REVIEWING MARKET DEVELOPMENTS IN THE TOP-PERFORMING SEGMENT. BAT PRODUCT LISTS

Work package WP2: Status quo and monitoring of market development

Task 2.3: Monitoring of market developments

Deliverable D2.5: Reviewing market developments in the top-performing segment.

BAT product lists

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Project Partners

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INTRODUCTION

About this project

ProCold is a European project in the framework of Horizon 2020, supporting the development and market penetration of energy efficient commercial refrigeration equipment. The project aims at stimulating both the supply and demand side market for environmentally friendly efficient technology by various market oriented services, including among others a web-based product database for efficient products, procurement guidelines and tools and a product competition. The project is implemented in 8 countries (DE, FR, CH, IT, CZ, PT, SE, AT).

The services and tools provided by the project are based on long-term experience with the specific technologies and market in the different countries.

This document provides an overview and analysis of the market development for professional and commercial refrigerated cabinets as well as minibars and wine coolers through the project period. Tables of best available technology are provided for each 6 month of the project (the first year is combined in one table due to the start of the project); diagonal slashes mark fields that do not conform to the selection criteria.

Product types

To facilitate the reading of this document, a quick overview on the key appliances covered by the ProCold project is provided below by showing pictures of relevant types. More details can be found in the report "D2.1: Professional Cold Product Category Definitions and Saving Potentials"[1].

Refrigerated commercial display cabinets

Typical use of refrigerated commercial display cabinets is in supermarkets, retail, canteens, bakeries etc. They can be self-service cabinets (direct access for customers) or serve-over counters, vitrines etc. where employees will access the foodstuffs.

[1] Download under http://www.pro-cold.eu/uploads/Deliverables/D2_1_Product-definitions-and-saving-potentials_final%20-%20Kopie.pdf

Beverage coolers and ice cream freezers

Beverage coolers and ice cream freezers are procured in large numbers by food and beverage industry and branded; loaned or leased to retailers, kiosks, take-aways, canteens, sport facilities etc.

Refrigerated vending machines

Refrigerated vending machines are only for refrigerated foodstuffs. They do not include vending machines for coffee and other hot beverages or microwave-equipped vending machines.

Professional refrigerated storage cabinets

Professional refrigerated storage cabinets are intended for use in professional kitchens, they meet high demands regarding food hygiene (temperature monitoring, stainless steel surfaces).

Minibars

Minibars are used primarily in 4- and 5-star hotels but also for camping and boating.

Wine storage appliances

Basically, professional and household wine storage appliances are technically the same.

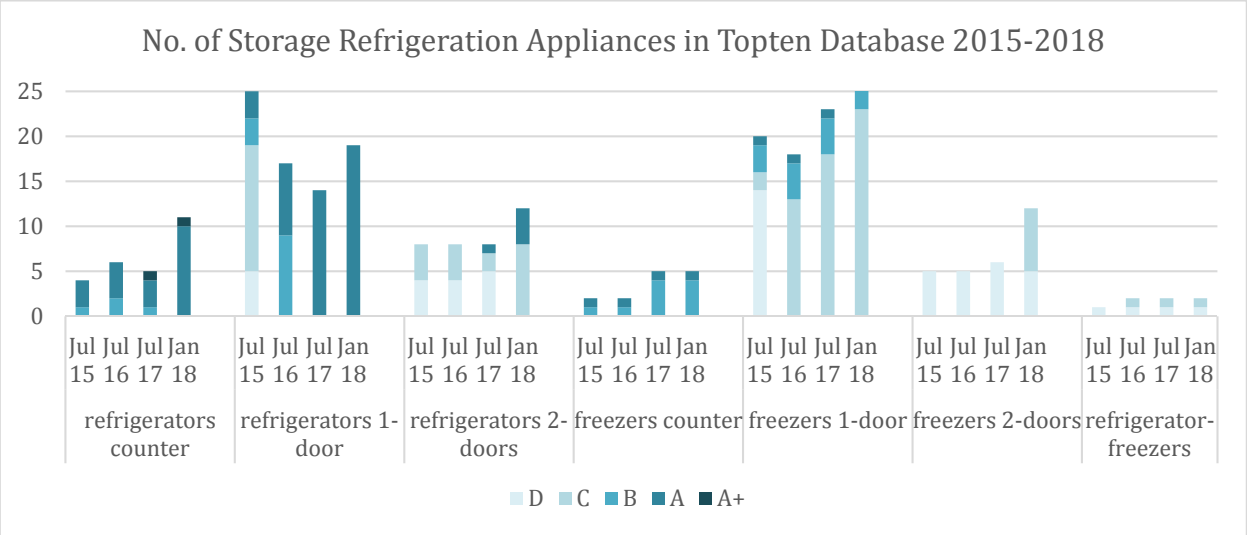
Professional / commercial static-air cabinets

All static-air storage cabinets, refrigerator-freezers and chest freezer storage cabinets and the vertical static-air display cabinets are currently falling into a gap between the scopes of EU regulations for professional / commercial and household products. As a consequence, it is at the discretion of manufacturers and dealers to apply labelling and Eco-design requirements, or to omit product information for products intended for professional use.

PROFESSIONAL REFRIGERATED STORAGE CABINETS

Topten lists for this group have been updated since the beginning of the ProCold project.

