Working document highlight options for a possible Commission Regulation implementing Ecodesign Directive 2009/125/EC with regard to commercial refrigerating display appliances

Background

Directive 2009/125/EC establishes a framework for the setting of Community eco-design requirements for energy-related products with the aim of minimizing their environmental impact and ensuring their free movement within the internal market.

The Directive provides for the setting of requirements which the energy-related products covered by implementing measures must fulfil in order to be placed on the market and/or put into service.

A preparatory study (Lot 12) has shown that commercial refrigerating display appliances have a significant potential for being improved in order to reduce environmental impacts and to achieve energy savings through better design which also leads to economic savings for businesses and end-users. The significant environmental parameters identified are:

- energy consumption in use;
- refrigerants used (leakage of refrigerants as a contributor to greenhouse gas emissions).

Based on the information in that study the aim of this paper is to look at the various options that exist with regards the development of legislation for commercial refrigerating display appliances.

Justification for action at the Community level

There is currently no EU legislation specifically dealing with the energy consumption of commercial refrigeration appliances.

Commercial refrigerating display appliances is a broad category of appliances which, by the nature of their use – often continuously – offer significant potential for energy savings if appropriate eco-design requirements are available.

Many types of commercial refrigerating display appliances are typically used non-stop 24 hours a day, 7 days a week. Thus, even relatively small percentage gains in energy efficiency can offer significant savings over the working life of the appliances.

Energy costs are calculated to be around 3 to 4% of the total sales price of a refrigerated food or drink item. Thus, a reduction in energy consumption could have a small deflationary effect on the retail price of chilled and frozen products.

Some plug-in appliances are not owned by the site owner where the machine is used: for example many smaller retailers are given product-branded beverage coolers or ice-cream freezers in which to sell specific products. This means that, in these cases, the manufacturer has little or no direct influence on the market to provide energy-efficient appliances as the owner is not paying the electricity bill.

Notwithstanding a lack of accurate statistics, and taking into account the size of the market for commercial refrigeration appliances (which comfortably exceeds the indicative threshold of 200,000 units), the aggregated environmental impact of these appliances as well as their

estimated cost-effective improvement potential justify the adoption of implementing measures. In 2005, some 2.9 million units of refrigerating appliances in four PRODCOM categories were produced in EU-25, corresponding to a total production value of €3 330 million. The total stock of commercial display refrigerators in EU-25 within the scope of this regulation is estimated at some 13.1 million units, comprising of 2.2 million remote refrigerated display cabinets, 1.9 million plug-in refrigerated cabinets for supermarkets, 6.3 million beverage coolers and 2.7 million plug-in freezers for sales of frozen products such as ice-creams. According to the preparatory study, EU-25 demand for remote commercial refrigerating display appliances is forecasted to have an annual growth of 2-3%, and the demand for plug-in appliances of 1-2% yearly, while world-wide annual demand is expected to grow at higher than above 5%.

The average life of commercial refrigeration appliances varies according to the design and use but is in the range of 9-10 years for cabinets, and 8 years for ice-cream freezers and beverage coolers.

In the total product lifecycle it is clear that energy consumption is overwhelmingly greatest during the use phase of refrigeration appliances – accounting for up to 98% of the product's total energy use.

Scope

For the purposes of this paper a refrigerating appliance shall be any mechanical appliance for the storage and preservation of perishable materials – this may be at temperatures greater than 0°C, such as chiller cabinets for fresh meat or sandwiches, or it may operate at temperatures below 0°C for frozen foods.

The term "commercial refrigerating display appliance" means any refrigeration appliance that is designed for use by commercial, institutional or industrial facilities for the purpose of storing and merchandising perishable materials at specified temperatures. It shall exclude household refrigerators and freezers (that are covered by Commission Regulation (EC) no 643/2009), as well as commercial refrigerating appliances used for storage such as wine cellars and walk-in cold rooms (These are covered by a separate preparatory study). Also excluded are chilled drink dispensers, ice-cream making machines and ice-making machines which do not satisfy the twin criteria of being both for commercial use and display the chilled product.

Nonetheless, the scope of the legislation is very broad, covering a diversity of products on the market. Cold vending machines are sufficiently large in numbers and homogeneous in design as to merit being covered by a separate ecodesign Regulation in their own right.

Option*: it is proposed that a 'stand-alone' measure for cold vending machines laying down performance requirements (possibly complemented by a measure on the labelling of such machines) be developed for adoption.*

What would be covered?

Commercial refrigeration display appliances take many forms: self-contained ("plug in") or with remote condensing units, for chilled or for frozen perishable materials, vertical, semi-vertical or horizontal appliances, with or without doors.

