

European Commission DG ENTR

Preparatory Study for Eco-design
Requirements of EuPs
[Contract N° S12.515749]

Lot 1

Refrigerating and freezing equipment:

Service cabinets, blast cabinets, walk-in cold rooms, industrial process chillers, water dispensers, ice-makers, dessert and beverage machines, minibars, wine storage appliances and packaged condensing units

Task 2: Economic and market analysis

Final report

May 2011

Project Team

BIO Intelligence Service

Mr. Shailendra Mudgal

Mr. Benoît Tinetti

Mr. Jonathan Bain

Mr. Raul Cervantes

Mr. Alvaro de Prado Trigo

Disclaimer:

The project team does not accept any liability for any direct or indirect damage resulting from the use of this report or its content.

This report contains the results of research by the authors and is not to be perceived as the opinion of the European Commission. The European Commission is not responsible for any use that may be made of the information contained therein.

Contents

2. Task 2: Economic and market analysis	5
2.1. Introduction	5
2.2. Global market data	6
2.3. Market trends.....	8
2.3.1. Demand-side trends	8
2.3.1.1 Food retailers and restaurants	8
2.3.1.2 Centralised catering	8
2.3.1.3 Eating habits.....	9
2.3.1.4 Reliability, food safety and quality.....	9
2.3.1.5 Population growth	9
2.3.1.6 Kitchen size and user safety	9
2.3.2. Technological trends	10
2.3.2.1 Packaged equipment.....	10
2.3.2.2 Natural refrigerants expected to increase replacement market	10
2.3.2.3 Reduction of refrigerant charge	11
2.3.2.4 Reduction of equipment footprint.....	11
2.3.2.5 Reduction of noise levels	12
2.3.2.6 Energy efficiency	12
2.3.2.7 Voluntary measures	12
2.3.2.8 System controls.....	12
2.3.2.9 Compressor types	13
2.3.2.10 Walk-in cold rooms and insulation.....	13
2.4. EU market data	14
2.4.1. EU-27 sales totals, growth rates and replacement sales	14
2.4.1.1 Sales	14
2.4.1.2 Annual growth rates.....	16
2.4.1.3 Replacement sales	17
2.4.2. EU-27 installed base (stock)	17
2.4.3. Product life	18
2.4.4. Product specific data	19
2.4.4.1 Service cabinets.....	19
2.4.4.2 Blast cabinets	21
2.4.4.3 Walk-in cold rooms	23
2.4.4.4 Process chillers	25

2.4.4.5	Remote condensing units.....	26
2.5.	EU market distribution structures and competition.....	30
2.5.1.	Maturity of the market	30
2.5.2.	Manufacturers of refrigerating equipment and refrigerants	31
2.5.3.	Market segmentation according to environmental and energy performance.....	32
2.5.4.	Refrigeration contractors (installers).....	33
2.5.5.	Distribution channels	34
2.5.6.	Redesign cycles	35
2.6.	User expenditure base data.....	37
2.6.1.	Average consumer prices (ex. VAT) and manufacturer margins	37
2.6.1.1	Service cabinets.....	37
2.6.1.2	Blast cabinets	38
2.6.1.3	Walk-in cold rooms	38
2.6.1.4	Process chillers	38
2.6.1.5	Remote condensing units.....	38
2.6.2.	Production cost structure and sector specific margin	39
2.6.3.	Installation costs	40
2.6.4.	Rates for running costs and disposal	41
2.6.4.1	Running costs	41
2.6.4.2	Disposal cost.....	42
2.6.4.3	Interest and inflation rates.....	43
2.7.	Conclusions	45
ANNEXES.....		46
2.7.1.1	EU Production	49
2.7.1.2	EU Trade	50
2.7.1.3	Apparent EU consumption	53
2.7.2.	Methodological issues related to the use of PRODCOM data	54
2.7.2.1	Prices of water dispensers	66
2.7.2.2	Prices of dessert and beverage machines	66
2.7.2.3	Prices of ice makers.....	66
2.7.2.4	Dessert and beverage machines	66
2.7.2.5	Water dispensers	67
2.7.2.6	Ice-makers	67
2.7.2.7	Market data for non-priority products.....	67

2. Task 2: Economic and market analysis

2.1. INTRODUCTION

The objective of Task 2 is to assess the market, such as product stock and sales, market structure (e.g. supply chain, main players, manufacturing costs) and evolution (e.g. growth areas, trends in product design). Where possible, data for the EU-27 is described from the year 1990 until 2025.

When assessing the stock and sales data, the Eurostat statistics, which rely on broad PRODCOM categories covering several products, do not provide a clear picture of the market (please see annex 2-1). Thus, alternative sources, including the literature and stakeholders, have been referenced.

Possible eco-design measures should be consistent with the market structures and ongoing trends in product design. Market trends will also be an input for the subsequent tasks, such as improvement potential. Finally, practical data on consumer prices and rates is provided to be used later in the study in Life Cycle Cost (LCC) calculations.

2.2. GLOBAL MARKET DATA

The commercial refrigeration market is very fragmented and produces equipment and components with a multitude of applications. Where possible, the market data is segmented by product group. Refined market segmentation, according to sub-categories of the product groups defined in Task 1, is also made.

The annual worldwide sales of commercial refrigeration equipment are estimated to be around US\$ 33,000 million (approx. € 24,300 million¹) for the year 2009².

For that same year, the projections estimate that the EU market will amount to US\$ 8,230 million (approx. € 6,051 millions), i.e. over a quarter of the global demand (see Figure 2-1). However, it is not clear whether other products covered by ENTR Lot 1, such as water dispensers, are included in the category “parts and others”, or not taken into consideration.

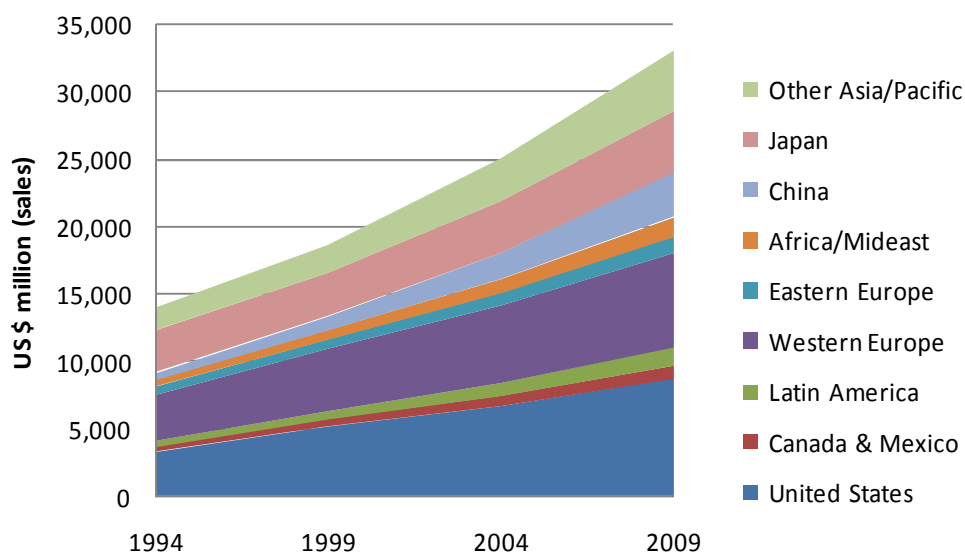


Figure 2-1: Worldwide sales of commercial refrigeration equipment²

Western EU³, along with the developed nations of North America and the Asia/Pacific region (i.e., Australia, Hong Kong, Japan, New Zealand, Singapore, South Korea), comprise mature markets for commercial refrigeration equipment. The US will remain the largest market in the world, as replacement demand continues to create sales opportunities

The products covered under ENTR Lot 1 considered in these projections are estimated to represent 35% of the demand, amounting to approximately US\$ 2,859 million (approximately € 2,102 million) (see Figure 2-2).

¹ €1 = US\$1.36

² Michael Deneen, 2001. World Commercial Refrigeration Equipment Industry Study, #1367

³ Freedonia. World Commercial Refrigeration Equipment to 2012. 2008

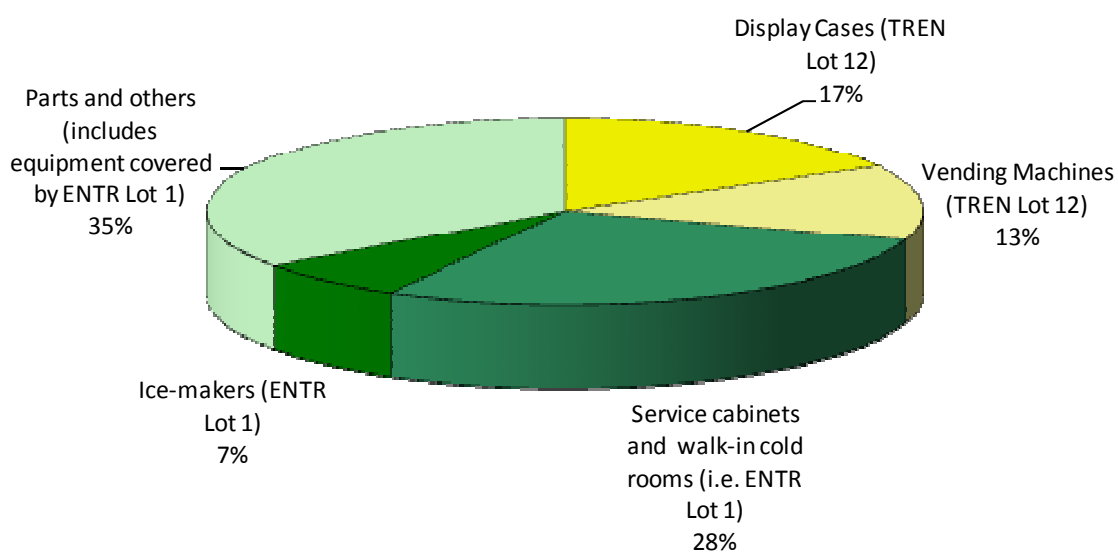


Figure 2-2: Worldwide sales of commercial refrigeration equipment by type²

2.3. MARKET TRENDS

2.3.1. DEMAND-SIDE TRENDS

2.3.1.1 Food retailers and restaurants

Worldwide, the continued growth of the number of food retailers and restaurants will contribute to the growth of the commercial refrigeration market. The ongoing expansion of fast food chains will specifically benefit this sector, since these facilities utilise a wide range of commercial refrigeration equipment³. At EU-27 level, growth of food retailers and restaurants is slow, which is in line with the low CAGR calculated in § 2.4.1.2. However, as in the UK, the cold storage capacity growth for the retail market in absolute terms is still estimated to be strong⁴ (see Figure 2-3).

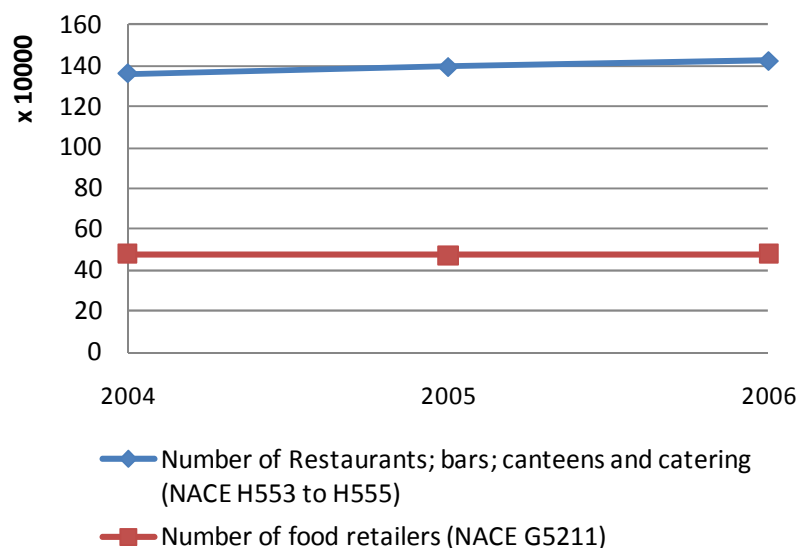


Figure 2-3: EU-27 number of food retailers, restaurants, bars, canteens and catering facilities⁵

This trend will in particular affect demand for service cabinets, blast cabinets, walk-in cold rooms and remote condensing units.

2.3.1.2 Centralised catering

The use of large central catering establishments (sometimes referred to as central processing units) to cater for smaller satellite locations has been reported in the literature⁶ and by stakeholders. This trend is likely to increase the consumption of refrigeration equipment for storage (equipment at smaller locations, retained and new equipment purchased for central processing sites), particularly blast cabinets

⁴ Defra. Policy Brief: Improving the energy performance of commercial refrigeration products. 2008

⁵ EUROSTAT

⁶ BSRIA, French Market for Refrigeration, 2009

(to rapidly cool the large volumes of food produced to maintain quality and safety before storage), service cabinets and walk-in cold rooms.

2.3.1.3 Eating habits

In Europe, the commercial refrigeration market trends are also driven by the increase in frozen food consumption⁷ (more capacity is therefore required for larger quantities of products in the frozen segment, with approximately 12% of new frozen food products every 2 years). However, such factors may be stronger in commercial equipment used in the retail sector (e.g. refrigerated display cabinets).

Stakeholders have also described the increased use of “fresh” food in catering. This requires the use of blast cabinets to pull down temperatures to maintain high levels of quality and hygiene of pre-cooked food (e.g. required when preparing large volumes of food in advance), and use of service cabinets and walk-in cold rooms for fresh food storage.

2.3.1.4 Reliability, food safety and quality

Reliability is of high importance to many end-users (e.g. supermarkets to avoid break-down and loss of stock). Hence there is an inherent conservatism in the refrigeration market, through which it may be a struggle for new technologies to become established.

Maintaining high levels of product quality is also an important driver in the market, both to achieve food safety standards and provide customer satisfaction. National legislation regarding food safety standards (see Task 1), such as the 1997 law in France (encouraging the use of blast cabinets in every professional kitchen) should also be considered. If similar legislation is drawn up in other countries within the EU, this could have an impact on sales, increasing the number of sold units in a short period of time.

2.3.1.5 Population growth

Population growth in EU-27, with a CAGR for the period 2002-2009 of +0.45%⁵, could be an additional trend leading to a slight increase in commercial refrigeration equipment. However, population growth is not foreseen to be a strong driving factor.

2.3.1.6 Kitchen size and user safety

It has been stated that there is a trend that kitchens are getting smaller, leading to higher demand for horizontal refrigeration. Refrigerators with either cupboards or drawers for local storage of both refrigerated and frozen products are used so that foodstuffs are close to hand in the kitchen. Due to faster access and a reduction of the risks associated with professional users bending down in front of horizontal doors in busy kitchens, sales of products with drawers may increase in the coming years⁸.

⁷ Defra. *Policy Brief: Improving the energy performance of commercial refrigeration products*. 2008 and BIO Intelligence Service. Lot 12 Preparatory Study, Final Report for DG TREN. December 2007

⁸ Source: Adande Refrigeration

2.3.2. TECHNOLOGICAL TRENDS

The technical aspects of these trends will be discussed in more detail in Task 4.

2.3.2.1 Packaged equipment

Increasing demand for packaged refrigeration products, integrating the refrigerant charge and more sophisticated controls, will require less skill to install and maintain, and could also reduce use costs through greater energy efficiency. Stakeholders mentioned this trend, due to the decline of refrigeration engineering skills in the market and ease of use, and consider that this could affect the condensing unit, process chiller and remote product market segments.

A secondary benefit of packaged products is their reduced refrigerant charge compared to central refrigeration systems. One issue regarding alternative, low-GWP refrigerants is that they can have increased flammability and toxicity. Containing these refrigerants in equipment with higher standards of build quality (achieved in automated manufacturing environments) can be a means of reducing risk, and smaller refrigerant charges can be dispersed in place of a single large charge.

Lastly, the importance of reliability for end-users (e.g. supermarkets to avoid break-down and loss of stock) may impact on this trend – several dispersed packaged systems may be more desirable than a single central plant.

2.3.2.2 Natural refrigerants expected to increase replacement market

The choice of the refrigerant is a major issue in the refrigeration industry. Refrigeration manufacturers are affected by the legal and regulatory actions in different countries as well as by international policy initiatives, as described in Task 1.

Since January 2010, the use of virgin HCFCs in the maintenance and servicing of all equipment has meant a transition from HCFCs (mostly HCFC-22) to HFCs: R-404A and R-507A for low and medium temperature (LT and MT) levels, whereas R-134a is chosen for medium temperature low-capacity systems.

A number of low-GWP HCs (hydrocarbons), such as R290 (propane) and R600a (isobutane), as well as ammonia and CO₂ systems of different refrigeration capacities, have also been installed in various countries in the last 10 years⁹, although R600a is mostly used in small domestic applications¹⁰. This refrigerant transition has caused the industry to adapt to the new properties of these replacement refrigerants and to work on system redesign to develop products that can operate with R-404A, R-507A, and R-134a but also with HCs and CO₂.

⁹ UNEP. *Report by the Refrigeration, Air Conditioning and Heat Pumps Option Committee*. 2002. This report also states that the choices for replacement refrigerants are different in Europe, Japan and the US. In Japan, voluntary policy is undertaken and more than one third of the new equipment uses HFCs. R-404A is preferred for low temperature and R-407C is used for medium temperatures. In the US, HCFC-22 is still in use, even in new equipment but more and more systems use R-404A.

¹⁰ Paulo Vodianitskaia, Ed McNerney (CLA) TOC Refrigeration, AC and Heat Pumps UNEP Dialogue Decision XX/8 Geneva 14 July 2009

In the current market, refrigeration equipment based on synthetic refrigerants (HFCs) is usually cheaper than technology based on alternative refrigerants, due to mass production of these extended technologies. However, this is not always the case, and depending upon the type of the system and design approach taken, the costs can be similar or even lower. In applications where safety and reliability aspects are strictly controlled by standards, HCs are competitive and used due to their relatively safe and non-toxic characteristics. For example, just over 35% of current production of domestic refrigerators and freezers are equipped with HC refrigerants, primarily R600a¹¹. This percentage is close to 100% in the EU¹². Some stakeholders have increased sales of units using HCs in certain product categories, such as service cabinets, to as high as 29%¹³, and the trend toward use of alternative refrigerants may increase with further legislation, design/safety improvements and consumer acceptance.

Large-scale roll-out of refrigeration systems based on more environmentally-friendly natural refrigerants such as ammonia and CO₂ has not yet occurred. However, the trend toward natural refrigerants is expected to drive the demand for compressors which are compatible with their utilisation. Already, leading compressor manufacturers have responded to the demand from the retail sector for more environmentally-friendly technologies with the addition of CO₂-based compressors in their portfolio. Switching to new refrigerants not only depends on the availability of compatible compressors and other components but also on the global availability of refrigerants, and on the technical familiarity of technicians and engineers (i.e. refrigeration contractors).

There are however some trade-offs to consider for the use of these refrigerants, such as performance in varying ambient conditions, toxicity and flammability. Some of these issues can be mitigated by the reduction of refrigerant charges.