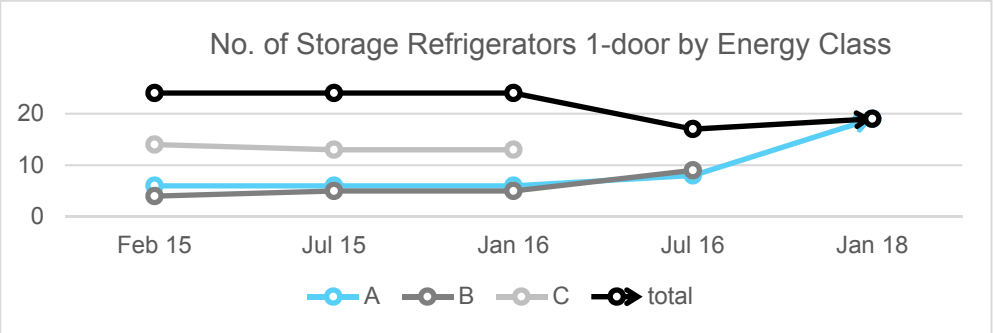
In May 2015, the EU labelling and eco-design regulations for professional refrigerated storage cabinets were adopted and since 1st July 2016 the EU energy label and the first stage of minimum requirements are in effect. On January 2018, the second tiers came into effect and models of efficiency class G were banned from the market with the exception of heavy-duty cabinets.



Graph 1 Development of professional refrigeration BAT products from July 2015 to January 2018

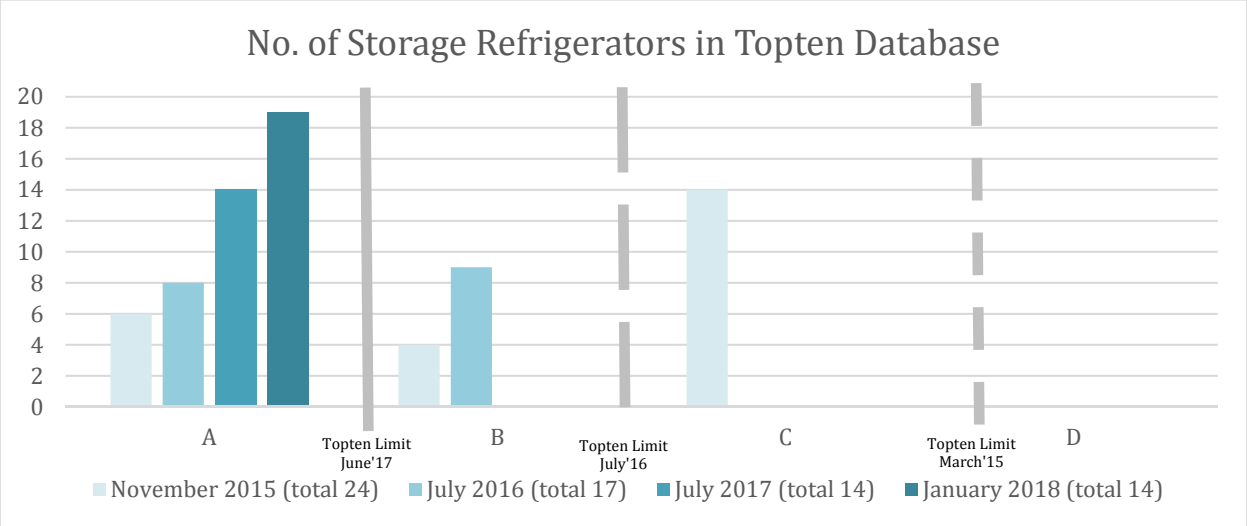
Graph 1 shows that the introduction of EU regulations for professional refrigerated storage cabinets lead to a jump in best available technology. Even before the regulations came into force new models were introduced on the market that reached the best energy efficiency classes A, B and C. Positive developments have occurred especially in the product groups with the highest demand on the market: 1-door refrigerators and 1-door freezers as well as counter refrigerators. The first A+ storage appliance on the market (counter refrigerator) was listed in 2017.

Overall the number of BAT products was rather stagnant from the start of the ProCold project in 2015 until January 2016 - half a year before the EU labelling and eco-design regulations came into effect. Taking into account the time from development and testing of new products to the time the new products came on the market, it is obvious that the adaptation to the May 2015 regulations triggered significant technological advancements.



Graph 2 Impact of EU Labelling and Eco-design on the Development of 1-door Refrigerators from February 2015 until January 2018