Option 1

That there is a single, generic performance requirement set for all designs of commercial refrigeration display appliances.

The advantage of this approach is that the legislative requirements will be design-neutral and technology-neutral. The disadvantage is that, given the diverse designs that are covered then any measures are either likely to be lowest common denominator measures, or if more stringent, may affect certain sectors/designs far more than others.

Option 2

That there are several requirements set, according to the use of the commercial refrigeration display appliance – for example four categories with requirements for:

i. *plug-in units designed to operate below 0°C,*
ii. *plug-in units designed to operate above 0°C,*
iii. *appliances with remote condensation units designed to operate below 0°C, and*
iv. *appliances with remote condensation units designed to operate above 0°C*

It is proposed that option 2 is more suitable as it will allow the development of ecodesign standards that are better targeted.

Performance

The performance of products in the scope of any proposed Regulation can be measured and tested through EN ISO 23953[1].

Option: It is proposed that a mandate will be addressed to European Standardisation Bodies in order to translate EN ISO 23953 into a harmonised standard for the purpose of this Regulation, taking into account the currently on-going revision of this norm.

Design features that can affect the performance of commercial refrigeration display appliances

Using current best practice there are many relatively simple design/operation steps that can be taken to reduce energy consumption of commercial refrigeration display appliances, especially appliances without doors:

- *Night curtains*. The use of curtains to prevent the loss of cold air during stores' off hours is estimated to be able to reduce total energy consumption by up to 26%, offering a payback period of a few months.
- *Air curtains*. An air curtain – formed by blowing air – reduces the warming effect of ambient air on the cooled air within refrigeration appliances. Air curtains offer energy savings of up to 10%. Average payback period is around ½ year.

[1] EN ISO 23953 covers any "cabinet cooled by a refrigerating system which enables chilled and frozen foodstuffs placed therein for display to be maintained within prescribed temperature limits"

- *ECM evaporator fans*. The electronically commutated motor (ECM) is an ultra high efficiency motor, the main benefit of which is its ability to operate at a high level of efficiency at all speeds. On average the use of fans powered by ECMs can reduce energy consumption by 8%. The payback from using such motors is estimated to be 7-8 months.

- *Liquid suction heat exchangers*. The use of more efficient designs of heat exchanger can reduce energy consumption by 2.5% on average, with a payback period of 10-11 months.

- *Fitment and use of doors.* Doors can be used as an alternative to night curtains. They can reduce energy consumption by up to 52% (since they will be used all the time, instead of just at night). The average payback period for glass doors is some 16 months.

- *Insulation*. Thicker insulation or the use of vacuum insulated panels can reduce energy consumption by 3-6%. Payback time for better insulation is in the region of three years.

- *Positioning of anti-sweat heaters*. Improving the location of anti-sweat heaters – which reduce the condensation caused by external warm air entering the refrigeration appliances – can have an energy saving of up to 18% with a payback time of six months.

Not all the options may be desirable or feasible, depending on the intended use of the refrigeration appliances but, in a best case scenario, the cumulative savings in energy consumption from using several options could be in excess of 50% with a payback time of less than 18 months depending on the type and design of appliances.

Option: It is proposed to mandate the fitment of either doors or night curtains or air curtains (depending on the design and customer's intended use of the appliance) in order to improve energy efficiency especially during hours when the retailer is closed but is still using refrigeration; the other features would be optional.

In addition, certain designs of commercial refrigeration display appliances contain lighting to illuminate the products on display. Such lighting falls outside the scope of EU ecodesign requirements for lamps. Thus, one possibility is for ecodesign requirements for commercial refrigeration display appliances to also include requirements for lighting used in such appliances.

Option: there is not a strong argument for specific requirements for lighting as part of an ecodesign Regulation for commercial refrigeration display appliances. Much of the lighting is already by means of fluorescent lamps and so is relatively energy-efficient. There is nothing to prevent equipment manufacturers using the most energy-efficient designs of lighting to reduce the overall consumption of energy for the appliance, but this would not significantly change the overall consumption figures for an appliance – in comparison with the energy needed to perform the refrigeration tasks gains made through efficient lighting alone are unlikely to significantly affect the Energy Efficiency Index of the appliance.

Energy Labelling

Where useful, ecodesign performance requirements are complemented with legislation requiring that the products are labelled showing the consumption of energy and other

resources of products. Thusfar, the scope of the legislation (Directive 92/75/EEC) has been limited to household appliances, not allowing for covering commercial refrigeration display appliances.

However, the scope of the soon-to-be-adopted new framework Directive broadens the scope so as to allow for the indication by labelling and standard product information of the consumption of energy and other resources by all energy-related products. This will permit EU labelling legislation for commercial refrigeration display appliances.