2.3.2.3 Reduction of refrigerant charge

New technologies such as mini-channel heat exchangers¹⁴ are mainly aimed at reducing the refrigerant charge, and can be an important advantage for the use of HCs, ammonia and other refrigerants with safety issues. These technologies increase the heat exchanger surface by minimising the heat exchanger size, thus allowing a higher efficiency, a lower refrigerant charge and smaller footprint.

2.3.2.4 Reduction of equipment footprint

Another trend is toward units with a smaller "footprint" (the physical space taken by the machinery at the location of use). New technology, such as mini-channel heat exchangers can be used to decrease products' physical footprints (without

¹¹ McInerney, E. et al. (2009) *Task force decision XX/8 report: Assessment of alternatives to HCFCs and HFCs and update of the TEAP 2005 supplement report data*, UNEP Technology and Economic Assessment Panel

¹² UNEP. TEAP 2010 progress report Volume 1. "Assessment of HCFCs and environmentally sound alternatives. Scoping study on alternatives to HCFC refrigerants under high ambient temperature conditions" May 2010.

¹³ Foster Refrigeration, *Corporate Social Responsibility Report 09/10*

¹⁴ Kandlikar, S G, A Roadmap for Implementing Minichannels in Refrigeration and Air-Conditioning Systems - Current Status and Future Directions; *Heat Transfer Engineering*, 28(12):973–985, 2007)

affecting storage volume), and 'slim-line' versions of products can be purchased that do not conform to the Gastronorm dimensions (please see Task 1 for details).

2.3.2.5 Reduction of noise levels

Commercial refrigeration appliances are increasingly required by customers to reduce the noise level produced during operation, particularly in those products located indoors in common areas. For remote condensing units installed outdoors or in machinery rooms this problem is not so important and the footprint is the driver in design. Professional refrigeration products (covered by the Machinery Directive) are covered by regulation related to safety in terms of noise emission (acoustic pressure), which requires a different approach to that for domestic products¹⁵.

Compressor motors and fans are the parts in the commercial refrigeration appliances which produce the most noise. Both have been developed with new technologies such as scroll, screw or rotary compressors and variable speed drive motors that contribute to reducing the level of noise emitted by the product.

2.3.2.6 Energy efficiency

Intelligent defrost systems and anti-sweat heaters, as well as variable capacity control systems and improved designs for compressors are being developed, along with various monitoring systems relying on sophisticated software packages (e.g. the introduction of microprocessor-based controls to reduce energy use¹⁶). Demand for new and more efficient products is expected to further increase over the long term¹⁷.

Technological innovation in the area of commercial refrigeration energy efficiency also consists of improvements in materials (e.g. insulating materials).

2.3.2.7 Voluntary measures

As described in Task 1, EU voluntary programmes such as the EUROVENT and ASERCOM certification programmes, the UK ECA scheme, and national MEPS requirements in various third countries can be identified as trends setters toward improved efficiency of these products. They require manufacturers to either meet certain performance standards or provide information on the energy consumption of their products.

2.3.2.8 System controls

The implementation of capacity controls and evaporating and condensing temperature controls in refrigeration equipment is allowing reductions in energy consumption. According to the manufacturers, this trend will increase in the following years.

Variable capacity controls allow the machine to work at part load or full load conditions depending on the needs, thereby increasing efficiency and reducing

¹⁵ Source: Electrolux

¹⁶ Deneen, Michael A., Gross, Andrew C. *The global commercial refrigeration equipment market. (Focus on Industries and Markets)*. 2002

¹⁷ Frost & Sullivan. *The European Refrigeration Compressors Market*. 2007

energy consumption. Variable condensing pressure allows the condenser to work at different condensing temperatures depending on the ambient temperature, thus reducing the workload and energy consumption. These types of controls allow higher efficiencies to be achieved over the year in varying seasonal conditions.

2.3.2.9 Compressor types

A shift is occurring in the commercial refrigeration market towards scroll compressors, especially in machines with medium to high cooling capacities. This trend is expected to strengthen in the following years. However, new developments are being applied to small hermetic reciprocating compressors, which achieve high efficiencies that make these compressors suitable for small commercial refrigeration machines.

2.3.2.10 Walk-in cold rooms and insulation

Regarding walk-in cold rooms and stores, polystyrene/styrene is no longer used due to fire hazard. According to stakeholders, there are ongoing research initiatives by panel manufacturers to develop alternatives. Polyurethane (PUR) foam is standard in industry (approx 80 to 95%), and polyisocyanurate (PIR) foam is also used (5 to 20% - but it is though mainly for larger cold stores), and reportedly rare use of expanded polystyrene (XPS) or phenolic (PF) foam¹⁸. For larger cold store manufacturers, the market is governed by panel manufacturers/foaming machine manufacturers.

In general, market is limited in terms of innovation, due to small players and lack of resource to develop new technologies; it relies on developments in larger markets (e.g. components)¹⁹.

¹⁸ Source: GR Scott, Assofoodtec (IT)

¹⁹ Discussed at EFCCEM meeting on walk-in cold rooms, London, 12/10/2010.

2.4. EU MARKET DATA

2.4.1. EU-27 SALES TOTALS, GROWTH RATES AND REPLACEMENT SALES

Data related to service cabinets, blast cabinets, walk-in cold rooms, industrial process chillers, ice makers, remote condensing units, and refrigeration compressors (other than the one included in plug-in commercial refrigeration equipment), is derived from various sources, including literature, TREN Lot 12 figures and feedback from stakeholders.

2.4.1.1 Sales

As no robust public market data covering EU-27 were available, the EU-27 refrigeration equipment market was estimated on UK and French statistics published by UK MTP²⁰ and BSRIA²². Sales data from the UK and France were used to extrapolate to the EU-27 level, assuming the UK market represents 13.5%, and the French market around 12.6%, of the total EU-27 market (this percentage estimate is based on expert estimates from major EU manufacturers collected during the TREN Lot 12 preparatory study²¹) for service cabinets, walk-in cold rooms and process chillers. Blast cabinets were estimated through stakeholder comments and other sources, described below. BSRIA data²² was also used as the basis for the calculation of remote condensing unit sales and stock. The data is presented in Table 2-1 and it is assumed that the Western EU market represents 85% of the total EU-27 market².

However, the UK and French market may have a different segmentation or distribution per product category compared to the EU market as a whole (which will likely depend on national food consumption habits as well). Such an extrapolation by product category might thus be biased. Updated figures were obtained from the ENTR Lot 1 first stakeholder questionnaire²³ and individual stakeholder feedback.

The figures for blast cabinets take into account the following information:

- BSRIA report on French Market for Refrigeration considers that blast equipment sales and installed base was similar to that of the service cabinets for year 2007. This could be explained by the French law that encourages establishments to pull down the temperature of foodstuffs in a certain period of time (French law of 29/09/1997) after being cooked. As result of this law, France is a very significant consumer of blast equipment. Also, France consumption of blast equipment is expected to be one of the highest in Europe when considering that the country has 15% of hotel and

²⁰ UK Defra statistics available at <http://whatif.mtprog.com/>

²¹ Data collected during the TREN Lot 12 Preparatory Study on refrigerated display cabinets and vending machines, among major EU manufacturers - BIO Intelligence Service. Lot 12 Preparatory Study, Final Report for DG TREN. December 2007

²² BSRIA "French Market for Refrigeration" 2009

²³ BIO Intelligence Service. *First ENTR Lot 1 online questionnaire to stakeholders*. Different versions of the questionnaire are available depending on the product category and can be downloaded from www.ecofreezercom.org/documents_1.php

restaurant establishments in Europe²⁴, after Spain and Italy only. This can lead to the conclusion that French market can represent around 15% of the total market of blast cabinets.

- According to Eurostat figures, France accounted for 26% of new hotel and restaurant establishments from 2003 to 2007. In particular, for the same years studied by the BSRIA report, France had the third highest growth in this sector.
- Considering the 5 top countries (66% of the total figure) with new establishments between 2003 and 2007, the approximate trend of growth is 2.15% per year. This trend is considered applicable for the EU for the coming years.
- Catering is considered a increasing consumer of large blast cabinets, leading to a slight increase in sales. However, these companies are likely to purchase fewer larger units than restaurants.

Considering these aspects, the sales for France are estimated to represent 25% of the total European market. According to stakeholders, figures for blast cabinets might represent around 10% of sales for service cabinets in average in Europe. France presents an extreme ratio between blast and service cabinets (1:4). By contrast, Northern European markets seem to have only 1 blast cabinet per every 20 service cabinets. Nevertheless, based on the assumptions above, these figures are thought to be higher.

The BSRIA document shows figures for the French market for process industrial chillers. However, it does not mention the operational temperature range. It has been mentioned by stakeholders (Daikin, 2010) that the market for low and medium temperature process chillers is between 10 to 20% of the total market for process chillers. The figures below take this assumption into consideration.

Table 2-1 shows the updated figures for past, current and future EU-27 sales, including extrapolated estimates for 2025 sales of service cabinets, blast cabinets, walk-in cold rooms, industrial process chillers and remote condensing units. Data for other products can be found in the Annex.

Table 2-1: Updated sales estimates for EU-27

Product type	1990	2006	2007	2008	2012	2020	2025
	Units						
Service cabinets	313,237	390,578	393,985	397,444	415,096	440,230	461,396
Blast cabinets	95,110	165,600	170,000	173,655	198,078	224,155	249,310
Walk-in cold rooms	73,481	87,925	88,052	88,289	91,059	99,230	103,522
Industrial process chillers ¹	3,491	5,644	6,364	6,441	6,918	8,105	8,949
Remote condenser units ²	766,702	632,100	617,516	599,759	573,023	502,614	458,608

¹ Packaged and plants

² Commercial refrigeration only

Figure 2-4 shows the evolution of sales from 1990 to 2025 of products covered by ENTR Lot 1. This shows a high number of remote condensing units and service

²⁴ Eurostat: http://epp.eurostat.ec.europa.eu/portal/page/portal/statistics/search_database

cabinets in the EU market, and a small share for industrial process chillers and blast cabinets.

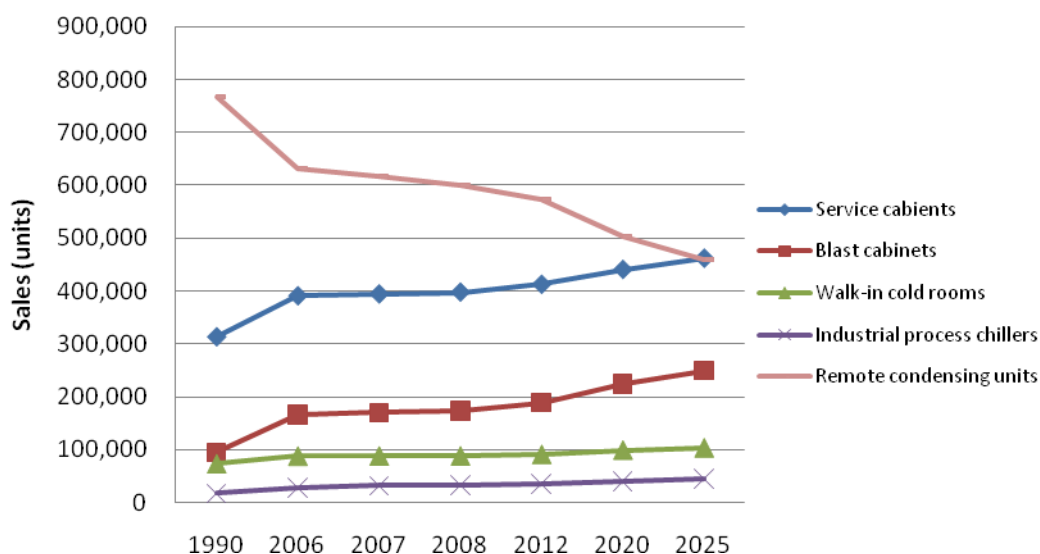


Figure 2-4: EU-27 refrigeration sales evolution from 1990 to 2025

2.4.1.2 Annual growth rates

Based on the sales figures in Table 2-1, the compound annual growth rate (CAGR) has been estimated for the 2008–2012 period. It is relatively low for all product categories (see Table 2-2), and highlights the slow annual growth rate for refrigeration equipment. This demonstrates that the market is not particularly dynamic (in general linked to food consumption and hence EU population), and that new products may take time to disperse into the installed base (stock). The economic crisis may have significantly affected growth recently (EU GDP decreased by 4.5% in 2009), but the continued population growth and recovery of the economy should lead to further growth.

Table 2-2: Calculated CAGR for the period 2008-2012

Product category	CAGR 2008-2012
Service cabinets	0.91%
Blast cabinets	2.15%
Walk-in cold rooms	0.78%
Industrial process chillers	1.80%
Remote condensing units	-1.13%

2.4.1.3 Replacement sales

The shares of the sales for replacement²⁵ shown below were calculated using data on stock and sales provided in Table 2-1. The calculations show that about 90% of the sales in almost all groups are for replacement of an existing unit (see Table 2-3), which seems reasonable. In the case of remote condensing units and walk-in cold rooms, the replacement sales are slightly lower, due to the particular characteristics of the products and the requirement for installation.

Table 2-3: Estimated share of replacement sales in 2008 (EU-27)

Product category	2008	
	Replacement sales (units)	Share of replacement sales over total sales (%)
Service cabinets	367,323	92
Blast cabinets	471,325	98
Walk-in cold rooms	74,230	83
Industrial process chillers	136,141	98
Remote condensing units	36,724	82

2.4.2. EU-27 INSTALLED BASE (STOCK)

Past and future estimates of the installed base of refrigeration equipment were also calculated based on Defra statistics and extrapolated to the EU-27 level (again assuming that the UK market represents 13.5% of the total EU-27 market). Such estimates were supplemented by a market study²⁶ on bottled water dispensers, as well as responses from the industry to the first questionnaire²⁷. Initial figures were presented in the previous working documents (Figure 2-2) and updated data are presented in Table 2-4.

²⁵ Replacement sales for the year $n = \text{sales}(n) - [\text{stock}(n) - \text{stock}(n-1)]$

²⁶ Zenith International. *West Europe Water Coolers market 2008*. July 30, 2008

²⁷ BIO Intelligence Service. *First ENTR Lot 1 online questionnaire to stakeholders*. Different versions of the questionnaire are available depending on the product category and can be downloaded from www.ecofreezer.com.org/documents_1.php

Table 2-4: Updated estimates of EU-27 stock – current, past and future

Product type	1990	2006	2007	2008	2012	2020	2025
	Units						
Service cabinets	2,404,852	3,196,511	3,228,919	3,260,163	3,380,904	3,621,615	3,824,409
Blast cabinets	516,141	1,035,798	1,292,529	1,331,197	1,478,884	1,761,092	1,958,727
Walk-in cold rooms	1,122,444	1,491,948	1,507,075	1,521,659	1,578,022	1,690,370	1,785,024
Industrial process chillers ¹	8,455	76,417	78,707	80,929	89,471	106,442	117,282
Remote condenser units ²	3,688,270	5,048,537	5,147,339	5,243,301	5,618,759	6,301,534	6,682,502

¹ Packaged and plants

² Commercial refrigeration only

Stock for blast cabinets, for which figures were unavailable in from UK MTP, has been calculated considering the lifetime of the equipment and the potential sales as expressed in Table 2-4.

Figure 2-5 illustrates the stock evolution across different product categories covered by ENTR Lot 1 in the years 1990-2025.

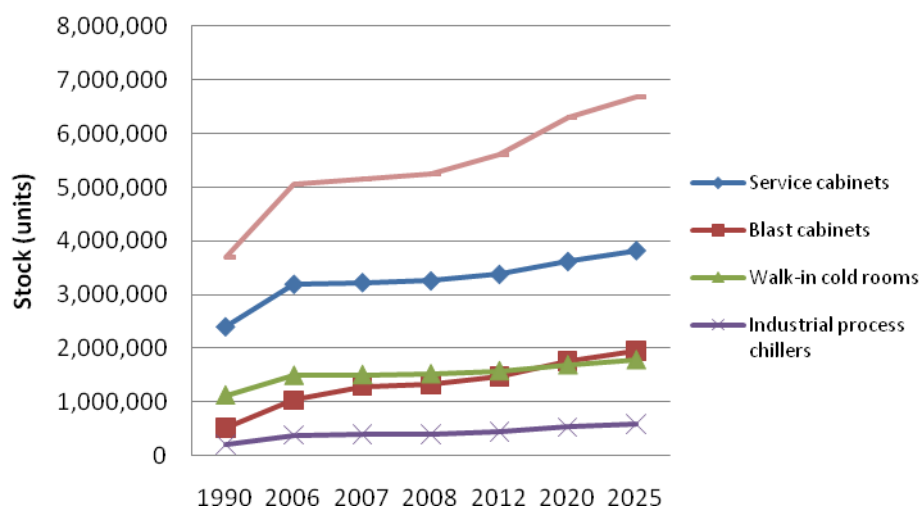


Figure 2-5: EU-27 stock evolution according to product category

2.4.3. PRODUCT LIFE

The average product life is a useful information which can be used for the calculation of market data when either only stock or sales data is available by applying the formula in §2.4.1.1.

Based on existing data from literature, estimates have been made regarding the product lifetime for the refrigeration equipment included in ENTR Lot 1. Results show that the product lifetime varies between 6 and 20 years, depending on the product category. Details are presented in

Table 2-5.

Table 2-5: Estimates of product lifetime

Source	Defra MTP ²⁸	ADL 1996 ²⁹	ME 2000 ³⁰	Study estimates 1	Study estimates 2 (stock/sales in 2008)	Figure to be used in ENTR Lot 1 analysis
Product type	(years)					
Service cabinets	8	8 to 10	9	8.5	8	8.5
Blast cabinets	-	-	-	8.5*	6	8.5
Walk-in cold rooms	18	12 to 25** 8 to 12***	-	18.5** 10***	17	17
Industrial process chillers	15	-	-	15	20	15
Remote condensing units	-	8 to 12 (air cooled only)	-	10 (air cooled only)	11.5 (air cooled only)	8

* Assumed to be similar to service cabinets

** Insulated box

*** Semi-hermetic compressor servicing refrigeration equipment

- : No data available/found

2.4.4. PRODUCT SPECIFIC DATA

More detailed market data was found in the responses to the first stakeholder questionnaire³¹ and through stakeholder feedback.

2.4.4.1 Service cabinets

In the following table the different market sections for service cabinets are shown. It is divided by operation temperature, configuration of the equipment and location of the condensing unit. The percentage of each sub-classification stock is assumed to be comparable to the percentage of sales. The total figures for sales and stock are extrapolated to the EU-27 from UK MTP data, estimating that the UK market is 13.5% of the EU market.