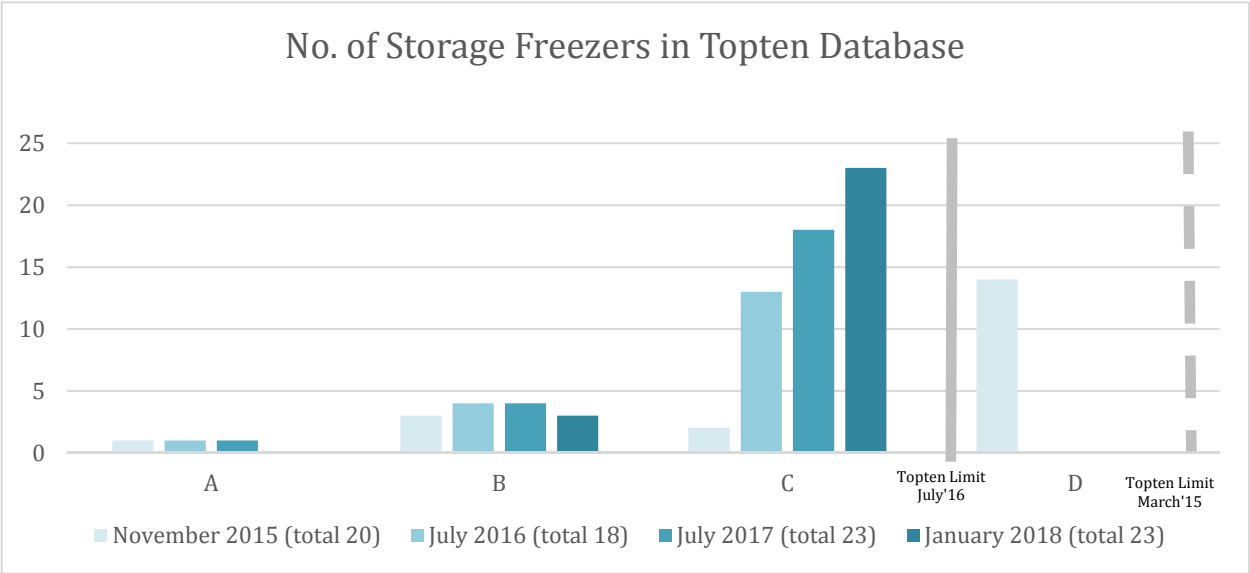
In July 2016, the Topten-Selection criteria were raised from min. C to B for **1-door refrigerators**. As a consequence, 12 products were taken out from the lists. In June 2017 Topten selection criteria were raised from min. B to A for 1-door refrigerators. As a consequence, 12 products were taken out from the lists. The number of class A products are now – 1.5 years after the introduction of the label – higher than the number of class C products on the market one year before the introduction of the label.



Graph 3 Development of Topten Selection Criteria for 1-door Refrigerators and No. of BAT products

In July 2016, the Topten selection criteria were raised from min. D to C for **1-door freezers**.

Since the selection criteria were revised several times subsequently, no further change in selection criteria was required. While the number of class C products increased by a factor of 10 in little more than 2 years, no such developments could be seen for class A or B products; rather, the only product declared class A and two of the four declared class B products could not substantiate their declaration and were removed from the Topten Database. A broad shift towards more energy efficient technology implemented by numerous manufacturers (26 products by 11 manufacturers) is nonetheless clearly visible for this category.



Graph 4 Development of Topten Selection Criteria for 1-door Freezers and No. of BAT products

The amount of good products on the market increases to a level where they supersede the maximum number of lower energy class products only a short time before, as is the case with the 1-door refrigerators of the class C and the 1-door storage freezers of the class D. Altogether the number of products with higher energy classes increased significantly.

Table 1 shows all changes in selection criteria that have taken place since the start of the project. The changes in selection criteria for 1-door refrigerators and freezers are discussed above. Significant developments were also observed for the categories counter refrigerators as well as 2-door refrigerators and freezers between July 2017 and January 2018 (cf. Graph 1). This resulted in a tightening of selection criteria in November 2017 for

- **Counter refrigerators**: min. class A instead of class B; despite removing 1 class B product, the number of listed products more than doubled as the number of A products rose from 3 to 10 within half a year.
- **2-door refrigerators**: min. class C instead of class D; despite removing 5 class D products, the list of products increased as the number of class C products rose from 2 to 8 and the number of class A products rose from 1 to 4. No class B product has been listed by manufacturers.

While for **2-door freezers** the number of class D products declined from 6 to 4 products, the first 7 class C products were listed by 6 manufacturers. Tightening selection criteria for this category to require min. class C instead of class D might soon be feasible if technological developments continue.

For **counter freezers** there has been no tightening in selection criteria. While the criteria and listed products were frequently reviewed and some new products were listed, the strict original criteria of min. class B still remains sufficient to represent the best available technology on the market.

For **refrigerator-freezers** – exempt from the label for professional refrigeration appliances - no development has taken place. After two products available on the market had been identified, no further models could be listed and no technological development observed. A clear method for determining the energy consumption of refrigerator-freezers is essential for effectively comparing products in this category and for end-users to make an informed decision.

	01.Mar.2016	***01.Jul.2016***	***01.Jun.2017***	***01.Nov.2017***
Refrigerators counter				Min. class A (EEI < 25)
Refrigerators 1-door	Min. class C (EEI < 50)	Min. class B (EEI < 35)	Min. class A (EEI < 25)	
Refrigerators 2-doors				Min. class C (EEI < 50)
Freezers counter				
Freezers 1-door	Min. class D (EEI < 75)	Min. class C (EEI < 50)		
Freezers 2-doors				
Refrigerator-freezers				

Table 1- Tightening of Selection Criteria for Professional Refrigeration Appliances over the Project Period

Conclusion: Class C products use twice the amount of energy of class A products – the saving potential between products of the same product type is significant. A recent Topten

study has shown that 56 % of professional refrigeration storage cabinets online were not correctly declared with an energy label in September 2017 compared to 58 % of checked models in November 2016[2]. Taking into account the jump in best availability technology for correctly declared products since the adaptation of the regulation in 2015 with great technological innovations, a great number of kWh could be saved if all products were labelled correctly and end-users could easily make informed decisions. If mandatory labelling were strictly enforced and market surveillance increased, the label could realize its remaining potential – which is significant, as can be seen by the increasingly efficient technologies listed on Topten.

MINIBARS AND WINECOOLERS

Minibars and wine coolers are covered by the EU regulation EN 1060/2010. As such, standardized energy data is available and a product comparison with regards to energy efficiency and life cycle cost possible.

