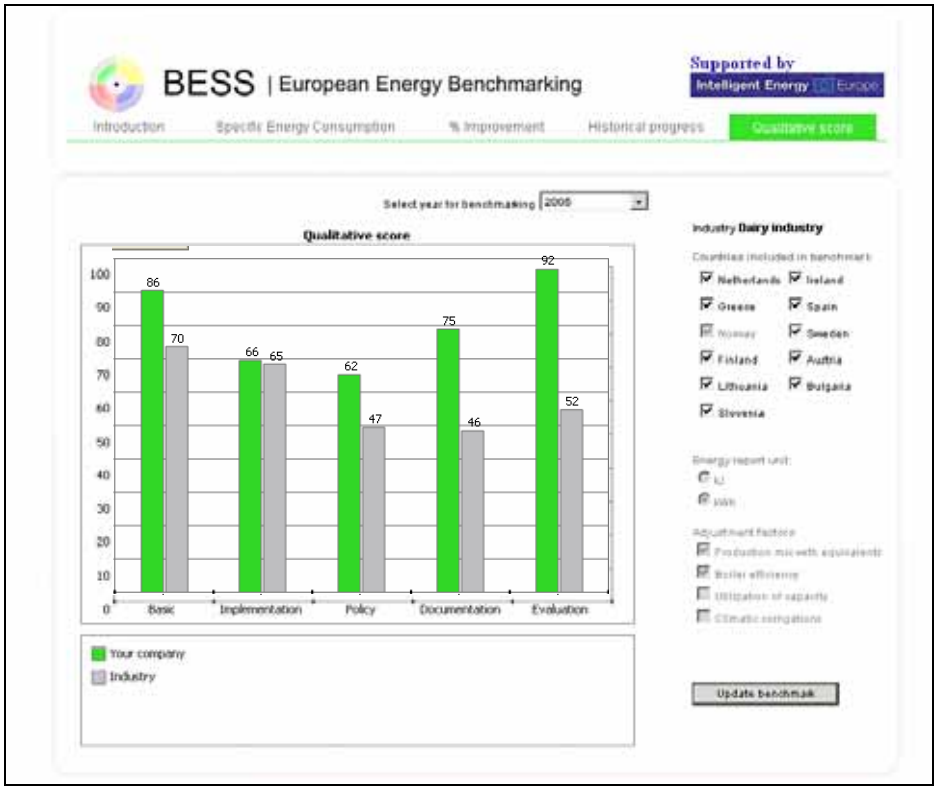


Figure 4: Quantitative benchmarking based on the BESS energy management checklist in the e-learning part.