²⁸ Defra statistics available at <http://whatif.mtprog.com/>

²⁹ Arthur D. Little, Inc. *Energy Savings Potential for Commercial Refrigeration Equipment, Final Report Prepared for US Department of Energy*. 1996

³⁰ Mark Ellis and Associates. *Self-contained Commercial Refrigeration*. March 2000

³¹ BIO Intelligence Service. *First ENTR Lot 1 online questionnaire to stakeholders*. Different versions of the questionnaire are available depending on the product category and can be downloaded from www.ecofreezercom.org/documents_1.php

Table 2-6: Sales and stock of service cabinets in 2008 by technical characteristic

Technology	Sales		Stock	
	(units)	(%)	(units)	(%)
Refrigerators	275,429	69.3	2,259,293	69.3
Freezers	116,451	29.3	955,228	29.3
Refrigerators-freezers	5,564	1.4	45,642	1.4
TOTAL	397,443		3,260,163	
Vertical	278,211	70	2,282,114	70
Horizontal	115,259	29	945,447	29
Chest	3,974	1	32,602	1
TOTAL	397,444		3,260,163	
Plug-in	389,495	98	3,194,960	98
Remote	7,949	2	65,203	2
TOTAL	397,444		3,260,163	
1-door	255,239	64	2,093,677	64
2(+) doors	142,205	36	1,166,486	36
TOTAL	397,444		3,260,163	

- : No data available/found

The sale shares per product type are shown in the table below.

Table 2-7: Market share per equipment category based on data provided by the industry

Configuration	Operation temperature	Model type: door numbers (~net volume in L)	Condensing unit location	Approximate market proportion
Vertical	Refrigerator	1 (~400 to 600L)	Integral	33.61%
			Remote	0.69%
		2 (~1300L)	Integral	14.41%
			Remote	0.29%
	Freezer	1 (~400 to 600L)	Integral	13.45%
			Remote	0.27%
		2 (~1300L)	Integral	5.76%
			Remote	0.12%
	Refrigerator/freezer	1 (~400 to 600L)	Integral	0.69%
			Remote	0.01%
		2 (~1300L)	Integral	0.69%
			Remote	0.01%
Horizontal	Refrigerator	1 (~150L)	Integral	9.95%
			Remote	0.20%
		2+ (up to ~800L)	Integral	9.95%
			Remote	0.20%
	Freezer	1 (~150L)	Integral	4.26%
			Remote	0.09%
		2+ (up to ~800L)	Integral	4.26%
			Remote	0.09%
	Refrigerator/freezer	1	Integral	0.00%
			Remote	0.00%
		2+	Integral	0.00%
			Integral	0.00%

Configuration	Operation temperature	Model type: door numbers (~net volume in L)	Condensing unit location	Approximate market proportion
			Remote	0.00%
Chest	Refrigerator	1	Integral	0.00%
			Remote	0.00%
		2	Integral	0.00%
			Remote	0.00%
	Freezer	1	Integral	0.98%
			Remote	0.02%
		2	Integral	0.00%
			Remote	0.00%
	Refrigerator/freezer	1	Integral	0.00%
			Remote	0.00%
		2	Integral	0.00%
			Remote	0.00%

Stakeholders have estimated that products with drawers account for about 5³² to 12³³% of the market for horizontal products.

2.4.4.2 Blast cabinets

In the following table the different market sections for blast cabinets are shown. It is divided by operation temperature, configuration of the equipment, capacity for cabinets only, capacity for trolley/pass-through equipment (stakeholders have mentioned that the energy consumption of these two types of equipment is comparable) and location of the condensing unit. The percentage of each sub-classification stock is assumed to be comparable to the percentage of sales.

³² Source: Adande Refrigeration

³³ Source: Foster

Table 2-8: Sales of blast cabinets in 2008, by technical characteristic

Type of equipment	Sales		Stock	
	(units)	(%)	(units)	(%)
Refrigerator	15,629	9	119,808	9
Freezer	1,737	1	13,312	1
Refrigerators-freezers	156,290	90	1,198,077	90
TOTAL	173,655		1,331,197	
Reach-in / cabinet	147,607	85	1,131,517	85
Trolley	17,366	10	133,120	10
Pass-through	8,683	5	66,560	5
TOTAL	173,655		1,331,197	
Small reach-in R (3 trays)	44,282	30	101,837	9
Medium reach-in R (5 to 10 trays)	73,803	50	905,214	80
Large reach-in R (14-15 trays)	14,761	10	67,891	6
Extra-large reach-in R (20 trays)	14,761	10	56,576	5
TOTAL	147,607		1,131,517	
Small roll-in + pass-through T (up to 100kg)	15,629	60	109,824	55
Medium roll-in + pass-through T (100-150kg)	7,814	30	59,904	30
Large roll-in + pass-through T (150-240kg)	2,605	10	29,952	15
TOTAL	26,048		199,680	
Plug-in	133,714	84	1,118,205	84
Remote	39,941	16	212,991	16
TOTAL	173,655		1,331,197	

These figures are considered as an average of the EU market, and are based on comments from stakeholders. According to stakeholders, the market share of larger equipment is higher in northern EU countries. Also, in these countries, chilling-only machines present higher market proportion.

The sale shares per product type are shown in the table below.

Table 2-9: Market share per equipment category based on data provided by the industry

Model	Function	Size	Approximate market share (%)
Reach-in	Chilling	Small R	1.91
		Medium R	4.21
		Large R	0.77
		Extra-large R	0.77
	Freezing	Small R	0.26
		Medium R	0.43
		Large R	0.09
		Extra-large R	0.09
	Chilling/Freezing*	Small R	22.95
		Medium R	38.25
		Large R	7.65

Model	Function	Size	Approximate market share (%)
		Extra-large R	7.65
Roll-in	Chilling	Small T	0.06
		Medium T	0.03
		Large T	0.02
	Freezing	Small T	0.06
		Medium T	0.03
		Large T	0.01
	Chilling/Freezing*	Small T	5.88
		Medium T	2.94
		Large T	0.98
Pass-through	Chilling	Small T	0.03
		Medium T	0.01
		Large T	0.01
	Freezing	Small T	0.03
		Medium T	0.02
		Large T	0.01
	Chilling/Freezing*	Small T	2.94
		Medium T	1.47
		Large T	0.49

*User behaviour corresponds only to chilling cycles. Information found in brochures only available for freezing cycles

2.4.4.3 Walk-in cold rooms

In the following table the different market sections for walk-in cold rooms are shown. It is divided by size, operation temperature and refrigeration system type. The percentage of each sub-classification stock is assumed to be comparable to the percentage of sales. The total figures for sales and stock are extrapolated to the EU-27 from UK MTP data, estimating that the UK market is 13.5% of the EU market.

In general the end user, even without expert knowledge, can install a factory-built product, as the refrigerant is pre-charged (in either a single-piece packaged refrigeration unit or integral configuration), and all that is required is construction of the enclosure for use and attachment of the refrigeration system as required. The customised product (i.e. customised) is designed and constructed by a refrigeration installer, the insulated box often attached to a remote refrigeration system configuration, which frequently requires installation of piping and charging of the refrigerant (operations needing specialist skills). Another differentiation between factory-built and customised is that factory-built products are of pre-determined sizes and shapes, whereas customised products can be designed to fit customer footprint requirements.

Walk-in cold room enclosure kits and insulation panels are often manufactured by different companies from those manufacturing refrigeration systems. Two walk-in cold rooms of the same dimensions and panel thicknesses and intended for the

same use may be equipped, by the end user, with two completely different refrigeration systems³⁴.

Table 2-10: Sales and stock of walk-in cold rooms in 2008 by technical characteristic

Technology	Sales		Stock	
	(units)	(%)	(units)	(%)
Small	59,180	67	1,019,968	67
Medium	27,696	31	477,344	31
Large	1,421	2	24,499	2
TOTAL	88,289		1,521,659	
Refrigerators	60,902	69	1,049,640	69
Freezers	26,487	31	456,498	31
Refrigerators-freezers	8,829	1	15,217	1
TOTAL	88,289		1,521,659	
Factory-built	26,487	30	456,498	30
Customised	52,973	60	912,995	60
TOTAL	88,289		1,521,659	
Packaged unit	40,326	45	695,022	45
Remote condensing unit	35,316	40	608,664	40
Remote plant	13,243	15	228,249	15
TOTAL	88,289		1,521,659	

The sale shares per product type are shown in the table below.

Table 2-11: Market share per equipment category based on data provided by the industry

Size	Operation temperature	Design	Refrigeration system	Approximate market proportion
Small (up to 20m3)	Refrigerators	Factory-built	Packaged	22.25%
		Customised	Packaged unit	2.22%
			RCU	15.57%
			Remote plant	4.45%
	Freezer	Factory-built	Packaged	11.27%
		Customised	Packaged unit	1.13%
			RCU	7.89%
			Remote plant	2.25%
	Refrigerator / freezer	Factory-built	Packaged	0.00%
		Customised	Packaged unit	0.00%
			RCU	0.00%
			Remote plant	0.00%
Medium (20m3 to 100m3)	Refrigerators	Factory-built	Packaged	4.68%
		Customised	Packaged unit	1.87%
			RCU	11.21%
			Remote plant	5.61%
	Freezer	Factory-built	Packaged	1.62%
		Customised	Packaged unit	0.65%
			RCU	3.89%

³⁴ Source : INCOLD

Size	Operation temperature	Design	Refrigeration system	Approximate market proportion
	Refrigerator / freezer	Factory-built	Remote plant	1.94%
			Packaged	0.00%
		Customised	Packaged unit	0.00%
			RCU	0.00%
			Remote plant	0.00%
Large (100m3 to 400m3)	Refrigerators	Factory-built	Packaged	0.00%
			Packaged unit	0.00%
		Customised	RCU	0.57%
			Remote plant	0.57%
	Freezer	Factory-built	Packaged	0.00%
			Packaged unit	0.00%
		Customised	RCU	0.24%
			Remote plant	0.24%
	Refrigerator / freezer	Factory-built	Packaged	0.00%
			Packaged unit	0.00%
		Customised	RCU	0.00%
			Remote plant	0.00%

2.4.4.4 Process chillers

In the following table the different market sections for process chillers are shown. It is divided by configuration, and the percentage of each sub-classification stock is assumed to be the same as that for sales. The total sales and stock are extrapolated to the EU-27 from UK MTP data and BSRIA data, estimating that the UK market is 13.5% of the EU market, while the French market represents around 12.6%.

The proportion of low and medium temperature water-cooled and air-cooled equipment is assumed to be similar to the proportion of these two types of equipment for high temperature (HT) chillers, i.e. about 30% of the market is expected to be water-cooled. This also follows the market shares found for RCUs, in which water-cooled equipment is less than 10% of the total market.

Table 2-12: Sales and stock of industrial process chillers in 2008 by technical characteristic

Technology	Sales		Stock	
	(units)	(%)	(units)	(%)
Packaged	5,270	90	72,836	90
Field erected	586	10	8,093	10
TOTAL	5,856		80,929	
MT (-12°C to +3°C)	3,279	56	45,320	56
LT (-25°C to -8°C)	2,577	44	35,609	44
TOTAL	5,856		80,929	
Small (<100kW)	1,757	30	24,279	30
Medium (101-499kW)	2,635	45	36,418	45
Large (500-999kW)	1,171	20	16,186	20
Extra-large (>1000kW)	293	5	4,046	5
TOTAL	5,856		80,929	
Air-cooled	4,319	74	59,696	74
Water-cooled	1,536	26	21,233	26

Technology	Sales		Stock	
	(units)	(%)	(units)	(%)
TOTAL	5,856		80,929	

The sale shares per product type are shown in the table below

Table 2-13: Market share per equipment category based on data provided by the industry

Operation temperature	Size	Cooling system	Market Low and Medium temp (%)
MT	Small	Air cooled	13.5
		Water cooled	3.4
	Medium	Air cooled	19.0
		Water cooled	6.3
	Large	Air cooled	7.9
		Water cooled	3.4
	Extra-large	Air cooled	1.7
		Water cooled	1.1
LT	Small	Air cooled	10.5
		Water cooled	2.6
	Medium	Air cooled	13.8
		Water cooled	5.9
	Large	Air cooled	6.1
		Water cooled	2.6
	Extra-large	Air cooled	1.3
		Water cooled	0.9

2.4.4.5 Remote condensing units

The total figures for remote condensing units sales and stock are extrapolated to the EU-27 from BSRIA Report “French Market for Refrigeration”³⁵, considering the sales trend during the years 2006-2007 and the forecast foreseen in the report for years 2008-2011 as the trend until 2025; the ratio “sales per capita” as a still value; and the replacement sales per year being 84%.

Table 2-14: Sales and stock of remote condensing units in 2008

Technology	Sales		Stock	
	(units)	(%)	(units)	(%)
Packaged single compressor	569,771	95%	4,981,136	95%
Packaged with multiple compressors	29,988	5%	262,165	5%
TOTAL	599,759		5,243,301	
Low temperature (-35°C)	119,952	20%	1,048,660	20%
Medium temperature (-10°C)	479,807	80%	4,194,641	80%
TOTAL	599,759		5,243,301	
LT - Cooling capacity 0.2kW-20kW	113,954	95%	996,227	95%
LT - Cooling capacity 20kW-50kW	4,798	4%	41,946	4%
LT - Cooling capacity > 50kW	1,200	1%	10,487	1%
MT - Cooling capacity 0.2kW-20kW	383,846	80%	3,355,713	80%

³⁵ BSRIA “French Market for Refrigeration” 2009

MT - Cooling capacity 20kW-50kW	71,971	15%	629,196	15%
MT - Cooling capacity > 50kW	23,990	5%	209,732	5%
TOTAL	599,759		5,243,301	
LT reciprocating compressor	113,954	95%	996,227	95%
LT scroll compressor	5,998	5%	52,433	5%
LT screw compressor	0	0.0%	0	0.0%
LT rotary compressor	0	0.0%	0	0.0%
MT reciprocating compressor	431,826	90%	3,775,177	90%
MT scroll compressor	47,981	10%	419,464	10%
MT screw compressor	0	0.0%	0	0.0%
MT rotary compressor	0	0.0%	0	0.0%
TOTAL	599,759		5,243,301	

According to information provided by stakeholders, the most common condensing units in the EU market are small condensing units with low cooling capacity (between 1-20kW) and medium evaporating temperature.

Market shares in the EU per operating temperature range and cooling capacity range according to information provided by stakeholders are shown in the table above.

The sale shares per product type are shown in Table 2-15 below, and the complete market split per classification is given in Annex 2-9.

Table 2-15 Market share per equipment category based on data provided by the industry

Configuration	Evaporating temp. (°C)	Cooling capacity (kW)	Compressor type	Aproximate market Proportion
Packaged condensing unit with single compressor	LT (-35°C)	0.2-20 kW average: 5-7 kW	Hermetic reciprocating	17.1%
			Scroll	0.6%
			Screw	0.1%
			Rotary	0.1%
		20-50 kW average: 20 kW	Hermetic reciprocating	2.7%
			Scroll	0.1%
			Screw	0.9%
			Rotary	0.0%
		>50 kW average: 50kW	Hermetic reciprocating	0.9%
			Scroll	0.0%
			Screw	0.0%
			Rotary	0.0%
	MT (-10°C)	0.2-20 kW average: 5-7 kW	Hermetic reciprocating	0.0%
			Scroll	5.5%
			Screw	0.3%
			Rotary	0.3%
		20-50 kW average:	Hermetic reciprocating	10.3%

Configuration	Evaporating temp. (°C)	Cooling capacity (kW)	Compressor type	Aproximate market Proportion
		20 kW	Scroll	1.0%
			Screw	0.0%
			Rotary	0.1%
		>50 kW average: 50kW	Hermetic reciprocating	3.4%
			Scroll	0.3%
			Screw	0.0%
			Rotary	0.0%
Packaged condensing unit with twin compressors or more	LT (-35°C)	0.2-20 kW	-	0.7%
		20-50 kW average: 20 kW	scroll	0.7%
			screw	0.1%
		>50 kW average: 50kW	scroll	0.2%
			screw	0.0%
	MT (-10°C)	0.2-20 kW	-	0.0%
		20-50 kW average: 20 kW	scroll	0.0%
			screw	0.2%
		>50 kW average: 50kW	scroll	0.9%
			screw	0.1%

Remote condensing units using parallel compressors (2 or more) are around 5% of the market of remote condensing units, whereas remote condensing units with a single compressor are the 95% of the market.

The remote condensing units working on low temperatures (evaporating temperature -35°C) are 15% of the market, while medium temperatures (evaporating temperature +10°C) are 60% of the market and high temperatures (air conditioning temperatures, out of the scope of the present preparatory study) are 25% of the market.

The largest share of the market are remote condensing units with low cooling capacities, between 0.3 kW and 20 kW. These are the 80% of the market, being the ranges between 20 kW and 50 kW the 15% and the condensing units with cooling capacity over 50 kW the 5% of the market.

The remote condensing units running reciprocating compressors are the most common in the market, being 95% of the market for low temperatures and 90% for medium temperatures. Scroll compressors in remote condensing units are 4% in low temperatures and 9% in medium temperatures and screw and rotary compressors are less than 1% of the market each type for both temperature ranges.

Most of the compressor motors are on/off type (93% for reciprocating, 98% for scroll and screw and 90% for rotary), the rest being VSD motors and 2-speed motors.

Regarding the cooling capacity, three ranges are observed: small condensing units (up to 20 kW), medium-sized condensing units (from 20 kW to 50 kW of cooling capacity) and large condensing units (over 50 kW). The small condensing units are the majority of the market and EU stock (80% of the market, according to stakeholders). The range from 20 kW to 50 kW represents 15% of the market and large condensing units account for 5% of the market.

Based on market observation and information provided by stakeholders, it can be said that the average small condensing unit is simple and does not include the latest technologies, which are usually developed for larger units, where the price is not the most important driver and the energy consumption is higher. Therefore, efficiencies in larger units can be higher than in smaller units, even though the total energy consumption is also higher.

2.5. EU MARKET DISTRIBUTION STRUCTURES AND COMPETITION

2.5.1. MATURITY OF THE MARKET

In Europe, the market is mature and saturated, making competition strong. Moreover, there are production overcapacities, intensifying price pressure due to Asian competition and the need to lower production costs in order to maintain profit margins. Additionally, the customer base is highly dispersed and relatively sensitive to price changes, and products are becoming more standardised. In response to these challenges, producers have restructured via mergers/acquisitions, and product line differentiation³⁶.

Supermarkets and food stores usually require short payback times, around 2 or 3 years, and do not make high investments on refrigeration equipment³⁷. On the other hand, manufacturers also require a short payback time, and the competitive market does not allow great price differentiations. Therefore, implementing changes affecting the design of the product or the production methods is not desired by manufacturers if the investment is not quickly recovered. There is also a desire by supermarkets to keep maintenance costs to a minimum, which is a key issue for decision of the type of system, size and complexity.

Economic and demographic forecasts indicate that the eastern European markets are likely to continue their current dynamic growth. The markets are growing at a faster rate than in western European countries, and even though the average prices are similar, competitiveness lead to slightly lower prices. The refrigeration market is linked to sectors such as beverages and retail, and it is inevitable that economic progress in these segments should lead to growth opportunities. The expendable income of eastern European customers has led to a rapid growth in the retail markets. The growth in commercial surfaces has stimulated the product sector market, including condensing units, compressors and other components. Access to EU markets has increased the general standard for consumer goods, creating a demand for newer and better-quality products, together with the need of comply with the EU legislation. EU markets, however, are extremely price-sensitive, and new economical product ranges attract more customers.³⁸

In Western Europe, a decrease in the total number of supermarkets in Germany has been noticed in recent years³⁹, and a similar situation can be supposed in the rest of the western European countries. In Southern and Eastern Europe there are more small food retail stores and fewer supermarkets, but the expectation is an evolution similar to the western European model, with more supermarkets and therefore less small food retail stores. This leads to a change in the refrigeration

³⁶ International Institute of Refrigeration/Institut International du Froid (IIR/IIF). Refrigeration - Industry as a partner for sustainable development. 2002

³⁷ Navigant consulting, Energy saving potential and R&D opportunities for commercial refrigeration. 2009.