Three cooling systems are implemented in **minibars**:

- Absorption: silent but high energy consumption, refrigerant R717
- Peltier-type / thermoelectric: silent, best technology is class A+, no refrigerant
- Compression: compressor makes noise, energy efficient, available with climate-friendly refrigerants (R600a)

Compression-type minibars are by far the most energy efficient ones. On the EU energy label compression-type minibars reach the classes A+++ and A++. The best minibars of the thermoelectric/Peltier-type reach A+, but more often they range in lower classes. Absorption-type minibars are inefficient and mostly in class D.

Remark on noise: Noise is an important criterion especially for minibars. Absorption-type and thermoelectric/Peltier-type minibars are silent and have therefore become conventional technology for minibars. Compression-type represents the conventional technology for most other household and commercial appliances. It is the most energy efficient technology, but the compressor makes some noise. The solution for minibars is therefore to install them with a presence sensor or timer that keeps them silent during the guests' residence in the room. Eutectic plates (= cold storage) guarantee a long cooling time without the need of the compressor starting.

The Topten database includes three compression type minibars (classes A+++ and A++) and two thermoelectric minibars (class A+). Developments and new products were not available from 2016 to January 2018. The Topten selection criteria remained unchanged.

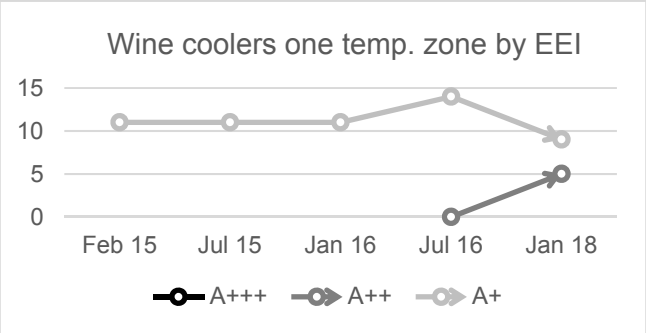
Possible reasons for the lack of new technologies and products are persisting uncertainties of hotel managers about sensor installations for compressor type minibars and a starting trend to install vending machines on hotel floors instead of individual minibars in each guest room.

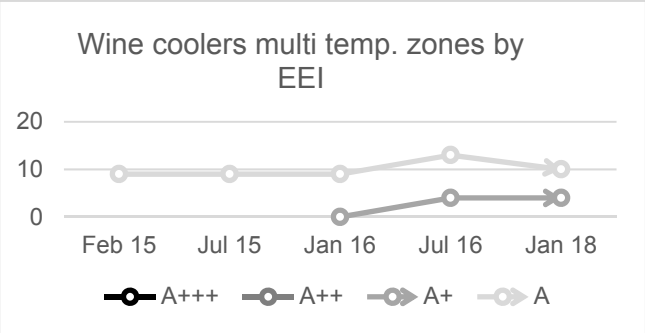
The number of good models for **wine coolers** has increased and better products have entered the market in the form of 4 A+ wine coolers with multiple temperature zones and 5 A++ wine coolers with one temperature zone. The more efficient models have replaced some of the older models that were subsequently taken off the market by their manufacturers.

The products listed in the Topten database include models with glass doors and models with solid doors. The appliances are used by gastronomy and private households as

[2] http://www.topten.eu/uploads/File/Declaration_Overview_of_Storage_refrigerators.pdf

needed. Inclusion of models with both door types into the scope of new regulation for household refrigeration, as it is currently intended, is strongly advisable.





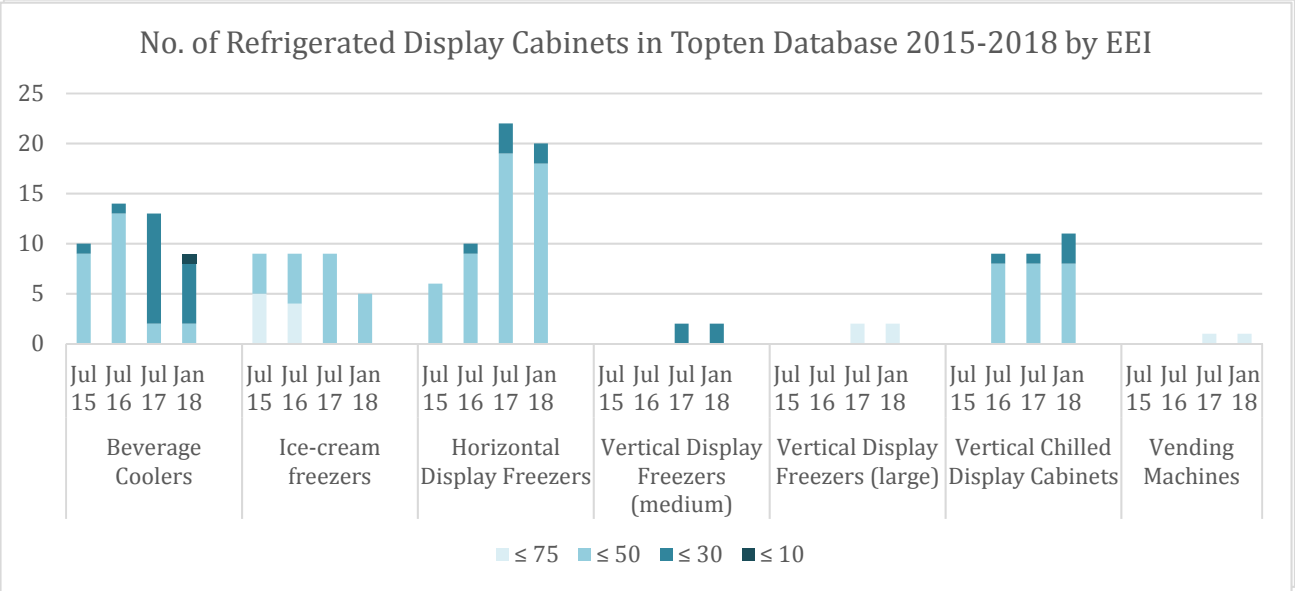
REFRIGERATED DISPLAY CABINETS

EU labelling and eco-design regulations for this group are still in preparation. The latest working documents are the Draft Energy Label and Draft Eco-design Regulation from DG Energy for Refrigerated Commercial Display Cabinets from 2014[3]. Policy priorities for 2018 indicate that a resumption of the work on this LOT (LOT 12) is planned for the second half of 2018, with adaptation and possible coming into effect in 2019.