The market for commercial refrigeration display appliances is somewhat different than for household appliances. Firstly, most of the sales will be 'business-to-business' and so it may be appropriate that the way that the product information is presented is not primarily by means of a label at the point-of-sale. Secondly, many actual users of such appliances will not own the equipment – either leasing it, or even being given the equipment in order to sell branded products within it. The need for information by such users may be different than for purchasing customers.

Option 1: *There shall be labelling requirements for commercial refrigerating display appliances that are identical to those previously developed for household appliances.*

Option 2: *There shall be labelling requirements for commercial refrigerating display appliances that require relevant information to be made available to both purchasers and users of commercial refrigerating display appliances in a manner appropriate for such products.*

Option 3: *There is no need for mandatory labelling for commercial refrigerating display appliances.*

There is a case for the provision of information regarding the energy consumption of such appliances but this does not need to take the form of the traditional label for energy consumption affixed to the appliance at the point of sale. Rather, for this class of product it is more important that the relevant information regarding the energy efficiency class of the product is displayed in a prominent manner as part of the advertising/selling materials (e.g. catalogues, websites…) for appliances.

"Green" refrigerants

An issue that needs to be considered for the eco-design of all forms of refrigerating appliances is the type of refrigerant used. The leakage of refrigerants can be an important contributor to greenhouse gas emissions.

There are various types of refrigerant currently used in commercial refrigerating display appliances. The most common refrigerants currently used are HFCs R134A and R404A with a global warming potential (GWP) of around 1500-1700. In contrast, there are some refrigerants with low GWP like hydrocarbons (e.g. propane), ammonia and carbon dioxide. Both hydrocarbons and ammonia can be used a primary refrigerant in indirect systems. If certain safety precautions are taken, hydrocarbons can also be used directly.

Carbon dioxide in particular offers is a low GWP refrigerant. Its chief downside is that has a relatively low optimal temperature, which means that if the ambient temperature rises above 31°C it can no longer function efficiently.

Option 1: *the ecodesign performance requirements oblige either the use of specific, low GWP, refrigerants, orexclude the use of high GWP refrigerants.*

Option 2: *the ecodesign performance requirements encourages the use of specific, low GWP, refrigerants by offering a premium in the energy efficiency requirements for appliances using low GWP refrigerants.*

Option 3: *to be design neutral and exclude any performance requirements for refrigerants.*

It is considered that whilst option 1 is theoretically most desirable the current limitation of how efficiently the 'greenest' refrigerants can perform at ambient temperatures above 30°C using current technology means that it would be premature to impose rules now that would ban the use of high GWP refrigerants. There is little sense in having 'green' refrigerants that cannot satisfactorily perform the required cooling task. However, the opportunity should be taken to send a clear signal to encourage the development and use of 'greener' refrigerants in all ambient conditions. Thus, at this stage option 2 would be favoured, but that option 1 may become viable in the longer term (and so would be a consideration during future revisions of the rulemaking in the light of technical progress).

International context

It should be noted that the US Department of Energy already in January 2009 has adopted a rulemaking for Energy Conservation Standards for Commercial Ice-Cream Freezers; Self-Contained Commercial Refrigerators, Commercial Freezers, and Commercial Refrigerator-Freezers Without Doors; and Remote Condensing Commercial Refrigerators, Commercial Freezers, and Commercial Refrigerator-Freezers, and has issued in May 2009 a Notice of Proposed Rule Making for Energy Conservation Standards for Refrigerated Bottled or Canned Beverage Vending Machines.

Raising of standards

Option: *Should the baseline performance requirements contained in an ecodesign regulation for commercial refrigerating display appliances be raised over a period of time?*

Irrespective of whether a single set of performance requirements is set for commercial refrigerating display appliances, or several are set for the different design/uses of the appliances, the view is that a gradual rise in requirements over time is desirable, in particular in order to provide the industry to adapt design and production. An incremental raising of legislative performance thresholds can work in synergy with a labelling scheme and encourage industry to invest in development.

Legislative proposals

It seems appropriate to bring forward legislative proposals for a Commission regulation laying down ecodesign requirements together with a delegated regulation with regard to energy labelling of commercial refrigerating display appliances. These would be swiftly complemented by similar measures for cold vending machines.

Potential benefits

Current energy consumption of commercial refrigerating display appliances under the scope of this regulation is estimated to be 57 TWh/yr, rising to 69 TWh/yr by 2015 and 73 TWh/yr by 2020 in the business-as-usual (BAU) scenario. According to data from the preparatory study, with greater energy efficiency measures these figures could decline in a best case scenario to 55 TWh/yr by 2015 and 47 TWh/yr by 2020 – a saving of up to 26 TWh/yr by 2020.