³⁸ Frost & Sullivan, Central and East European Refrigeration Systems Market

³⁹ UBA, Comparative assessment of the climate relevance of supermarket refrigeration systems and equipment

equipment market, moving towards bigger products purchased by bigger and more exigent companies.

New, bigger supermarkets allow the design and installation of decentralized systems, using remote condensing units or compressor packs, usually with a higher energy efficiency than standalone machines. However, these systems have lower flexibility when remodelling work has to be carried out within the store. As an indicator, German supermarkets are remodelled approximately every seven years and rebuilt in intervals of 14 years.

2.5.2. MANUFACTURERS OF REFRIGERATING EQUIPMENT AND REFRIGERANTS

According to the International Institute of Refrigeration³⁶ (IIR), organisations falling into the category of manufacturers of refrigerating equipment and refrigerants increasingly tend to be multinational corporations.

- Refrigerant manufacturers (which manufacture refrigerants, secondary refrigerants, lubricants, etc.) tend to be very large corporations due to the costly infrastructures required (liquefied gas, and particularly liquefied natural gas). Worldwide, this market is dominated by 15 to 20 very large companies.
- Component (compressors, mechanical and electronic controls, heat exchangers) manufacturers tend to be multinationals with manufacturing sites in various parts of the world but can also be small and medium-sized enterprises (SMEs).
- Manufacturers of specialised equipment (service cabinets, etc.) may be multinationals, but tend to be SMEs. They cover a broad company size range. However, at this stage, the share of SMEs in this sector and in each market segment is not known. Some larger manufacturers also provide installation and maintenance services.

At global level, major players include United Technologies Corporation (UTC), Ingersoll-Rand, and Manitowoc /Enodis which are estimated to represent over 25% of the world market (in Euros)³⁶. At the EU-27 level, UTC, and Ingersoll-Rand seem to be the largest big players as well as other companies such as e.g. Arneg, Foster, Jordao, Norpe, Williams Refrigeration, Ice-O-matic, Hoshizaki, and EPTA².

In Europe, a survey conducted by AREA³⁶ (Air conditioning and Refrigeration European Association) among national refrigeration associations in 12 countries (Belgium, Denmark, Finland, France, Germany, Greece, Hungary, the Netherlands, Norway, Spain, Sweden and the United Kingdom) reported 5,000 specialised firms in the commercial refrigeration sector, which employ 73,000 personnel for a total turnover of € 20,000 million.

Some manufacturers by product group are provided below.

Table 2-16: Manufacturers by product group (alphabetical order)

Service cabinets	Blast cabinets	Walk-in cold rooms	Chillers	Remote condensing units
Electrolux Foster GRAM Infrico Polaris Williams Refr.	Adande refrigeration Afinox Asskuhl Castel IMAC Electrolux Fagor Industrial Foster FRANKE GRAM Infrico IRINOX Isselbaecher SAGI Sanyo	<u>Kits and insulation</u> Kingspan Smeva Criocabin INCOLD MISA Refr. <u>Refrigeration systems</u> Riedel Zanotti <u>Whole product</u> Electrolux Foster Coldrooms GRAM GR Scott Williams Refri. Viessmann	Broad Carrier Cention Daikin Frigopol Frioherm Grasso Johnson Controls Lennox Mayekawa McQuay Robur Star refrigeration Titan Trane Thermax Yazaki York by Johnson Controls WITT	Bitzer Bock Daikin Danfoss Embraco / Aspera Emerson/Copeland Fracold Güntner Hubbard Tecumseh TEV United refrigeration

2.5.3. MARKET SEGMENTATION ACCORDING TO ENVIRONMENTAL AND ENERGY PERFORMANCE

For service cabinets and walk-in cold rooms, stakeholders have commented that the market is roughly divided into two ‘tiers’ of product quality. Higher tier products incorporate new technologies and use high-quality components and materials, differentiating themselves in terms of performance and energy efficiency (and/or low environmental impact).

The manufacturers of these high environmental quality products might also have a disposal (end-of-life) scheme in place as part of an environmental management framework⁴⁰, to ensure proper treatment of the equipment on disposal. This all leads to higher product prices and a lower tier of product types that are manufactured on a low-cost and low-price basis. While the higher tier products might be strongly branded and compete to be included in MS incentive schemes (UK ECA and Danish ETL – which target the top 20% and 50% of the market respectively), the lower-tier products, a growing segment⁴¹, are sold mainly via wholesalers under generic brand names.

Manufacturers may be involved in producing products in both of these two tiers of quality. Stakeholders did however state that many of the lower-tier products were being manufactured in Asia, sometimes based on old designs created in the EU, and that this competition was driving down prices, increasingly competing on price rather than high environmental performance, and hence forcing EU manufacturers to compete in the same tier. Associated quality and lifetime of the lower-tier products could lead to issues such as lower lifetime and higher product energy consumption.

⁴⁰ For example, ISO 14001.

⁴¹ Source: Foster

In particular for walk-in cold rooms, there is a concern that insufficiently policed regulation may lead to independent contractors installing poorly constructed products, at a low price, as cost is currently the main driver for customer product choice. If any regulatory framework fails to enforce requirements adequately, these installers could under-cut responsible manufacturers by providing low-cost and poor-performing products. Manufacturers have absorbed cost of recent improvements (cam-locks; energy efficient motors; etc.), but a more efficient system costs more up-front, and manufacturers state that customers do not want this, some need very quick payback and many cannot afford more higher-cost equipment. Even larger end-users reportedly often choose products that fall apart after 5 years (and are not concerned about the environmental impact and energy cost)⁴².

Stakeholders commented that blast cabinet marketing is focused on food quality and safety. Energy consumption is not a primary concern for customers, who value the benefits of improved food preservation (e.g. retained flavour and moisture, and reduced bacterial growth) that rapid cooling allows.

Process chillers are sold in smaller numbers, and used for more specific applications. These are predominantly high-value products that are designed in careful consideration of their application. Air-conditioning chillers (not included in the scope of ENTR Lot 1) are however more standardised products, and are covered by the EUROVENT and UK ECA voluntary schemes.

Remote condensing units are sold in very high numbers and are relatively standardised products, with some differentiation over efficiency improvements to allow energy savings. According to stakeholder comments, the most sold products used to be the smallest, simplest and cheapest options, and energy or environmental performance is not an important factor in the purchasing decision. However, these products are covered by the UK ECA, with minimum COP requirements.

2.5.4. REFRIGERATION CONTRACTORS (INSTALLERS)

This group comprises many smaller businesses⁴³, employing up to 20 people. Refrigeration contractors play a vital role in ensuring the highest performance for the refrigeration equipment and reducing refrigerant direct emissions. They are responsible for the correct installation of the equipment, for maintenance according to good practice and for disposal at the end of the life cycle, again in compliance with good practice (see later Task 3). Contractors also play a key role as end-user advisers. Third party contractors are usually used to procure, supply and install commercial refrigeration equipment.⁴

Manufacturers of commercial refrigeration equipment often partner with refrigeration contractors who provide installation and maintenance services for the products they sell.

⁴² Discussed at EFCEM meeting on walk-in cold rooms, London, 12/10/2010.

⁴³ International Institute of Refrigeration/Institut International du Froid (IIR/IIF). Refrigeration - Industry as a partner for sustainable development. 2002

2.5.5. DISTRIBUTION CHANNELS

Refrigeration equipment is distributed in five different ways (see Figure 2-11), by:

- utilising the manufacturer's own sales staff to sell directly to the end-user (channel 1);
- working through regional sales offices or manufacturers' representatives to sell equipment to independent distributors (equipment dealers, distributors, agents, brokers, etc.) (channel 2);
- working through installers (i.e. mechanical contractors) who will sell it to the end-user (channel 3);
- working through regional sales offices or manufacturers' representatives to sell equipment to independent distributors (equipment dealers, distributors, agents, brokers, etc.), who then sell the equipment to installers (i.e. mechanical contractors) who will sell it to the end-user (channel 4);
- selling to large food and beverage companies who then give their appliances for free or rent them to end-users who in return will sell their products (could be the case for e.g. ice machines, or beverage and dessert machines) (channel 5).

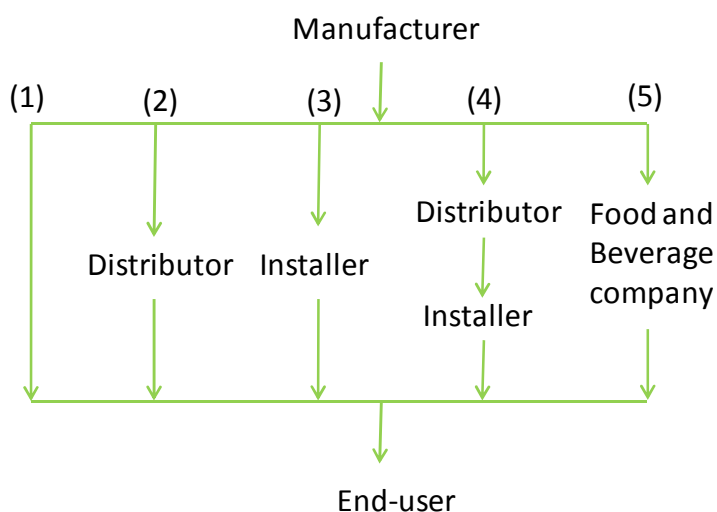


Figure 2-6: Distribution channels

Because of the highly fragmented industry and diverse factors affecting end-users' needs, the most common distribution channel is from manufacturer to distributor to end-user (channel 2 in Figure 2-6). The distributor is the interface between the manufacturer and the customers. However, large chains often employ a contractor or an engineer to specify their needs and to buy equipment directly from the manufacturers⁴⁴. For service cabinets, it is estimated that the majority are sold

⁴⁴American Council for Energy Efficient Economy. Packaged Commercial Refrigeration Equipment: A Briefing Report for Program Planners and Implementers, ACEEE 2002 www.aceee.org/pubs/a022full.pdf

through channels 1 (70%) and 2 (30%) in proportions similar to display cabinets⁴⁵.. For products requiring installation by professionals, such as remote condensing units, the main share of the sales is distributed by independent distributors (i.e. wholesalers) and installers, as shown in Table 2-17.

Table 2-17: EU-27 share of product sold through various distribution channels in 2008

Product type	Channel 1 (directly to end-user) (%)	Channel 2 (via independent distributor etc.) (%)	Channel 3 (via independent installer etc.) (%)	Channel 4 (via mechanical contractors) (%)	Channel 5 (via food industries) (%)
Service cabinets	70	30	0	0	0
Blast cabinets	0	95	0	0	4
Walk-in cold rooms	5	30	40	25	0
Industrial process chillers	40	5	10	20	25
Remote condensing units	0	15	85	0	0

- : No data available/found

2.5.6. REDESIGN CYCLES

The redesign cycle is defined as the time from making the decision to change the design to the point when only “new” redesign products are sold, and a return on investment has begun to be made. The redesigning cycles for different product categories are presented in the table below. Data was obtained from the responses from the industry to the 1st questionnaire⁴⁶.

Table 2-18: Redesign cycles

Product	Redesign cycle (months)
Service cabinets	25
Blast cabinets	10
Walk-in cold rooms	-
Industrial process chillers	42
Packaged condensing units	42

- : No data available/found.

⁴⁵ BIO Intelligence Service. Lot 12 Preparatory Study, Final Report for DG TREN. December 2007

⁴⁶ BIO Intelligence Service. First ENTR Lot 1 online questionnaire to stakeholders. Different versions of the questionnaire are available depending on the product category and can be downloaded from www.ecofreezercom.org/documents_1.php

2.5.7. CLIMATE CONDITIONS

Climate conditions have importance in the refrigeration systems and energy consumption, since the performance of refrigeration products is often closely linked to ambient temperature. There are a variety of climatic zones in the EU-27, from the warm and dry Mediterranean coasts to the northern areas. Performance of commercial refrigeration equipment, as well as technologies appropriate can vary for these different climatic conditions. This is the case of the selection of the refrigerant, i.e. carbon dioxide is a commonly used in Nordic countries where cold ambient temperatures allow a high efficiency, whereas in warmer areas such as Southern Europe the efficiency of this refrigerant is very poor. Evaporative cooling technology for condensers is also closely linked to dry and warm climates, and its efficiency is also lower in dry and cold ambient conditions.

Central Europe has cold winters with daily average maximum temperatures from 2 °C in January to 25 °C in July. The wettest months on average are July (84 mm) August (64 mm) and September (99 mm).

Southern Europe has a warm dry winter. Daily average maximum temperatures vary from 7°C to 17 °C. In the summer, daytime maximum average temperatures reach 30-31 °C

Daily average maximum temperatures in Eastern Europe range from 1 °C in January to 28 °C in July. June (121 mm), July (96 mm) and May (72 mm) are the wettest months on average⁴⁷.

⁴⁷ www.metoffice.gov.uk

2.6. USER EXPENDITURE BASE DATA

2.6.1. AVERAGE CONSUMER PRICES (EX. VAT) AND MANUFACTURER MARGINS

The consumer prices described in this section are the product list prices, and exclude VAT. However, the literature⁴⁸ and stakeholders state that list price is often significantly higher than the final sale price, with reductions of around 40% of the list price being common, and prices varying further, depending on factors such as volume of units to be purchased.

2.6.1.1 Service cabinets

The average selling prices in 2007-2009 for service cabinets range between € 850 and over € 3,000; depending on the size, operating temperature, and the exterior of the cabinet (i.e. stainless steel or white).⁴⁹ Typically, a stainless steel exterior will be € 100 - € 300 more expensive than an equivalent model with a white exterior.

Table 2-19 details the price ranges according to the type of service cabinet. A US study⁵⁰ estimated the price of a freezer service cabinet at around US\$ 2,200 (approx. € 1,620) for a volume of 24ft³ (approx. 680 litres), and the price of a refrigerated service cabinet at US\$ 2,500 (approx. € 1,835) for a volume of 48ft³ (approx. 1,360 litres).

Table 2-19: Average prices for service cabinets (2009)

Net storage volume, V (litres)	Description	Average selling price (€)
V <400	Refrigerator	850 – 1,300
	Freezer	1,000 – 1,400
400 < V <600	Refrigerator	1,000 – 2,000
	Freezer	1,400 – 2,500
V >600	Refrigerator	1,500 – 3,000
	Freezer	1,500 – 3,000

⁴⁸ BSRIA "French Market for Refrigeration" 2009

⁴⁹ catalogue data

⁵⁰ Arthur D. Little, Inc. *Energy Savings Potential for Commercial Refrigeration Equipment, Final Report Prepared for US Department of Energy*. 1996

2.6.1.2 Blast cabinets

The typical price range for a blast cabinet is between € 2,000 and € 20,000 depending on the size. Table 2-20 details the price ranges according to the type of blast cabinets.

Table 2-20: Average prices for blast cabinets (2009)

Number of trays (GN 1/1)	Approximate capacity of the equipment (kg)	Description	Average selling price (€)
1 – 3	3 – 9	Refrigerator and/or freezer	2,000 – 5,000
4 – 7	12 – 21	Refrigerator and/or freezer	5,000 – 15,000
8 – 70 (trolleys)	24 – 240	Refrigerator and/or freezer	10,000 – 30,000

2.6.1.3 Walk-in cold rooms

The typical price range for walk-in cold room sold as a factory assembled product is estimated at between €1,000 and €9,000 depending on the size. The price for the average walk-in cold room is about €8,800 (ex VAT) according to stakeholders. Table 2-21 details the price ranges according to the storage volume. Some stakeholders have stated that these figures may be high⁵¹.

Table 2-21: Average prices for factory assembled walk-in cold rooms (2009)

Size	Storage volume (m ³)	Approximate price ranges (€) ex VAT
Small	Up to 20	2,000 – 7,000
Medium	20 to 100	7,000 – N/A
Large	100 to 400	N/A
<i>Average</i> ⁵²	27	8,800

N/A: data not found

2.6.1.4 Process chillers

From stakeholders' comments, the price for the end-user is between €200 and €250 per kW of cooling capacity. This price includes manufacturing, installation, and training (if required). According to stakeholders, the estimated price for an average (270kW cooling capacity) process chiller is € 60,000, where 15% VAT is not included.

According to stakeholders, the increase in price between production cost and consumer price (including installation) is about 100%.

2.6.1.5 Remote condensing units

An estimate of the price of remote condensing units based on responses to the 1st questionnaire⁵³ shows that the selling price of such products is very high, between

⁵¹ Source: Viessmann

⁵² Defra MTP, based on an evaluation of the UK market

€1,000 and €20,000. The distribution channels also influence the price, with usual price discounts being up to 50%-60% for big retailers or installers. The installation costs depend on the product, the installer and the country, and can be up to 20% of the total cost of the product.

The public price of the product varies depending on the cooling capacity of the condensing unit, the number and size of the compressors, the technology used in the compressor, the housing, insulations, etc.

As stated in §2.4.4.5, the typical remote condensing unit has between 5-7kW of cooling capacity for medium temperature (evaporation temperature -10°C), a single hermetic reciprocating compressor, and uses R404a as refrigerant. The average price of a product with these characteristics is around € 4,500.

Remote condensing units working at low evaporating temperatures are 20%-25% more expensive than remote condensing units with the same cooling capacity working at medium evaporating temperatures. On the other hand, higher cooling capacities mean higher prices in all the temperature ranges and compressor technologies.

Regarding compressor types, reciprocating technology is the cheapest, being scroll and rotary 50% more expensive and screw around 55% more expensive than reciprocating.

Variable speed drive technology for compressor motors increments the price in 50% over on/off technology in all types of compressors, whereas 2 speed technology is 20% more expensive than on/off.

2.6.2. PRODUCTION COST STRUCTURE AND SECTOR SPECIFIC MARGIN

The production cost is the sum of the different costs due to direct labour, direct material, and overheads (including investment depreciation). Other non-production cost elements include selling, marketing, general and administrative, research and development, and interest. No robust data was found in existing literature to determine the proportion of each of these costs.

In USA, the DoE estimates the manufacturer mark-up value to be a factor of 1.32⁵⁴.