Since there is not yet a standardised product information available for most refrigerated display cabinets, the available data on best available technology is very sparse and often difficult if not impossible to obtain for buyers on the market. The situation will quickly improve when the planned EU labelling and eco-design regulations will be finalised.

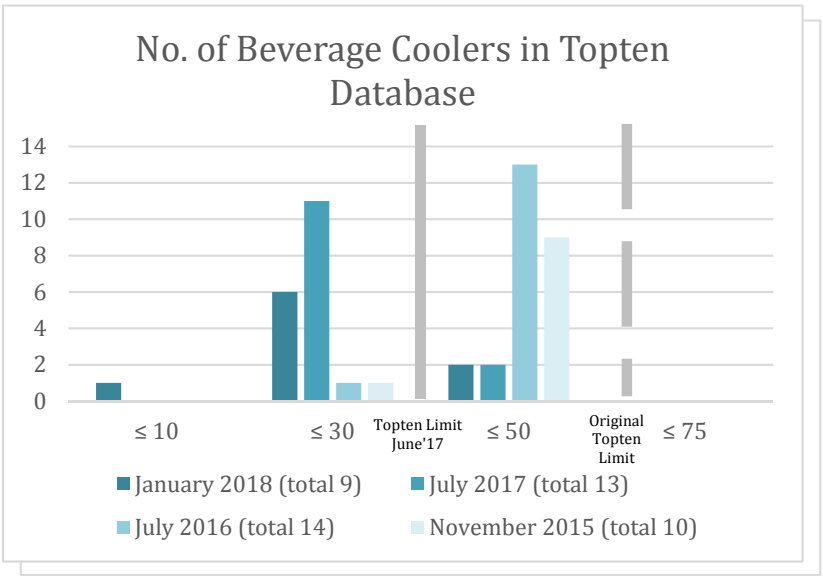
Still, the growing numbers of models listed in the Topten product lists show that data availability improved since 2015. This is due to growing awareness for energy efficiency as sales argument and procurement criterion, as a result of the EU regulations in preparation and projects like ProCold and Topten that specifically help the market for high-efficiency products to develop. In the absence of relevant regulation, an important motivation for manufacturers to provide standardised product information have been the rebate programmes for energy efficient commercial and professional refrigeration appliances in Switzerland and Austria (organized by ProCold).

[3] All references to EEIs in this section about commercial refrigerated display cabinets mean a draft EEI as calculated with the categories and M and N values from the 2014 working documents.



Graph 6 Development of refrigerated display cabinets BAT products from July 2015 to January 2018

Beverage coolers were, at the start of the ProCold project, measured according to EN ISO 23953 before the introduction of prEN 16902 and from December 2016, according to the adoption of EN 16902 by CEN. The delay of the labelling regulation and eco-design for commercial refrigeration appliances has proven to severely impede the availability of standardised product information according to EN 16902: no manufacturer had this data readily available. All beverage coolers listed on the Topten database were specifically tested by manufacturers according to EN 16902 for the listing on Topten. This makes well-informed purchase decisions by end-users about products on the market exceedingly difficult.



Graph 7 Development of Selection Criteria for Beverage Coolers and No. of BAT products

After a growing number of models with an EEI ≤ 50 could be observed from 2015 to 2016, a significant rise of even more efficient products with an EEI ≤ 30 happened in 2017 and 2018. By the end of May 2017, the Topten database contained 19 models with an EEI ≤ 50 and 10 models with an EEI ≤ 30, resulting in a total of 29 models by 7 manufacturers.

At this point, the Topten selection criteria were tightened from a maximum EEI of 50 to a maximum EEI of 30; as a consequence, 17 products were taken out from the lists. The selection criteria were adapted to remain at a maximum EEI of 50 for models using the refrigerant R744 (CO_2). This was decided because CO_2 is the refrigerant with the lowest GWP of 1. Topten wished to observe the development of this technology using R744 for beverage coolers after the "crossing of the CO_2 equatorial line" in 2016 – meaning

technological innovation that overcomes the previously accepted geographical limit for cost-effective construction of CO2 systems[4]. As a result, two beverage coolers with the refrigerant R744 and an EEI between 30 and 50 remained in the list.

After the adaptation of prEN 16902 in 2015 and EN 16902 in 2016, Topten set a transitional phase until 01.01.2018 after which only products with standardised product information according to (pr)EN 16902 would be listed on Topten. Manufacturers were informed of this 9 months in advance and all models with product information according to older test standards were removed from the Topten database on 01.01.2018. As a consequence, 7 models from 1 manufacturer were removed from the list, though the difference in measurement and consumption was around 6%.

The same manufacturer has since scheduled testing with EN 16902 for 2018 for more than 11 main models (29 models including similar models) that are very likely to meet the Topten criteria. This would more than double the current Topten database for beverage coolers, resulting in a total of more than 20 products.

The current Topten database for beverage coolers includes

- 6 models with EEI ≤ 30, 2 models with refrigerant R744 and EEI ≤ 50
- Vertical and horizontal beverage coolers
- Beverage coolers with glass doors and solid doors
- Models from 4 manufacturers

The ProCold competition "Best European Product" winner is still the best vertical beverage cooler with glass door on the list. There are strong indications that several of the products scheduled for testing in 2018 will surpass this winner product in energy efficiency, denoting a trend towards more efficient technologies. In January 2018, the first beverage cooler (horizontal) with an EEI < 10 was listed.

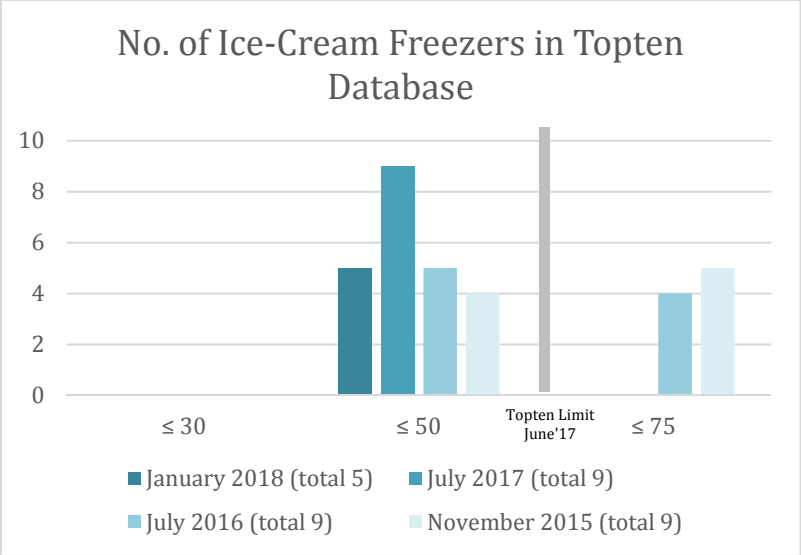
While this development of beverage coolers documents the rapid increase in efficient technology, it just as clearly substantiates that the lack of energy label for commercial refrigeration appliances makes it close to impossible for end-users to identify and consciously choose those technologies due to lack of standardised product information.

Ice-cream freezers were at the start of the ProCold project measured according to EN ISO 23953 before the introduction of prEN 16901 and finally the adoption of EN 16901 by CEN in December 2016. Analogous to the beverage coolers, the delay of the labelling and eco-design regulation for commercial refrigeration appliances has proven to severely impede the availability of standardised product information according to EN 16901: very few manufacturer have this data readily available. After the same adaptation phase until 01.01.2018 for standardised product information for ice-cream freezers on Topten, 4 models from 1 manufacturer were removed from the list when product data was not measured according to (pr)EN 16901.

After a very slow shift from models with EEI ≤ 75 to EEI ≤ 50 between 2015 and 2016, 2017 resulted in a sudden increase of more efficient products (cf. graph 8). By the end of May 2017, the Topten database contained 10 models with an EEI ≤ 75 and 9 models with an EEI ≤ 50, resulting in a total of 19 models by 2 manufacturers.

At this point, the Topten selection criteria were raised from a maximum EEI of 75 to a maximum EEI of 50; as a consequence, 10 products were taken out from the lists.

[4] http://publication.shecco.com/upload/file/org/5756d985c374d1465309573TcvxE.pdf



Graph 8 Development of Selection Criteria for Ice-Cream Freezers and No. of BAT products 2015-2018

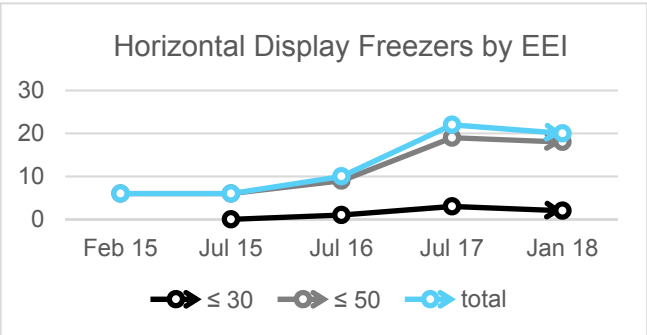
One manufacturer has scheduled testing for 2018 according to EN 16901 for their 5-10 efficient models with the highest market share that are very likely to meet the Topten selection criteria. Including similar models, 36 models in their product range might be efficient enough for the Topten database depending on the results of testing with EN 16901. However, as testing is time consuming, expensive and not mandatory, only the top-selling efficient products will be tested and listed with standardised product information. For the same reason, other manufacturers of ice-cream freezers and commercial display refrigeration in general continue to measure their products according to their own measurement protocols.

The current Topten database for ice-cream freezers includes:

- 5 models with EEI ≤ 50
- Ice-cream freezers with glass lids and solid lids
- Models by 2 manufacturers

The ProCold competition "Best European Product" winner in March 2017 has since been significantly surpassed by more energy efficient products. The currently most efficient ice-cream freezer with glass lid has an EEI of 35 compared to the winner product with an EEI of 48.2; this denotes a technology that is 27% more efficient than the winner model from 2017 less than 1 year after the end of the competition, equivalent to a higher energy class if a label were in effect.

As for beverage coolers, a significant potential for energy savings is apparent but the delayed label makes the realization difficult because buyers have no way of identifying the efficient products.