According to information provided by stakeholders, the estimated margin for the equipment considered within the scope is:

Table 2-22: Estimated margin per product

Equipment	Cost	Approximate margin (%) [*]
Service cabinets	-	40 to 60
Blast cabinets	-	40 to 60 ^{**}

⁵³ BIO Intelligence Service. *First ENTR Lot 1 online questionnaire to stakeholders*. Different versions of the questionnaire are available depending on the product category and can be downloaded from www.ecofreezer.com.org/documents_1.php

⁵⁴ US DoE. *Commercial Refrigeration Equipment ANOPR Technical Support Document, Chapter 5*. 2007. www1.eere.energy.gov/buildings/appliance_standards/commercial/pdfs/cre_nopr_tsd_chp_5.pdf

Equipment	Cost	Approximate margin (%) [*]
Walk-in cold rooms	-	10
Chillers	200-250 €/kW	100
Remote condensing units	1,000 – 20,000 €/unit	100 to 300 ^{***}

^{*} Ratio between cost of product and end-user price

^{**} Margin increases with the equipment size. The range of margin refers to the price set by the manufacturer in brochures. Retailer price might not be the same (not business to business equipment) ^{***} Includes installation costs: vary with the size of the system

- : No data available/found

2.6.3. INSTALLATION COSTS

There is no significant installation cost for plug-in products. Remote appliances however need to be linked to a refrigeration system which supplies the appliance with refrigeration energy. The installation costs only consider the labour costs incurred, all material costs involved during installation will not be included, due to their being part of the refrigeration system costs.

It is estimated at 10 % of the product cost based on the results for remote refrigerated display cabinets⁴⁵ and assuming installation costs are similar across remote refrigeration products.

According to stakeholders, the installation cost for chillers is around 30% of the end-user cost. For split units the cost will be higher.

A previous US study⁵⁵ estimates the installation costs for an ice-maker to be around US\$ 300 (approx. € 220).

Table 2-23: Installation costs by product

Product	Cost (% product price)
Service cabinets*	10 (remote) 1 (plug-in)
Blast cabinets*	10 (remote) 1 (plug-in)
Walk-in cold rooms*	10 (remote) 1 (plug-in)
Industrial process chillers	30
Packaged condensing units*	10

- : No data available/found

*: Estimate

⁵⁵ Arthur D. Little, Inc. *Energy Savings Potential for Commercial Refrigeration Equipment, Final Report Prepared for US Department of Energy*. 1996

2.6.4. RATES FOR RUNNING COSTS AND DISPOSAL

2.6.4.1 Running costs

The significant running costs of refrigeration equipment are the electricity costs, the repair and maintenance costs, and the installation costs.

◆ Electricity costs

Electricity prices for industry in Member States (MS), as of June 2008, are presented in Table 2-24. These rates will be used in a Life Cycle Cost (LCC) calculation at a later stage in the study (Task 4).

As demonstrated in the table, different electricity rates apply depending on annual energy consumption.

Table 2-24 Electricity prices (first semester 2008) for industry depending on consumption⁵⁶

Electricity cost € / kWh with taxes	Industrial consumer IA	Industrial consumer IB	Industrial consumer IC	Industrial consumer ID	Industrial consumer IE	Industrial consumer IF
	Consump. < 20 MWh	20 MWh < Consump. < 500 MWh	500 MWh < Consump. < 2 000 MWh	2 000 MWh < Consump. < 20 000 MWh	20 000 MWh < Consump. < 70 000 MWh	70 000 MWh < Consump. < 150 000 MWh
Austria	0.15	0.15	0.13	0.11	0.10	0.09
Belgium	0.20	0.17	0.13	0.11	0.10	0.09
Bulgaria	0.08	0.08	0.07	0.06	0.05	0.04
Croatia	0.12	0.10	0.09	0.08	0.06	0.05
Cyprus	0.19	0.19	0.16	0.15	0.14	0.14
Czech Republic	0.20	0.16	0.13	0.11	0.10	0.10
Denmark	0.24	0.22	0.21	0.21	0.20	0.20
Estonia	0.08	0.07	0.07	0.06	0.05	0.04
Finland	0.09	0.09	0.08	0.07	0.06	0.06
France	0.12	0.10	0.08	0.07	0.07	0.07
Germany	0.23	0.17	0.14	0.13	0.12	0.12
Greece	0.14	0.18	0.18	0.11	0.07	0.07
Hungary	0.18	0.16	0.14	0.12	0.11	0.09
Ireland	0.17	0.16	0.15	0.13	0.13	-
Italy	-	-	-	-	-	-
Latvia	0.10	0.09	0.08	0.07	0.06	0.06
Lithuania	0.12	0.11	0.10	0.08	0.08	0.07
Luxembourg	0.17	0.12	0.11	-	-	-
Malta	0.14	0.14	0.13	0.10	0.06	-
Netherlands	0.22	0.16	0.12	0.11	0.10	0.11
Norway	0.11	0.10	0.10	0.08	0.07	0.04

⁵⁶ EUROSTAT

Electricity cost € / kWh with taxes	Industrial consumer IA	Industrial consumer IB	Industrial consumer IC	Industrial consumer ID	Industrial consumer IE	Industrial consumer IF
	Consump. < 20 MWh	20 MWh < Consump. < 500 MWh	500 MWh < Consump. < 2 000 MWh	2 000 MWh < Consump. < 20 000 MWh	20 000 MWh < Consump. < 70 000 MWh	70 000 MWh < Consump. < 150 000 MWh
Poland	0.17	0.13	0.11	0.10	0.09	0.08
Portugal	0.16	0.11	0.09	0.08	0.07	0.06
Romania	0.13	0.12	0.11	0.09	0.08	0.07
Slovakia	0.20	0.17	0.14	0.13	0.12	0.10
Slovenia	0.17	0.15	0.11	0.09	0.08	0.08
Spain	0.16	0.14	0.11	0.10	0.08	0.07
Sweden	0.11	0.08	0.07	0.06	0.06	0.06
United Kingdom	0.15	0.13	0.11	0.10	0.10	0.10
Average EU-27	0.18	0.14	0.12	0.11	0.09	0.09

- : No data available/found

◆ Repair and maintenance cost

In the Energy Star LCC calculation tool, the maintenance cost for refrigeration and freezing appliances is negligible and fixed to zero.

Assuming similar maintenance costs across all refrigeration equipment, during the whole product life they comprise about 7 % of the Life Cycle Cost.⁴⁵ According to the responses to the 1st stakeholder questionnaire⁵⁷, repair as well as maintenance costs for blast refrigeration and freezers are around € 500 during the life of the product. For service cabinets, blast refrigeration and freezers, industrial process chillers, as well as packaged condensing units, leak tests are required when there is more than 3kg of HFC refrigerant in the product. Usually it is advised to have from 2 to 4 inspections per year which includes checks of pressure switches, replacing door seals and controllers.

It has been mentioned that maintenance actions for process chillers occur on a two-year basis. The cost of this maintenance is around 4% of the initial cost⁵⁸ for high temperature equipment, this figure could be more for low and medium temperature, since the components are less commonly produced.

2.6.4.2 Disposal cost

Refrigeration equipment is often renewed before reaching the end of its life, and is sold in the second-hand market (exported to Africa, Asia, or Eastern Europe) or sold to scrap metal dealers, implying a source of income.

⁵⁷ BIO Intelligence Service. *First ENTR Lot 1 online questionnaire to stakeholders*. Different versions of the questionnaire are available depending on the product category and can be downloaded from www.ecofreezercom.org/documents_1.php

⁵⁸ Lot 6: Air-conditioning and ventilation systems. Draft Task 2. 2010

A small fraction of the products however (mostly plug-ins) are treated at household refrigeration products' recycling plants. Less than 1% of the appliances found in these plants are commercial equipment⁴⁵. When disposed of in refrigerator recycling plants, the disposal costs depend on the weight and the volume of the commercial refrigeration equipment. In EU-27 Member States, this disposal cost varies between €60 and €250 per ton of equipment depending on many local factors such as electricity rates and staff wages⁵⁹.

The recovery of 500g of refrigerant liquid costs approximately €4 and recycling plants typically try to recycle the other material such as metal (e.g. steel, copper, aluminium).

Stakeholders have commented that refrigeration process chillers are sold for recycling at almost 100%; the only parts that not recycled are electronic and electrical components. A 4MW equipment can generate a profit of € 5,000 to € 10,000 at the end of its useful life in this way. In general, the refrigerant charge is 200 to 250g per kW of cooling capacity; this refrigerant must be collected as for the other equipment within the scope.

2.6.4.3 Interest and inflation rates

The following table shows the annual average inflation rate in 2008 for Member States of EU-27 and inflation and long term interest rates for 2007 as published by Eurostat.

Table 2-25: Interest and inflation rates for EU-27

Location	2008 Average Inflation rates %	2007 Long term Interest rates %
Austria	3.2	4.05
Belgium	4.5	4.06
Bulgaria	12	4.42
Cyprus	4.4	4.51
Czech Republic	6.3	-
Denmark	3.6	4.02
Estonia	10.6	-
Finland	3.9	4.05
France	3.2	4.07
Germany	2.8	4.02
Greece	4.2	4.29
Hungary	6	6.74
Ireland	3.1	4.04
Italy	3.5	4.26
Latvia	15.3	5.63
Lithuania	11.1	4.58
Luxembourg	4.1	-
Malta	4.7	4.73

⁵⁹ Source : Interview with Mr. Christoph Becker – RAL Quality Assurance Association for the Demanufacture of Refrigeration Equipment Containing CFCs

Location	2008 Average Inflation rates %	2007 Long term Interest rates %
Netherlands	2.2	4.07
Poland	4.2	5.5
Portugal	2.7	4.18
Romania	7.9	-
Slovakia	3.9	4.49
Slovenia	5.5	4.54
Spain	4.1	4.07
Sweden	3.3	3.93
United Kingdom	3.6	4.94
EU-27	3.7	4.63

- : No data available/found

2.7. CONCLUSIONS

In the absence of a single source for comprehensive market data, current sales and stock of refrigeration equipment have been derived from a variety of sources. The accuracy of the figures presented may be challenged; they clearly show, however, that the yearly sales of the products are higher than the volume threshold set in the Eco-design Directive (apart from industrial process chillers and blast cabinets).

Existing data also highlights the slow growth of the refrigeration products market, with low CAGR, a high proportion of replacement sales, long redesign cycles, and long product lifetimes. This could limit rapid integration of any new technologies introduced to the market and the recent economic contraction and slowing of growth may have reduced sales, compared to the recent past. However, increased use of central catering and use of refrigeration over freezing to store “fresh” food, as opposed to using frozen foods in food preparation, and greater use of blast chilling to raise hygiene levels and food quality for example, may mitigate some of the effects of contraction in the market.

The main product trends are as follows:

- move toward packaged, plug-in products to avoid the need for trained installers;
- improved control systems to maximise system efficiency; and
- increased use of HCs and CO₂ to reduce environmental impact and pre-empt regulation.

The data presented in Task 2 will play a part in formulating the Base Cases. Product price and lifetime data described in Task 2 are also key inputs for further analysis in Tasks 4 and 6.

ANNEXES

This page is left intentionally blank

Annex 2-1 PRODCOM and EUROSTAT data

The Eurostat database gives a first overview of the refrigeration sector in the EU. This database uses the PRODCOM⁶⁰ classification, and contains market data:

- per number of units and value (€);
- for the EU-27 or per country; and
- per year since 1995.

Even though the PRODCOM classification is not detailed enough to describe all the products identified in Task 1⁶¹, the following product categories have been identified as relevant to this project:

- 29.23.13.33: Refrigerated show-cases and counters incorporating a refrigerating unit or evaporator for frozen food storage;
- 29.23.13.35: Refrigerated show-cases and counters incorporating a refrigerating unit or evaporator (excluding for frozen food storage);
- 29.23.13.40: Deep-freezing refrigerating furniture (excluding chest freezers of a capacity ≤ 800 litres, upright freezers of a capacity ≤ 900 litres);
- 29.23.13.50: Refrigerating furniture (excluding for deep-freezing show-cases and counters incorporating a refrigerating unit or evaporator);
- 29.23.13.90: Other refrigerating or freezing equipment;
- 29.71.11.10: Combined refrigerators-freezers, with separate external doors;
- 29.71.11.35: Compression-type built-in refrigerators;
- 29.71.11.50: Chest freezers of a capacity ≤ 800 litres;
- 29.71.11.70: Upright freezers of a capacity ≤ 900 litres.

The PRODCOM statistics have the advantage of being the official data source in the EU (hence they are used and referenced in other EU policy documents regarding trade and economic policy, providing consistency).

Table 2-26 summarises the relevant data and gives an overview of the production, imports, exports⁶² and apparent consumption⁶³ for the nine identified PRODCOM categories in units and million Euros for the EU-27 for the latest 3 years for which data are available.

⁶⁰ Prodcom Classification: List of PRODUcts of the European COMMunity

⁶¹ See BIO Intelligence Service. *Working document on Task 1 published on 04/05/2009*. 2009 available at www.ecofreezercom.org

⁶² Data for Imports and exports provided in Table 2-26 include both intra-EU and extra-EU trade

⁶³ Apparent consumption is defined as production + imports - exports

Table 2-26 Overview of the Eurostat EU-27 economic data for relevant product categories

		2005				2006				2007			
		Prod.	Imp.	Exp.	Calculated apparent consump.	Prod.	Imp.	Exp.	Calculated apparent consump.	Prod.	Imp.	Exp.	Calculated apparent consump.
29231333	M. unit	0.5	0.0	0.1	0.4	0.4	0.2	0.2	0.4	0.6	2.1	1.0	1.6
	x10 ⁶ €	595.1	4.9	60.6	539.5	512.4	11.6	101.2	422.8	698.1	24.1	125.3	596.9
29231335	M. unit	0.8	0.2	0.6	0.4	0.8	0.4	0.4	0.8	0.8	0.5	0.4	0.9
	x10 ⁶ €	1,110.2	63.9	264.9	909.2	1,241.6	92.5	334.2	999.9	1,389.0	112.9	359.2	1,142.7
29231340	M. unit	0.6	0.0	0.0	0.5	0.7	0.0	0.1	0.6	0.7	0.0	0.1	0.7
	x10 ⁶ €	446.8	4.5	22.0	429.3	561.6	4.1	29.1	536.6	595.8	5.2	26.1	575.0
29231350	M. unit	0.8	1.7	0.3	2.2	0.7	0.8	0.7	0.8	0.7	0.7	0.7	0.7
	x10 ⁶ €	981.9	55.7	163.7	873.9	989.5	75.8	198.2	867.1	1,063.5	79.0	197.5	945.0
29231390	M. unit	4.0	N/A	N/A	N/A	4.8	N/A	N/A	N/A	3.0	N/A	N/A	N/A
	x10 ⁶ €	2,481.3	283.4	380.3	2,384.4	2,994.8	162.2	362.7	2,794.3	3,289.8	233.9	556.8	2,966.9
29711110	M. unit	7.5	N/A	N/A	N/A	7.3	2.9	1.4	8.8	8.0	3.4	1.6	9.8
	x10 ⁶ €	1,888.2	665.7	308.8	2,245.0	1,803.6	786.6	346.7	2,243.5	2,081.7	824.0	419.1	2,486.6
29711135	M. unit	3.2	0.1	0.1	3.2	3.3	0.1	0.1	3.3	3.2	0.3	0.1	3.3
	x10 ⁶ €	664.7	10.4	29.1	646.0	682.4	17.0	35.4	664.0	681.3	27.9	41.2	668.0
29711150	M. unit	3.3	N/A	N/A	N/A	3.5	0.3	0.8	3.0	3.2	0.5	0.7	3.0
	x10 ⁶ €	681.9	33.1	129.6	585.4	746.8	38.2	121.8	663.2	616.7	58.4	125.7	549.3
29711170	M. unit	2.4	N/A	N/A	N/A	2.4	0.7	0.3	2.8	2.5	1.6	0.4	3.7
	x10 ⁶ €	543.0	95.0	65.2	572.9	530.8	91.2	73.5	548.4	585.9	121.9	93.7	614.1
Total	M. unit	23.1	2.0	1.1	24.0	23.9	5.5	3.9	25.4	22.7	9.0	4.9	26.8
	x10 ⁶ €	9,393.1	1,216.6	1,424.1	9,185.6	10,063.5	1,279.1	1,602.8	9,739.8	11,001.8	1,487.3	1,944.5	10,544.5

2.7.1.1 EU Production

Figure 2-7 provides Member State (MS) level PRODCOM data for the EU-27 production for the nine PRODCOM categories mentioned above, for the most recent year for which data is available (2007). The aggregated estimates for the whole EU-15, EU-25 and EU-27 are also from the PRODCOM database.

The production volume in EU-27 for the combined nine PRODCOM categories in 2007 is **22.7 million units** corresponding to a total production value of **€11,000 million**. Figure 2-7 gives the distribution per MS.

The PRODCOM data is not complete and some countries appear to have no production activity although this is probably not the case. The PRODCOM statistics show that leading MS in terms of production of commercial refrigeration products are: Italy, Germany, France, Poland, Spain, UK, Finland and the Netherlands.

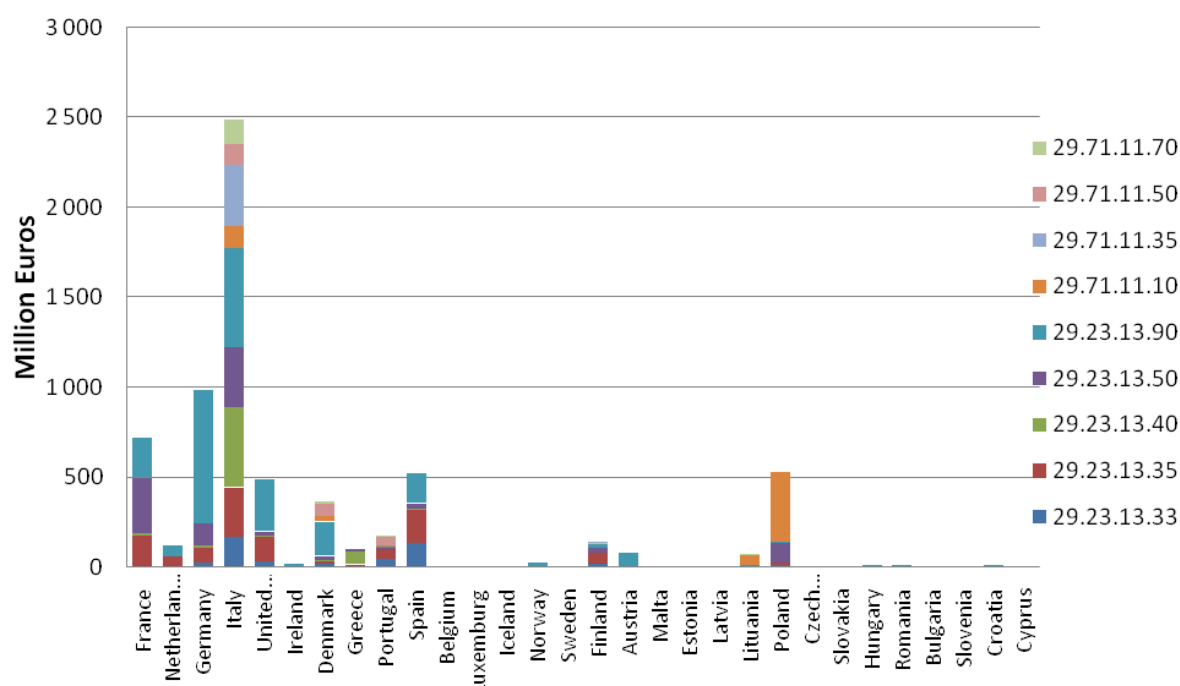


Figure 2-7: EU-27 production of commercial refrigeration equipment in 2007

2.7.1.2 EU Trade

◆ EU imports and exports

Annex 2-3 and Annex 2-4 present the PRODCOM data on intra- and extra- EU-27 imports and exports for the nine identified categories of PRODCOM per MS and for the EU-27 as a whole.