Graph 9 Development of Horizontal Display Freezers on Topten from 2015 to 2018

Horizontal Display Freezers and horizontal combined refrigerator/freezer chests in the Topten database are measured according to EN ISO 23953-2:2005 or 2015.

Despite the appearance of the first products with an EEI ≤ 30 in 2015, the market development for this category was very slow until 2017 when the label for commercial refrigeration appliances was scheduled to be finalized and adopted. At this time, new technology resulted in an increase of models with an EEI ≤ 50 from 9 to 19 products and of models with an EEI ≤ 30 from 1 to 3 models, totalling 22

efficient horizontal display freezers by 5 manufacturers in the Topten database by July 2017.

In January 2018, two models were removed from the lists by the manufacturers. Since the end of the ProCold project on 31.01.2018, a manufacturer has sent in a new series of efficient supermarket freezers with 6 models.

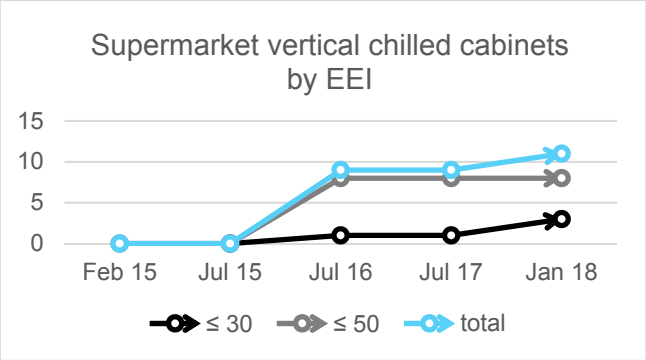
As for beverage coolers and ice-cream freezers, most product information was measured by manufacturers with EN ISO 23953 explicitly for the listing on the Topten database. For declaration in their catalogues, manufacturers measure supermarket chests with the loading customary in the markets, which is significantly lower than the load detailed in the EN ISO 23953, also decreasing the door-opening time during the loading. Each manufacturer has their own definition of "loading customary in the markets" and while some may be similar, it makes comparing the product data in catalogues impossible.

In conclusion, the increase of energy efficient horizontal display freezers with standardised product information has come to an abrupt stop after the repeated delay in labelling and eco-design regulation for LOT 12. The previously identified products are still available on the market.

Topten selection criteria to assess available technology for **vertical display freezers** were identified in January 2016. In order to prevent listing models with large glass area, Topten selection criteria stipulate that all listed models have closed sides. The first products were listed in February 2017. Two products were listed as medium cabinets with a total display area (TDA) of below 2 m^2 and an EEI ≤ 30; other two products were listed as large cabinets with a TDA of more than 2 m^2 and an EEI ≤ 60.

While this product category has only really developed on the market in the last years, there has been a high increase in the number of products on the market from various manufacturers. This results from the competition between supermarkets and discounters, which leads to discounters continuously seeking to increase their display area for frozen and refrigerated food stuffs with the use of vertical and combined cabinets.

Hardly any of the models have standardised product information available.



Vertical chilled display cabinets of a high enough energy efficiency to fulfil Topten selection criteria were similarly to vertical display freezers only available on the market midway through the ProCold project period.

By January 2018, 11 models from 3 manufacturers were listed. Test reports with data according to ISO 23953 were only made available in order for the products to be included in the rebate programmes for energy efficient commercial and professional refrigerated cabinets in Switzerland and Austria.

While the differences in test norms makes it difficult for buyers to make informed decisions about the most efficient models on the market, supermarket owners and procurers have shown an increased willingness to install cabinets with doors in their premises.

No products have been listed for vertical **small counter top freezers** (TDA < 0.33 m^2) or **horizontal chilled display cabinets**. Many horizontal display cabinets that are installed for refrigeration in supermarkets are "universal" chests - meaning they can be set at either

freezing or refrigerating temperatures – because it allows a flexible use of the equipment according to circumstances. While horizontal chilled display cabinets are on the market, no standardised product information is available for efficient models. Similarly, no standardised product information is available for energy efficient counter top display freezers at this point of time.

Since the ProCold product competition in March 2017, Topten selection criteria have been defined for **refrigerated vending machines** with the winner product listed on Topten. The winner product was tested according to EN 50597:2015 for the energy consumption of vending machines and Topten selection criteria have been defined as a maximum EEI of 75 according to this test standard along with the use of green refrigerants.

Manufacturers have only recently started the development and production of vending machines with refrigerants with a low global warming potential such as R290, R600a or R744. Test results according to EN 50597:2015 are not yet available, while most vending machines have been tested according to the E.V.A. test standard for vending machines. Topten plans to establish a technical base for a correction factor or a selection criteria equivalent for product information according to E.V.A. test standard in 2018. It is to be expected that more products will enter the Topten database once an equivalent minimum requirement in the Topten selection criteria can be established or manufacturers start testing their new models by EN 50597:2015.

SUMMARY

In February 2015, 85 models from 11 manufacturers were listed in the Topten database for professional and commercial refrigeration including minibars and wine coolers. If "similar models" are taken into account (different sizes of same series, other door type (glass or solid), or another configuration), a total of 187 models were listed.

In January 2018 at the end of the project period, 170 energy efficient models (291 including "similar models") from 30 manufacturers were listed for the ProCold project.

Year	# models	# models incl. similar models	# manufacturers	# categories
Feb. 2015	85	187	11	11
Jan. 2018	170	291	30	16

Table 2 Differences in BAT Products, Manufacturers and Categories from the Beginning to End of the ProCold Project

Despite the numerous tightening of selection criteria, the number of BAT products has doubled since the start of the project while the number of participating manufacturers has almost tripled.

For professional refrigerated storage cabinets the adoption and entry into force of the energy labelling and eco-design regulation has triggered an ongoing jump in best available technology. Further significant saving potential could be realized with an increased market surveillance with regards to the implementation of the labelling.

For commercial refrigerated display cabinets, the planned adoption of energy labelling and Eco-design regulation initially led to an increased availability in standardised product information of efficient appliances. But the delay in the regulation lead to uncertainty, and manufacturers stopped this trend. Manufacturers currently test and declare their commercial refrigeration cabinets according to their own measurement protocols, making it impossible for buyers to compare and make informed purchasing decisions. Standardised product information is only generated and made available by manufacturers if additional

incentives are provided, such as rebate programmes (currently implemented in Austria and Switzerland).

Even manufacturers with highly efficient commercial refrigeration appliances that strongly support the introduction of the energy label hesitate to generate standardised product information due to the high testing cost and uncertainty with regards to the further development of the regulation. Many share apprehensions that during the process of finalizing the label and eco-design measures, the test standard will be adapted as well, forcing them to re-test their entire product range at high cost, time and effort. Due to limitations of laboratory resources, such tests might take around 9 month (depending on the size of the product range).

This atmosphere of immobility and waiting caused by the delay in the regulation for LOT 12 leads to 34 TWh missed savings each year by 2024[5]. The market development shows the emergence of increasingly energy efficient technical innovations that currently cannot be marketed adequately due to an incomparability of product data on the market.

Manufacturers have stated to be willing to generate and provide standardised product information provided it results in buyers being able to make informed decisions on the market.

REFRIGERANTS IN TOPTEN SELECTION CRITERIA

At the start of the project, the selection criteria with regards to refrigerants were based on the 2022 goal of the F-Gas regulation and required the use of “refrigerants with a global warming potential GWP below 150”.

With the introduction of artificial HFOs such as R1234yf and R1234ze, studies have shown an increased accumulation of HFO molecules in the air since 2012[6] with no knowledge of long-term effects on the environment or possible plant toxicity[7]. As a result, Topten selection criteria were changed to “natural refrigerant with a global warming potential GWP $\leq$ 3”.

Climate-friendly natural refrigerants with GWP of 3 or below are R600a/isobutane, R290/propane and R744/CO_2. Thermoelectric / Peltier-type minibars and wine coolers operate without a refrigerant.

This change in selection criteria had no effect on the products currently listed in the Topten database.

[5] ProCold calculations based on JRC estimates.
[6] https://www.empa.ch/documents/56101/190047/Vollmer_Tagesanzeiger_pdf/52da2504-aeec-42be-bdc6-1b77363da99e
[7] https://www.kfz-betrieb.vogel.de/r1234yf-nicht-nur-brennbar-sondern-giftig-a-397106/

ADDITIONAL FACTS ABOUT PROCOLD

ProCold is a European project designed to support the market development for energy efficient commercial refrigeration equipment. The project is funded in the framework of the Horizon 2020 programme.

Project Coordination:

ADEME, French Agency for Environment and Energy Management

Project Partners:

Austria: Austrian Energy Agency, AEA

Czech Republic: The Energy Efficiency Center, SEVEn

France: Guide Topten

Germany: Oeko-Institut e.V.

Italy: Politecnico di Milano

Portugal: Quercus

Sweden: Swedish Society for Nature Conservation

Switzerland: Bush Energie GmbH

Project duration:

01.02.2015 – 31.01.2018

REFERENCES

[1] Draft energy label and Eco-design regulation DG ENER Lot 12 refrigerated commercial display cabinets (September 2015); detailed graphs for different product types showing the label classes, Tier 1 and Tier 2.

[2] Commission Delegated Regulation (EU) No 1060/2010 of 28 September 2010 supplementing Directive 2010/30/EU of the European Parliament and of the Council with regard to energy labelling of household refrigerating appliances

[3] Commission delegated regulation (EU) 2015/1094 of 5 May 2015 supplementing Directive 2010/30/EU of the European Parliament and of the Council with regard to the energy labelling of professional refrigerated storage cabinets

[4] Commission Regulation (EU) 2015/1095 of 5 May 2015 implementing Directive 2009/125/EC of the European Parliament and of the Council with regard to Eco-design requirements for professional refrigerated storage cabinets, blast cabinets, condensing units and process chillers

[5] Regulation (EU) No 517/2014 of the European Parliament and of the Council of 16 April 2014 on fluorinated greenhouse gases and repealing Regulation (EC) No 842/2006

[6] Article "Crossing the CO_2 Equator" in Accelerate Europe, Vol. 1, Issue 3, June 2016, pp. 30-39

[7] Article "Gefährliches Kältemittel in der Luft" in the Swiss Tages-Anzeiger, 25.January 2016, page 36 (study by Empa – Swiss Federal Laboratories for Materials Science and Technology)

[8] ProCold website www.topten.eu/pro-cold

- Product lists 'Professional Refrigerators' with top-efficient commercial and professional products using green refrigerants
- Policy recommendations for commercial and professional refrigeration products
- Procurement guidelines for storage refrigerators and freezers, minibars and wine coolers and water coolers
- Declaration overview of storage refrigerators (ProCold study 2017)

[9] ProCold website www.pro-cold.eu

- D2.1: Professional Cold Product Category Definitions and Saving Potentials