Figure 2-8 and Figure 2-9 present the imports and exports distribution per MS in million Euros for the year 2007.

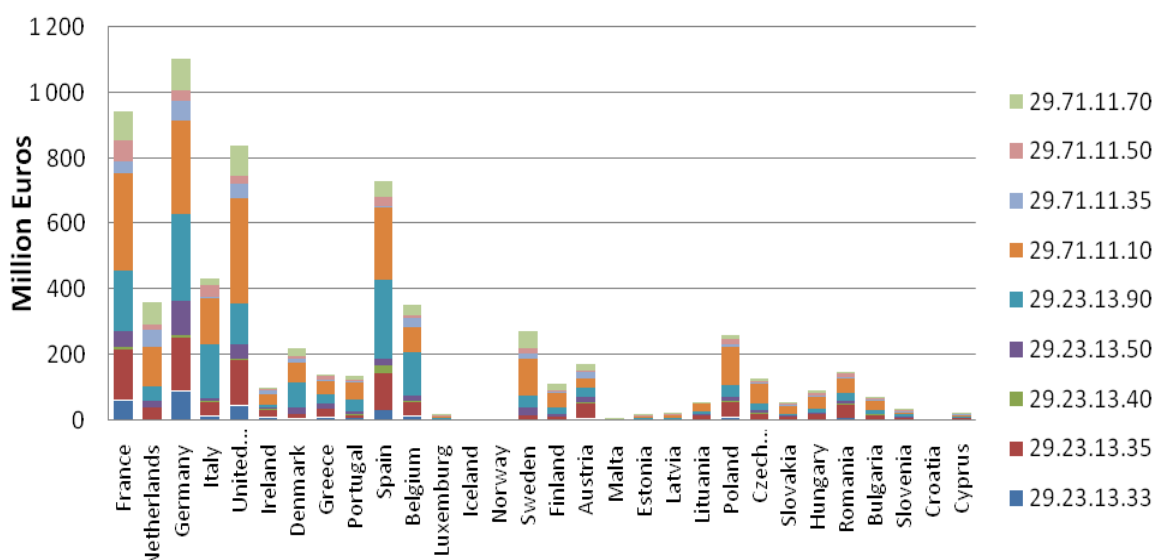


Figure 2-8: EU-27 commercial refrigeration equipment imports in 2007

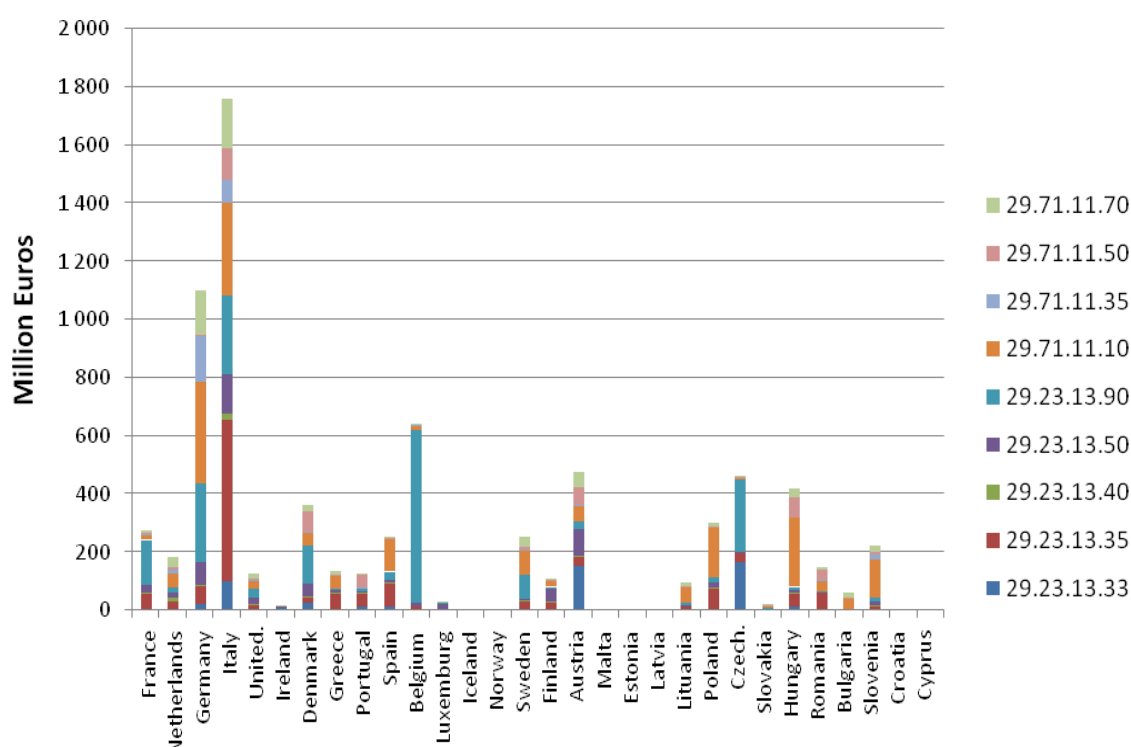


Figure 2-9: EU-27 commercial refrigeration equipment exports in 2007

In the Eurostat database, the breakdown of the imports and exports into intra- and extra-EU-25 data is given according to the Harmonised System (HS) classification or according to the Combined Nomenclature (CN). Table 2-27 gives the equivalence between the PRODCOM, the HS and CN classifications.

Table 2-27: Equivalence between the PRODCOM, HS, and CN classifications

PRODCOM	Designation	CN8	HS6
29.23.13.33	Refrigerated showcases and counters incorporating a refrigerating unit or evaporator for frozen food storage	8418.50.11	8418.50
29.23.13.35	Refrigerated showcases and counters incorporating a refrigerating unit or evaporator (excluding for frozen food storage)	8418.50.19	
29.23.13.40	Deep-freezing refrigerating furniture (excluding chest freezers of a capacity ~ 800 litres. Upright freezers of a capacity ~ 900 litres)	8418.50.91	
29.23.13.50	Refrigerating furniture (excluding for deep freezing showcases and counters incorporating a refrigerating unit or evaporator)	8418.50.99	
29.23.13.90	Other refrigerating or freezing equipment	8418.69	8418.69
29.71.11.10	Combined refrigerators-freezers, with separate external doors	8418.10	8418.10
29.71.71.35	Compression-type built-in refrigerators	8418.21.59	8418.21
29.71.11.50	Chest freezers of a capacity <= 800 litres	8418.30	8418.30
29.71.11.70	Upright freezers of a capacity <= 900 litres	8418.40	8418.40

Annex 2-6 and Annex 2-7 present the breakdown of the extra EU-27 imports and exports by country of destination and of provenance according to the Eurostat HS6 data.

The total extra-EU-27 imports and extra-EU-27 exports for 2008 for the six HS6 categories amounted respectively to **€1,988 million** (57% of the total intra- and extra-EU-27 imports) and **€1,978 million** (50 % of the total intra- and extra-EU-27 exports).

The main countries of origin of imported commercial refrigeration equipment in EU-27 are China, Turkey, South Korea, and the US (see Figure 2-10). The main countries of destination for exported EU-27 commercial refrigeration equipment are Russia, Switzerland, Norway, and the US (see Figure 2-11).

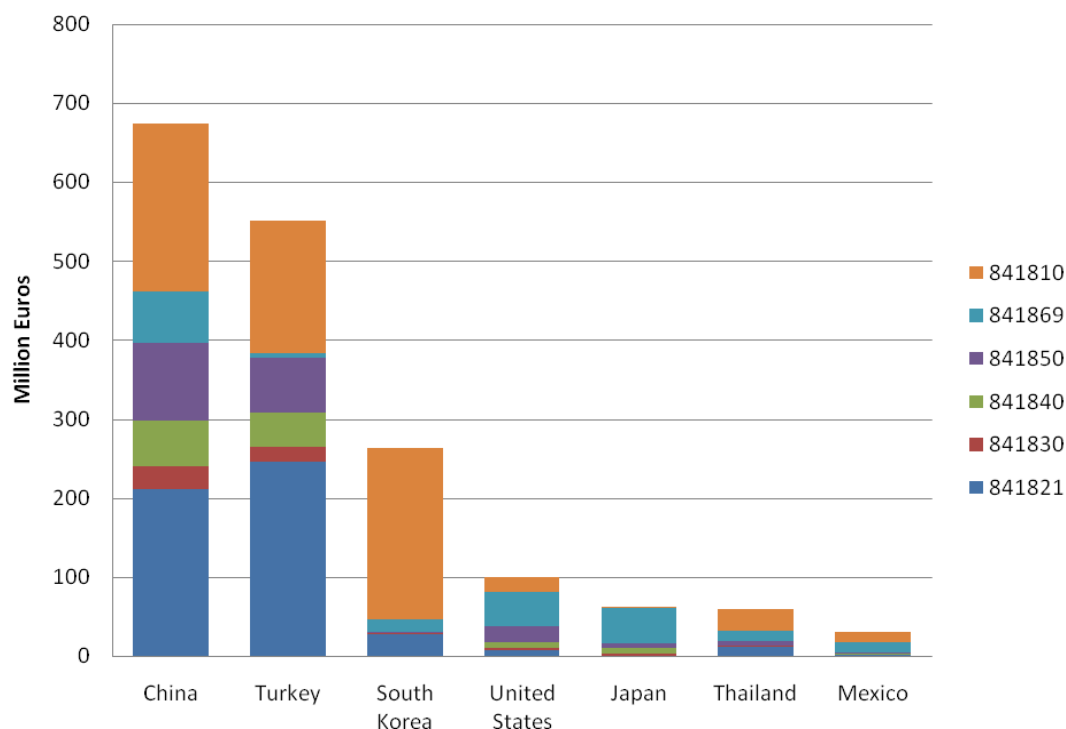


Figure 2-10: Extra-EU imports per major country of provenance in 2008

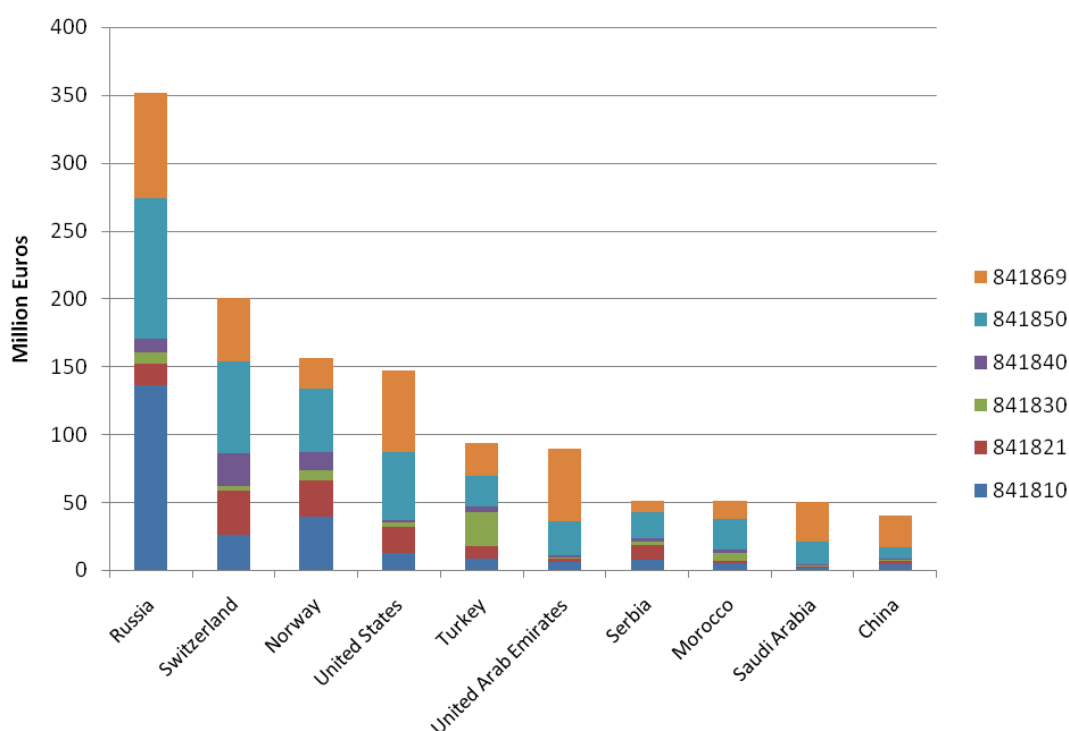


Figure 2-11: Extra-EU exports per major country of destination in 2008

2.7.1.3 Apparent EU consumption

Annex 2-5 shows the apparent consumption (defined as “production + imports – exports”) of commercial refrigerators and freezers as calculated from the official

Eurostat data. The total EU-27 apparent consumption for the year 2007 is estimated at **€10,544 million** and **26.8 million units**.

2.7.2. METHODOLOGICAL ISSUES RELATED TO THE USE OF PRODCOM DATA

As described, PRODCOM data are based on products whose definitions are standardised across the European community and thus allow comparability between MS data. The PRODCOM statistics also have the advantage of being the official EU source, used and referenced in other EU policy documents regarding trade and economic policy, hence guaranteeing EU consistency.

However, the quality of these data can be challenged as the PRODCOM classification of ENTR Lot 1 products is not detailed enough to cover all the products identified in Task 1. Moreover, the PRODCOM categories do not explicitly state the product categories covered by each PRODCOM code.

PRODCOM classifies commercial refrigerators and freezers in the category NACE 29.23 – “Manufacture of non-domestic cooling and ventilation equipment”. Commercial refrigerators and freezers explicitly appear in this classification. However, few criteria are used to identify the different types of products. In addition, as some of the commercial refrigerating and freezing equipment are similar to household equipment (e.g. service cabinets, hotel minibars), a degree of overlap between commercial and domestic refrigerating and freezing equipment may occur.

Hence, these datasets will not be used for the purpose of this study and instead stock data will be calculated using sales data, as presented in the next section.

Annex 2-2 Eurostat EU-27 production of lot 1 relevant products (2007)⁶⁴

2007 Production	29231333		29231335		29231340		29231350	
	x10 ³ units	x10 ⁶ €	x10 ³ units	x10 ⁶ €	x10 ³ units	x10 ⁶ €	x10 ³ units	x10 ⁶ €
France	-	-	-	169.8	-	19.9	-	308.4
Netherlands	-	-	4.1	57.6	0.0	0.0	-	-
Germany	1.2	24.7	13.4	76.9	11.0	22.0	55.0	119.4
Italy	146.6	167.6	114.4	274.2	578.1	450.3	212.5	329.7
United Kingdom	5.5	26.6	37.2	143.0	1.5	3.0	-	24.8
Ireland	-	-	-	2.6	-	-	0.0	0.0
Denmark	61.7	18.9	48.3	15.2	0.5	1.8	50.1	26.2
Greece	1.6	1.5	20.2	10.6	70.8	75.5	21.8	13.6
Portugal	29.4	46.4	60.4	50.4	6.9	3.9	11.8	8.7
Spain	50.8	131.5	197.1	183.9	4.6	7.4	37.4	31.9
Belgium	-	-	-	-	-	-	0.0	0.0
Luxemburg	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Iceland	0.0	0.0	0.0	0.0	0.0	0.0	-	-
Norway	0.0	0.0	-	-	-	-	-	-
Sweden	-	-	-	-	0.0	0.0	-	-
Finland	11.7	18.6	63.2	62.8	0.0	0.0	14.5	23.4
Austria	-	-	-	-	0.0	0.0	-	-
Malta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Estonia	0.0	0.0	0.0	0.0	0.0	0.0	-	-
Latvia	0.0	0.0	0.0	0.0	0.0	0.0	-	-
Lithuania	0.0	0.0	0.0	0.0	0.0	0.0	19.3	5.1
Poland	8.1	11.2	8.9	9.1	0.7	5.1	134.0	109.8
Czech Republic	-	-	-	-	-	-	-	-
Slovakia	-	-	-	-	0.0	0.0	0.0	0.0
Hungary	-	-	-	-	0.0	0.0	-	-
Romania	-	-	13.9	2.9	-	-	-	-
Bulgaria	1.9	2.5	2.0	2.2	-	-	-	-
Slovenia	-	-	0.0	0.0	-	-	0.0	0.0
Croatia	-	-	-	-	0.0	0.0	0.0	0.0
Cyprus	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
EU-15 TOTALS	-	-	-	-	-	-	-	-
EU-25 TOTALS	583.5	694.9	744.5	1,383.8	691.6	595.8	718.3	1,059.5
EU-27 TOTALS	585.9	698.1	760.4	1,389.0	691.7	595.8	734.3	1,063.5

⁶⁴ Countries presented by date of entry into the EU

2007	29231390		29711110		29711135		29711150		29711170	
Production	x10 ³ units	x10 ⁶ €	x10 ³ units	x10 ⁶ €	x10 ³ units	x10 ⁶ €	x10 ³ units	x10 ⁶ €	x10 ³ units	x10 ⁶ €
France	-	220.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Netherlands	-	61.3	-	-	0.0	0.0	0.0	0.0	0.0	0.0
Germany	212.3	742.8	-	-	-	-	0.0	0.0	-	-
Italy	213.1	549.7	606.4	122.8	1,944.5	341.4	909.7	119.3	694.5	132.0
United Kingdom	223.2	289.2	-	-	-	-	-	-	-	-
Ireland	94.8	15.4	0.0	0.0	0.0	0.0	-	-	-	-
Denmark	16.5	187.8	77.3	29.4	0.0	0.0	321.2	73.3	19.3	13.1
Greece	-	-	-	-	-	-	0.0	0.0	-	-
Portugal	1.5	3.3	11.2	1.9	0.0	0.0	286.6	52.6	13.5	4.7
Spain	1,078.2	164.1	-	-	0.0	0.0	0.0	0.0	0.0	0.0
Belgium	-	-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Luxemburg	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Iceland	-	-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Norway	0.6	24.5	0.0	0.0	-	-	0.0	0.0	0.0	0.0
Sweden	-	-	-	-	0.0	0.0	0.0	0.0	-	-
Finland	4.0	22.2	10.3	8.8	1.0	0.2	0.0	0.0	3.1	1.2
Austria	13.9	80.4	-	-	0.0	0.0	-	-	0.0	0.0
Malta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Estonia	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Latvia	-	-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Lithuania	0.2	2.7	343.2	57.0	5.6	0.6	0.0	0.0	70.8	10.6
Poland	-	2.4	1,689.9	387.8	0.0	0.0	0.0	0.0	-	-
Czech Republic	-	-	-	-	0.0	0.0	0.0	0.0	-	-
Slovakia	-	-	0.0	0.0	0.0	0.0	0.0	0.0	-	-
Hungary	32.7	12.0	-	-	-	-	-	-	-	-
Romania	7.4	3.7	847.8	-	-	-	-	-	-	-
Bulgaria	0.7	-	-	-	0.0	0.0	-	-	0.2	0.1
Slovenia	3.2	3.0	-	-	-	-	-	-	-	-
Croatia	15.4	7.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cyprus	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
EU-15 TOTALS	-	-	-	-	-	-	-	-	-	-
E-25 TOTALS	3,016.2	3,281.8	6,996.1	1,841.7	3,206.1	600.0	2,953.8	584.7	2,392.6	573.9
E-27 TOTALS	3,024.3	3,289.8	8,016.1	2,081.7	3,218.1	681.3	3,193.8	616.7	2,472.6	585.9

Annex 2-3 Eurostat EU-27 Imports of lot 1 relevant products (2007)

2007 Imports	29231333		29231335		29231340		29231350	
	x10 ³ units	x10 ⁶ €	x10 ³ units	x10 ⁶ €	x10 ³ units	x10 ⁶ €	x10 ³ units	x10 ⁶ €
France	52.8	61.0	233.7	152.7	10.8	8.9	145.5	48.5
Netherlands	5.4	1.8	88.2	38.4	26.4	0.8	102.7	18.5
Germany	79.6	89.4	223.9	161.5	9.8	11.0	318.7	102.1
Italy	22.3	13.8	58.8	41.1	3.2	3.3	79.3	10.8
United Kingdom	2,054.0	45.8	431.9	139.5	8.1	2.4	190.8	45.8
Ireland	5.8	8.7	39.1	25.6	1.1	0.4	25.7	6.8
Denmark	3.8	4.4	20.6	16.0	0.7	0.2	116.3	19.2
Greece	43.5	10.4	150.9	21.8	10.3	4.1	97.4	14.4
Portugal	2.8	6.8	11.1	11.6	0.6	0.6	26.1	7.3
Spain	48.3	31.9	201.3	110.6	18.1	26.2	295.2	18.9
Belgium	9.2	12.2	87.0	45.6	1.3	2.0	36.1	17.4
Luxemburg	0.5	0.4	2.5	2.7	1.0	0.2	6.4	2.8
Iceland	-	-	-	-	-	-	-	-
Norway	-	-	-	-	-	-	-	-
Sweden	1.8	3.8	17.9	11.0	3.3	1.8	68.6	25.5
Finland	2.5	3.7	10.5	8.5	0.1	0.6	21.2	8.7
Austria	7.6	5.7	36.2	48.5	3.4	1.9	45.7	15.6
Malta	0.7	0.4	1.9	1.5	0.0	0.1	0.6	0.9
Estonia	1.3	2.1	2.2	1.0	0.0	0.0	7.5	3.0
Latvia	0.7	0.5	3.7	3.4	1.2	0.7	2.7	1.2
Lithuania	1.8	1.1	13.4	15.2	0.1	0.1	4.2	2.1
Poland	18.8	9.4	71.0	49.8	0.5	1.0	20.1	12.1
Czech Republic	10.1	2.5	64.0	19.5	1.6	1.1	21.0	7.6
Slovakia	2.1	2.4	18.9	11.1	0.6	0.3	1.7	1.8
Hungary	2.3	2.3	19.8	18.0	0.5	0.3	9.1	2.4
Romania	14.7	7.5	87.9	43.5	1.6	1.1	23.5	7.0
Bulgaria	0.9	0.8	34.6	17.2	0.9	0.5	10.9	3.0
Slovenia	2.6	2.1	8.2	8.8	0.0	0.1	2.4	1.6
Croatia	-	-	-	-	-	-	-	-
Cyprus	1.2	1.5	5.2	8.4	0.7	0.3	11.5	1.7
EU-15 TOTALS	-	-	-	-	-	-	-	-
EU-25 TOTALS	2,067.9	24.4	546.3	123.2	15.3	5.1	686.9	78.1
EU-27 TOTALS	2,065.3	24.1	522.9	112.9	16.3	5.2	694.9	79.0

2007 Imports	29231390		29711110		29711135		29711150		29711170	
	x10 ³ units	x10 ⁶ €	x10 ³ units	x10 ⁶ €	x10 ³ units	x10 ⁶ €	x10 ³ units	x10 ⁶ €	x10 ³ units	x10 ⁶ €
France	-	187.2	1,219.9	297.0	188.3	35.5	454.5	66.1	412.9	86.3
Netherlands	-	46.4	496.4	118.7	242.3	51.9	89.6	16.5	387.7	66.7
Germany	-	267.2	1,124.5	283.0	442.7	59.8	172.6	35.1	575.0	94.4
Italy	-	162.3	630.0	140.9	15.7	4.2	216.9	37.0	118.1	18.6
United Kingdom	-	124.8	1,233.4	318.5	249.7	46.0	295.6	23.8	1,263.0	93.9
Ireland	-	7.4	107.3	32.4	58.7	10.6	29.5	4.0	26.9	5.3
Denmark	-	76.6	202.5	61.7	59.6	9.5	51.3	9.2	98.5	22.1
Greece	-	31.0	129.2	42.1	5.8	1.9	73.5	11.5	13.6	3.3
Portugal	-	37.6	233.4	54.8	8.0	1.8	42.0	5.8	42.3	8.4
Spain	-	242.5	711.1	219.5	25.5	5.9	192.6	27.3	185.4	45.8
Belgium	-	132.7	276.6	74.4	116.3	26.9	55.1	10.7	135.2	33.0
Luxemburg	-	3.2	14.3	6.1	6.5	1.9	2.6	0.4	6.6	1.9
Iceland	-	-	-	-	-	-	-	-	-	-
Norway	-	-	-	-	-	-	-	-	-	-
Sweden	-	34.3	397.9	111.0	82.9	18.4	99.6	14.8	193.9	51.5
Finland	-	19.3	158.5	45.3	10.6	2.1	30.0	4.6	72.9	18.8
Austria	-	26.9	98.6	28.7	104.6	21.0	19.4	3.7	98.7	19.9
Malta	-	1.5	6.4	1.8	0.6	0.2	2.5	0.4	2.4	0.8
Estonia	-	1.8	37.6	8.4	7.2	1.5	1.1	0.2	3.2	0.6
Latvia	-	2.6	53.4	11.9	2.7	0.6	1.7	0.3	5.5	1.2
Lithuania	-	8.2	113.1	27.5	3.4	0.7	2.3	0.6	12.4	2.7
Poland	-	34.7	534.2	117.0	42.0	7.6	103.5	15.7	78.8	13.1
Czech Republic	-	20.6	289.0	62.5	13.9	2.3	27.6	5.1	55.4	7.8
Slovakia	-	3.7	114.9	29.4	3.0	0.7	14.7	3.2	17.6	3.5
Hungary	-	12.9	182.9	38.0	34.6	4.3	33.6	5.8	58.9	9.9
Romania	-	25.1	251.7	48.0	1.9	0.3	71.5	10.6	26.4	5.1
Bulgaria	-	9.5	142.5	33.1	3.1	0.7	25.7	5.2	20.8	3.3
Slovenia	-	6.2	36.3	8.1	28.1	3.1	21.6	3.2	14.2	2.4
Croatia	-	-	-	-	-	-	-	-	-	-
Cyprus	-	1.1	19.8	7.8	2.0	0.6	5.3	1.4	3.5	1.1
EU-15 TOTALS	-	-	-	-	-	-	-	-	-	-
EU-25 TOTALS	-	230.4	3,564.0	859.7	270.6	31.7	492.4	62.5	1,765.1	142.6
EU-27 TOTALS	-	233.9	3,356.2	824.0	251.8	27.9	474.1	58.4	1,632.0	121.9

Annex 2-4 Eurostat EU-27 Exports of lot 1 relevant products (2007)

2007 Exports	29231333		29231335		29231340		29231350	
	x10 ³ units	x10 ⁶ €	x10 ³ units	x10 ⁶ €	x10 ³ units	x10 ⁶ €	x10 ³ units	x10 ⁶ €
France	0.5	1.8	24.7	56.7	4.6	4.9	71.8	24.4
Netherlands	0.2	0.1	203.5	28.6	229.8	13.8	86.2	16.8
Germany	8.9	20.6	45.0	62.4	1.8	4.3	106.2	78.7
Italy	122.7	100.7	384.7	553.7	60.6	22.9	149.5	136.4
United Kingdom	2.9	4.3	25.3	15.1	1.4	1.0	544.7	22.6
Ireland	8.9	11.5	2.4	2.4	0.1	0.0	1.4	0.8
Denmark	52.2	24.5	61.9	22.5	0.3	0.2	120.4	45.9
Greece	0.8	0.2	234.0	60.9	0.7	0.3	23.1	9.8
Portugal	10.8	11.0	56.6	50.7	0.7	0.3	4.9	4.5
Spain	5.9	14.2	82.0	76.9	11.8	5.1	49.0	10.6
Belgium	0.4	0.3	47.5	15.0	0.1	0.1	20.4	10.0
Luxemburg	0.4	1.0	1.9	4.4	0.0	0.0	12.4	18.9
Iceland	-	-	-	-	-	-	-	-
Norway	-	-	-	-	-	-	-	-
Sweden	0.7	3.0	19.1	28.9	1.3	3.7	16.6	5.6
Finland	3.2	2.6	49.7	29.0	0.1	0.3	22.7	42.7
Austria	204.3	152.2	20.9	35.5	1.4	1.3	202.9	92.9
Malta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Estonia	0.0	0.0	0.1	0.1	0.1	0.0	0.7	0.2
Latvia	0.1	0.4	0.6	1.7	0.1	0.0	0.2	0.2
Lithuania	0.7	1.6	24.1	17.0	0.1	0.3	1.4	0.8
Poland	4.8	3.6	109.5	75.8	1.3	1.1	17.2	14.2
Czech Republic	859.5	166.2	91.5	33.4	0.1	0.3	3.4	0.7
Slovakia	0.1	0.4	4.1	8.1	0.0	0.0	2.7	0.6
Hungary	9.1	12.6	49.9	47.6	0.0	0.0	21.5	9.0
Romania	0.1	0.0	122.0	66.1	0.0	0.0	0.1	0.1
Bulgaria	0.1	0.0	0.7	0.4	0.1	0.0	0.2	0.1
Slovenia	1.1	2.0	15.0	13.4	3.3	2.5	17.2	10.8
Croatia	-	-	-	-	-	-	-	-
Cyprus	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2
EU-15 TOTALS	-	-	-	-	-	-	-	-
EU-25 TOTALS	1,031.1	136.7	440.1	381.8	53.3	27.2	722.4	202.4
EU-27 TOTALS	1,010.0	125.3	372.2	359.2	52.4	26.1	712.8	197.5

2007 Exports	29231390		29711110		29711135		29711150		29711170	
	x10 ³ units	x10 ⁶ €	x10 ³ units	x10 ⁶ €	x10 ³ units	x10 ⁶ €	x10 ³ units	x10 ⁶ €	x10 ³ units	x10 ⁶ €
France	-	154.6	68.0	18.7	12.5	3.2	17.3	3.5	16.4	7.4
Netherlands	-	17.3	216.3	50.8	55.0	13.4	36.8	9.0	174.3	34.8
Germany	-	270.8	800.7	351.2	541.7	154.1	12.0	4.0	501.3	155.7
Italy	-	268.7	1,341.7	319.6	455.3	77.7	685.3	111.5	697.7	168.3
United Kingdom	-	31.9	130.2	26.8	10.3	2.5	58.4	6.6	76.5	17.4
Ireland	-	2.1	3.7	1.3	1.3	0.4	0.3	0.1	0.3	0.1
Denmark	-	128.8	153.3	48.5	13.7	2.4	298.0	69.7	40.4	19.5
Greece	-	1.5	110.4	47.3	13.0	2.2	2.9	0.8	72.2	10.7
Portugal	-	9.8	12.2	3.0	0.1	0.0	265.3	45.0	15.0	2.6
Spain	-	26.4	522.2	113.8	3.3	0.5	11.1	1.8	11.7	2.3
Belgium	-	593.9	77.8	18.8	6.0	1.2	9.8	1.3	14.8	2.8
Luxemburg	-	3.1	5.2	3.6	1.7	0.5	0.2	0.0	0.5	0.2
Iceland	-	-	-	-	-	-	-	-	-	-
Norway	-	-	-	-	-	-	-	-	-	-
Sweden	-	80.0	259.5	83.9	18.6	5.7	47.3	6.2	129.3	35.0
Finland	-	6.5	50.4	23.9	1.8	0.6	0.3	0.1	2.5	1.9
Austria	-	22.6	86.8	54.6	18.8	5.9	249.5	59.8	187.2	51.4
Malta	-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Estonia	-	0.2	0.5	0.1	0.1	0.0	0.0	0.0	0.0	0.0
Latvia	-	0.6	1.6	0.7	0.1	0.0	0.1	0.1	0.0	0.0
Lithuania	-	5.1	342.6	58.7	4.3	0.5	0.2	0.1	71.3	10.9
Poland	-	17.7	672.2	169.8	36.7	5.4	15.3	1.7	78.7	12.4
Czech Republic	-	248.3	34.0	9.3	5.3	0.6	2.2	0.4	6.9	3.2
Slovakia	-	0.5	19.7	9.3	0.0	0.0	1.0	0.2	3.4	0.7
Hungary	-	11.6	1,282.5	237.1	29.7	3.3	486.1	68.4	253.9	29.8
Romania	-	0.0	254.5	39.2	0.0	0.0	274.0	36.2	63.8	8.4
Bulgaria	-	0.5	199.0	42.2	0.1	0.0	0.8	0.2	121.1	17.0
Slovenia	-	13.4	584.7	131.1	132.6	18.0	48.0	7.9	132.1	23.9
Croatia	-	-	-	-	-	-	-	-	-	-
Cyprus	-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
EU-15 TOTALS	-	-	-	-	-	-	-	-	-	-
EU-25 TOTALS	-	577.0	1,688.6	449.0	132.0	41.9	571.5	114.2	354.2	95.1
EU-27 TOTALS	-	556.8	1,554.6	419.1	129.2	41.2	699.3	125.7	356.5	93.7

Annex 2-5 Eurostat EU-27 apparent consumption for year 2007

2007	29231333	29231335	29231340	29231350
------	----------	----------	----------	----------

Apparent consumption	x10 ³ units	x10 ⁶ €	x10 ³ units	x10 ⁶ €	x10 ³ units	x10 ⁶ €	x10 ³ units	x10 ⁶ €
France	52.3	59.2	209.0	265.8	6.2	23.9	73.8	332.5
Netherlands	5.2	1.7	-111.2	67.3	-203.4	-13.0	16.5	1.7
Germany	72.0	93.5	192.3	176.0	19.1	28.7	267.5	142.8
Italy	46.2	80.8	-211.6	-238.4	520.6	430.7	142.3	204.1
United Kingdom	2,056.7	68.1	443.8	267.5	8.3	4.4	-353.9	48.0
Ireland	-3.0	-2.9	36.7	25.8	1.0	0.3	24.2	5.9
Denmark	13.3	-1.2	7.0	8.7	1.0	1.8	46.0	-0.5
Greece	44.2	11.6	-62.9	-28.5	80.5	79.3	96.2	18.2
Portugal	21.4	42.3	14.8	11.2	6.8	4.2	33.0	11.5
Spain	93.2	149.2	316.3	217.6	11.0	28.6	283.7	40.1
Belgium	8.8	11.8	39.5	30.5	1.2	1.9	15.7	7.3
Luxemburg	0.1	-0.6	0.6	-1.7	1.0	0.2	-5.9	-16.1
Iceland	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Norway	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sweden	1.1	0.8	-1.1	-17.9	2.0	-1.9	51.9	19.8
Finland	11.0	19.7	23.9	42.3	0.0	0.4	13.0	-10.7
Austria	-196.8	-146.5	15.3	13.1	2.0	0.6	-157.1	-77.3
Malta	0.7	0.4	1.9	1.5	0.0	0.1	0.6	0.9
Estonia	1.3	2.1	2.1	0.9	0.0	0.0	6.8	2.8
Latvia	0.6	0.1	3.1	1.7	1.1	0.7	2.4	1.1
Lithuania	1.1	-0.5	-10.8	-1.8	-0.1	-0.2	22.1	6.4
Poland	22.1	17.0	-29.6	-16.9	-0.1	5.1	136.8	107.7
Czech Republic	-849.4	-163.7	-27.5	-13.9	1.5	0.8	17.6	6.9
Slovakia	2.0	1.9	14.8	3.0	0.6	0.3	-1.0	1.2
Hungary	-6.9	-10.3	-30.1	-29.6	0.5	0.3	-12.4	-6.6
Romania	14.6	7.5	-20.2	-19.6	1.6	1.1	23.4	6.9
Bulgaria	2.7	3.2	35.9	19.0	0.8	0.5	10.7	2.9
Slovenia	1.5	0.0	-6.8	-4.7	-3.3	-2.4	-14.7	-9.2
Croatia	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cyprus	1.2	1.5	5.2	8.4	0.7	0.3	11.5	1.6
EU-15 TOTALS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
EU-25 TOTALS	1,620.3	582.5	850.6	1,125.3	653.6	573.8	682.8	935.2
EU-27 TOTALS	1,641.3	596.9	911.1	1,142.7	655.6	575.0	716.5	945.0

2007	29231390	29711110	29711135	29711150	29711170
------	----------	----------	----------	----------	----------

Apparent consumption	x10 ³ units	x10 ⁶ €	x10 ³ units	x10 ⁶ €	x10 ³ units	x10 ⁶ €	x10 ³ units	x10 ⁶ €	x10 ³ units	x10 ⁶ €
France	0.0	253.0	1,151.9	278.2	175.8	32.3	437.2	62.6	396.4	78.9
Netherlands	0.0	90.5	280.1	67.9	187.3	38.4	52.8	7.5	213.4	31.9
Germany	212.3	739.2	323.8	-68.2	-99.0	-94.3	160.6	31.1	73.6	-61.3
Italy	213.1	443.2	-105.2	-55.9	1,504.9	267.9	441.3	44.7	115.0	-17.8
United Kingdom	223.2	382.1	1,103.2	291.7	239.4	43.5	237.2	17.2	1,186.5	76.5
Ireland	94.8	20.7	103.6	31.1	57.4	10.2	29.3	3.9	26.6	5.2
Denmark	16.5	135.7	126.5	42.6	45.8	7.1	74.6	12.8	77.5	15.7
Greece	0.0	29.4	18.8	-5.2	-7.2	-0.3	70.6	10.6	-58.6	-7.4
Portugal	1.5	31.1	232.5	53.8	7.9	1.8	63.3	13.3	40.8	10.5
Spain	1,078.2	380.2	189.0	105.7	22.2	5.3	181.6	25.6	173.7	43.5
Belgium	0.0	-461.2	198.8	55.6	110.4	25.8	45.2	9.4	120.4	30.2
Luxemburg	0.0	0.1	9.1	2.5	4.9	1.4	2.5	0.4	6.2	1.7
Iceland	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Norway	0.6	24.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sweden	0.0	-45.7	138.4	27.2	64.3	12.7	52.3	8.7	64.6	16.4
Finland	4.0	35.0	118.4	30.2	9.8	1.8	29.7	4.5	73.6	18.1
Austria	13.9	84.7	11.7	-25.9	85.8	15.1	-230.0	-56.1	-88.5	-31.5
Malta	0.0	1.5	6.4	1.8	0.6	0.2	2.5	0.4	2.4	0.8
Estonia	0.0	1.6	37.1	8.3	7.1	1.5	1.0	0.2	3.2	0.6
Latvia	0.0	2.0	51.9	11.2	2.6	0.6	1.6	0.2	5.5	1.1
Lithuania	0.2	5.8	113.8	25.9	4.7	0.9	2.1	0.5	11.9	2.4
Poland	0.0	19.3	1,552.0	335.1	5.3	2.2	88.2	14.0	0.2	0.7
Czech Republic	0.0	-227.7	255.0	53.3	8.6	1.8	25.4	4.7	48.4	4.6
Slovakia	0.0	3.2	95.1	20.2	3.0	0.6	13.7	3.0	14.2	2.7
Hungary	32.7	13.2	-1,099.6	-199.2	5.0	0.9	-452.4	-62.6	-194.9	-19.9
Romania	7.4	28.8	845.0	8.8	1.9	0.3	-202.5	-25.6	-37.3	-3.3
Bulgaria	0.7	9.0	-56.5	-9.1	3.0	0.6	24.9	5.0	-100.1	-13.6
Slovenia	3.2	-4.2	-548.4	-122.9	-104.5	-14.9	-26.4	-4.8	-117.9	-21.5
Croatia	15.4	7.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cyprus	0.0	1.1	19.8	7.8	2.0	0.6	5.3	1.4	3.5	1.1
EU-15 TOTALS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
EU-25 TOTALS	3,016.2	2,935.3	8,871.5	2,252.4	3,344.7	589.8	2,874.7	533.0	3,803.5	621.4
EU-27 TOTALS	3,024.3	2,966.9	9,817.7	2,486.6	3,340.7	668.0	2,968.6	549.3	3,748.1	614.1

Annex 2-6 EU Imports 2008 per major countries of provenance

HS6 Code	841810	841821	841830	841840	841850	841869	Total
2008 Extra-Imports	x10 ⁶ €	x10 ⁶ €	x10 ⁶ €	x10 ⁶ €	x10 ⁶ €	x10 ⁶ €	x10 ⁶ €
China	212.9	210.8	29.9	57.8	97.8	65.0	674.3
Turkey	168.7	245.6	18.5	43.3	70.7	4.5	551.3
South Korea	217.6	28.6	1.0	0.1	0.8	15.3	263.4
United States	19.5	6.8	3.0	8.3	19.9	43.0	100.4
Japan	0.2	0.0	3.5	6.0	6.8	45.6	62.2
Thailand	27.1	13.1	0.1	-	5.5	13.5	59.3
Mexico	13.0	2.4	0.0	0.1	1.6	13.2	30.3
Others (Total < 30M.)	93.6	54.2	12.0	5.2	40.5	41.3	246.8
EU-27 TOTAL	752.6	561.5	68.1	120.8	243.7	241.4	1,988.0

Annex 2-7 Extra-EU Exports 2008 by major country of destination

HS6 Code 2008 Extra-Exports	841810	841821	841830	841840	841850	841869	Total
	x10 ⁶ €	x10 ⁶ €	x10 ⁶ €	x10 ⁶ €	x10 ⁶ €	x10 ⁶ €	x10 ⁶ €
	841810	841821	841830	841840	841850	841869	Total
Russia	136.2	15.6	8.9	9.4	103.6	77.9	351.6
Switzerland	25.9	32.2	3.7	24.6	67.2	47.3	200.8
Norway	38.9	27.1	7.2	13.4	46.5	22.7	155.9
United States	12.9	18.9	3.4	1.8	50.3	59.7	146.9
Turkey	8.5	9.4	24.4	4.5	22.6	24.1	93.5
United Arab Emirates	5.9	2.5	0.8	1.8	25.0	53.3	89.3
Serbia	7.2	10.9	2.4	2.6	19.9	8.1	51.1
Morocco	4.7	2.1	6.2	1.7	22.7	13.5	50.8
Saudi Arabia	1.7	0.9	0.8	0.7	16.6	29.2	50.0
China	3.8	2.7	0.9	1.2	8.0	23.3	39.9
Australia	3.9	3.6	0.9	0.6	19.0	9.6	37.7
Israel	1.8	1.3	0.4	2.9	13.6	12.8	32.8
Angola	2.4	0.8	9.4	0.3	5.8	11.7	30.5
South Africa	3.6	2.9	0.6	1.6	7.1	11.6	27.4
India	1.2	0.6	0.3	0.8	5.5	17.2	25.7
South Korea	2.6	1.6	0.7	2.2	9.1	9.3	25.4
Japan	0.6	0.5	6.7	0.8	4.7	10.1	23.2
Egypt	0.9	0.8	0.9	0.8	8.9	9.6	21.9
Qatar	0.6	0.3	0.7	0.2	2.0	18.1	21.9
Belarus (Belorussi)	2.8	0.5	0.5	0.2	6.6	10.6	21.1
Algeria	1.5	1.2	3.8	0.6	3.9	9.9	20.9
Bosnia and Herzegovina	4.8	2.7	0.8	0.5	7.8	3.4	20.0
Mexico	0.9	0.4	0.0	0.1	12.3	4.3	18.0
Kazakhstan	3.4	0.4	0.3	0.4	6.6	5.9	17.0
Singapore	0.9	0.5	0.2	0.2	4.8	10.4	17.0
Iran	4.4	2.3	0.6	2.0	1.5	5.0	15.8
Hong Kong	2.6	1.3	0.2	0.3	4.9	5.9	15.3
Canada	3.7	0.9	0.3	0.2	6.2	3.7	14.9
Libya	1.2	0.3	1.8	0.3	5.0	5.9	14.6
Kuwait	1.0	0.7	0.4	0.4	7.5	3.2	13.3
Tunisia	1.6	1.0	0.5	0.4	4.5	5.1	13.0
Chile	0.6	0.2	0.4	0.1	7.5	4.2	13.0
Brazil	0.2	0.3	0.2	0.1	3.3	8.5	12.5
Nigeria	0.6	1.4	2.2	0.3	2.6	3.7	10.8
Thailand	0.5	0.3	0.0	0.3	4.2	5.5	10.8
Argentina	0.5	1.3	0.1	0.2	2.6	5.0	9.7
Moldova	3.0	0.7	0.2	0.6	2.6	1.8	9.0

HS6 Code 2008 Extra-Exports	841810	841821	841830	841840	841850	841869	Total
	x10 ⁶ €	x10 ⁶ €	x10 ⁶ €	x10 ⁶ €	x10 ⁶ €	x10 ⁶ €	x10 ⁶ €
	841810	841821	841830	841840	841850	841869	Total
Cuba	0.3	0.0	0.1	0.2	3.5	4.7	8.8
Oman	1.3	0.2	0.3	0.2	2.2	4.3	8.5
Iraq	0.1	0.0	0.8	0.2	1.8	5.1	8.0
Macedonia	1.7	0.8	0.3	0.2	3.7	1.2	7.8
VietNam	0.1	0.1	0.0	0.1	4.8	2.8	7.8
Montenegro	1.7	1.6	0.2	0.4	3.1	0.6	7.6
Albania	1.0	2.2	0.8	0.1	2.8	0.6	7.4
Bahrain	0.3	0.2	0.2	0.2	3.0	2.9	6.8
Jordan	0.6	0.2	0.2	0.5	1.4	3.8	6.7
New Zealand	0.5	0.6	0.3	0.1	4.3	0.9	6.7
Lebanon	0.8	0.5	0.1	0.4	3.6	1.3	6.7
Indonesia	0.4	0.1	0.2	0.1	2.3	2.9	5.9
Pakistan	0.8	0.1	0.2	0.1	0.5	3.3	5.0
Kenya	0.1	0.2	0.2	0.1	3.3	1.1	5.0
Venezuela	0.1	0.0	-	0.1	2.3	2.4	5.0
Georgia	0.9	0.4	0.1	0.1	1.7	1.6	4.7
Ghana	0.1	0.4	1.3	0.2	1.9	0.8	4.6
Senegal	0.4	0.3	0.7	0.4	1.7	1.0	4.5
Taiwan	0.7	0.3	0.2	0.1	1.4	1.0	3.8
Dominican Republic	0.0	0.0	0.1	0.0	0.9	2.7	3.7
Peru	0.1	0.1	1.2	0.0	1.2	1.0	3.6
Ethiopia	0.1	0.0	0.3	0.0	1.6	1.2	3.4
Azerbaijan	0.6	0.3	0.0	0.0	1.1	1.3	3.4
Philippines	0.1	0.1	0.0	0.1	2.1	0.9	3.3
Syria	0.2	0.0	0.0	0.1	0.7	2.2	3.3
Malaysia	0.2	0.2	0.0	0.4	1.0	1.3	3.2
Colombia	0.1	0.1	0.2	0.0	1.4	1.2	3.0
Others (Total < 3M.)	8.2	6.6	11.4	3.2	31.0	27.2	87.6
EU-27 Total	319.0	166.6	111.2	86.4	643.2	652.3	1,978.8

Annex 2-8 Additional product data

2.7.2.1 Prices of water dispensers

An estimate of the price of water dispensers based on catalogue data shows that the selling price of such products is between €100 and €500.

2.7.2.2 Prices of dessert and beverage machines

An estimate of the price of dessert and beverage machines based on catalogue data shows that the selling price of such products is very large, ranging from €1,000 to €20,000.

2.7.2.3 Prices of ice makers

The preliminary price range for an ice-maker (producing ice cubes) is estimated to be between €550 and €5,500 depending on the capacity. Table 2-28 details the price ranges according to the type of ice-maker. A previous US study⁶⁵ estimates the price of an ice-maker to be around US\$1,000 (approx. €735) for a 500lb/24h capacity (approx. 227kg/24h), which is lower than the preliminary data collected at this stage.

Table 2-28: Average prices for ice-makers (2009)

Capacity (kg/24h)	Description	Average selling price (€)
8.5 – 20	Ice-cuber	550 – 1,000
20 – 30	Ice-cuber	1,000 – 2,200
>30	Ice-cuber	2,200 – 5,550

2.7.2.4 Dessert and beverage machines

Table 2-29: Sales and stock of dessert and beverage machines in 2008 by technical characteristic

Technology	Sales		Stock	
	(units)	(%)	(units)	(%)
TOTAL	150,000		1,500,000	

⁶⁵ Arthur D. Little, Inc. *Energy Savings Potential for Commercial Refrigeration Equipment, Final Report Prepared for US Department of Energy*. 1996

2.7.2.5 Water dispensers

Table 2-30: Sales and stock of water dispensers in 2008 by technical characteristic

Technology	Sales		Stock	
	(units)	(%)	(units)	(%)
Bottled water	222,222	80	-	-
Mains water	55,556	20	-	-
TOTAL	277,778		2,500,000	

2.7.2.6 Ice-makers

Table 2-31: Sales and stock of ice-makers in 2008 by technical characteristic

Technology	Sales		Stock	
	(units)	(%)	(units)	(%)
TOTAL	120,148		985,756	

2.7.2.7 Market data for non-priority products

Table 2-32 Estimated share of replacement sales in 2008 (EU-27)

Product category	2008	
	Replacement sales (units)	Share of replacement sales over total sales (%)
Dessert and beverage machines	4,302	100
Water dispensers	254,632	92
Ice makers	111,040	92

Table 2-33 Calculated CAGR for the period 2008-2012

Product category	CAGR 2008-2012
Dessert and beverage machines	0.9%
Water dispensers	1.0%
Ice makers	0.9%

Table 2-34 Estimates of product lifetime

Source	Defra MTP ⁶⁶	ADL 1996 ⁶⁷	ME 2000 ⁶⁸	Study estimates 1	Study estimates 2 (stock/sales in 2008)	Figure to be used in ENTR Lot 1 analysis
Product type	(years)					
Dessert and beverage machines	-	-	-	9*	10	-
Water dispensers	-	-	9	9	9	-
Ice makers	8	7 to 10	10	9	8	-

* Assumed to be similar to water dispenser

- : No data available/found

⁶⁶ Defra statistics available at <http://whatif.mtprog.com/>

⁶⁷ Arthur D. Little, Inc. *Energy Savings Potential for Commercial Refrigeration Equipment, Final Report Prepared for US Department of Energy*. 1996

⁶⁸ Mark Ellis and Associates. *Self-contained Commercial Refrigeration*. March 2000

Annex 2-9: RCU market distribution

Configuration	Market %	Evaporating temp. (°C)	Market % commercial refrigeration	Cooling capacity (kW)	Market %	Compressor type	Market %	Compressor motor drive	Market %	Condenser cooling	Market %	Total market %
Packaged condensing unit with single compressor	95%	LT (-35°C)	20%	0.2-20 kW average: 5-7 kW	95%	Reciprocating	95.0%	On/off	93%	Air	100%	15.9%
								2 speeds	5%	Water	0%	0.0%
								VSD	2%	Air	100%	0.9%
										Water	0%	0.0%
										Air	100%	0.3%
										Water	0%	0.0%
						Scroll	5.0%	On/off	98%	Air	100%	0.9%
								2 speeds	0%	Water	0%	0.0%
								VSD	2%	Air	100%	0.0%
										Water	0%	0.0%
						Screw	0.0%	On/off	98%	Air	100%	0.0%
								2 speeds	0%	Water	0%	0.0%
								VSD	2%	Air	100%	0.0%
										Water	0%	0.0%
						Rotary	0.0%	On/off	90%	Air	100%	0.0%
								2 speeds	0%	Water	0%	0.0%
								VSD	10%	Air	100%	0.0%
										Water	0%	0.0%
				20-50 kW average: 20 kW	4%	Reciprocating	95.0%	On/off	93%	Air	100%	0.7%
								2 speeds	5%	Water	0%	0.0%
								VSD	2%	Air	100%	0.0%
										Water	0%	0.0%
						Scroll	5.0%	On/off	98%	Air	100%	0.0%
								2 speeds	0%	Water	0%	0.0%
								VSD	2%	Air	100%	0.0%
										Water	0%	0.0%
						Screw	0.0%	On/off	98%	Air	100%	0.0%
								2 speeds	0%	Water	0%	0.0%
								VSD	2%	Air	100%	0.0%
										Water	0%	0.0%
						Rotary	0.0%	On/off	90%	Air	100%	0.0%
								2 speeds	0%	Water	0%	0.0%
								VSD	10%	Air	100%	0.0%
										Water	0%	0.0%
		MT (-10°C)	80%	>50 kW average: 50kW	1%	Reciprocating	95.0%	On/off	93%	Air	95%	0.2%
								2 speeds	5%	Water	5%	0.0%
								VSD	2%	Air	95%	0.0%
										Water	5%	0.0%
						Scroll	5.0%	On/off	98%	Air	95%	0.0%
								2 speeds	0%	Water	5%	0.0%
								VSD	2%	Air	95%	0.0%
										Water	5%	0.0%
						Screw	0.0%	On/off	98%	Air	95%	0.0%
								2 speeds	0%	Water	5%	0.0%
								VSD	2%	Air	95%	0.0%
										Water	5%	0.0%
						Rotary	0.0%	On/off	90%	Air	95%	0.0%
								2 speeds	0%	Water	5%	0.0%
								VSD	10%	Air	95%	0.0%
										Water	5%	0.0%
				0.2-20 kW average: 5-7 kW	80%	Reciprocating	90.0%	On/off	93%	Air	100%	50.9%
								2 speeds	5%	Water	0%	0.0%
								VSD	2%	Air	100%	2.7%
										Water	0%	0.0%
						Scroll	10.0%	On/off	98%	Air	100%	1.1%
										Water	0%	0.0%
										Air	100%	6.0%

Configuration	Market %	Evaporating temp. (°C)	Market % commercial refrigeration	Cooling capacity (kW)	Market %	Compressor type	Market %	Compressor motor drive	Market %	Condenser cooling	Market %	Total market %
										Water	0%	0.0%
										Air	100%	0.0%
								2 speeds	0%	Water	0%	0.0%
								VSD	2%	Air	100%	0.1%
										Water	0%	0.0%
							0.0%	On/off	98%	Air	100%	0.0%
										Water	0%	0.0%
								2 speeds	0%	Air	100%	0.0%
								VSD	2%	Water	0%	0.0%
										Air	100%	0.0%
							0.0%	On/off	90%	Water	0%	0.0%
								2 speeds	0%	Air	100%	0.0%
								VSD	10%	Water	0%	0.0%
										Air	100%	0.0%
				20-50 kW average: 20 kW	15%		90.0%	On/off	93%	Water	0%	0.0%
								2 speeds	5%	Air	100%	0.5%
								VSD	2%	Water	0%	0.0%
										Air	100%	0.2%
							10.0%	On/off	98%	Water	0%	0.0%
								2 speeds	0%	Air	100%	0.0%
								VSD	2%	Water	0%	0.0%
										Air	100%	0.0%
							0.0%	On/off	98%	Water	0%	0.0%
								2 speeds	0%	Air	100%	0.0%
								VSD	2%	Water	0%	0.0%
										Air	100%	0.0%
				>50 kW average: 50kW	5%		90.0%	On/off	93%	Water	0%	0.0%
								2 speeds	5%	Air	95%	0.2%
								VSD	2%	Water	5%	0.0%
										Air	95%	0.1%
							9.0%	On/off	98%	Water	5%	0.0%
								2 speeds	0%	Air	95%	0.0%
								VSD	2%	Water	5%	0.0%
										Air	95%	0.0%
							0.5%	On/off	98%	Water	5%	0.0%
								2 speeds	0%	Air	95%	0.0%
								VSD	2%	Water	5%	0.0%
										Air	95%	0.0%
							0.5%	On/off	90%	Water	5%	0.0%
								2 speeds	0%	Air	95%	0.0%
								VSD	10%	Water	5%	0.0%
										Air	95%	0.0%
Packaged condensing unit with twin compressors or more	5%	LT (-35°C)	20%	0.2-20 kW	0%		0%	-	0%	-	0%	0.0%
				20-50 kW average: 20 kW	75%	scroll	100%	-	100%	Air	100%	0.8%
						screw	0%	-	100%	Water	0%	0.0%
				>50 kW average: 50kW	25%	scroll	95%	-	100%	Air	95%	0.2%
						screw	5%	-	100%	Water	5%	0.0%
										Air	95%	0.0%
		MT (-10°C)	80%	0.2-20 kW	0%		0%	-	0%	-	0%	0.0%
				20-50 kW average: 20 kW	75%	scroll	100%	-	100%	Air	100%	3.0%
						screw	0%	-	100%	Water	0%	0.0%
				>50 kW average:	25%					Air	100%	0.0%
						scroll	95%	-	100%	Water	0%	0.0%
										Air	95%	0.9%

Configuration	Market %	Evaporating temp. (°C)	Market % commercial refrigeration	Cooling capacity (kW)	Market %	Compressor type	Market %	Compressor motor drive	Market %	Condenser cooling	Market %	Total market %
				50kW		screw	5%	-	100%	Air	95%	0.1%
										Water	5%	0.0%