Household Refrigerating Appliances

New IEC Global Performance Standard

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History and motivation for the development of a global performance standard

- **idea:**
  to define a standard which will be used in all regions of the world
  to consider the requirements of an ideal test method

- **participants in the IEC working group:**
  representatives from NGO, governmental consultants and also from the industry/manufacturers from
  Australia, Brazil, China, Germany, Italy, Japan, New Zealand, UK and US

- **schedule:**
  2006: first meeting of the working group
  February 2015: publication of the standard

Overview current performance standards – energy consumption determination

region		Europe	Austalia/ New Zealand	US	Japan
standard		EN 62552-2013	AS/NZS 4474.1:2007	AHAM HRF-1 2008	JIS C 9801(2006)
energy consumption test					
	ambient temperature	25°C	32°C	32,2°C (90°F)	15°C & 30°C
	cooling compartment temperature	5°C	3°C	3,9°C	4°C
	freezer compartment temperature	-18°C (warmest)	-15°C (average)	-17,8°C (average)	-18°C (warmest)
	load in freezer compartment	yes	no	no	no
	door openings	no	no	no	yes

- **different target temperature for the different compartments**
- **very significant differences for the freezer compartment temperature**
  -> delta between Australia and Europe ~5 K
- **only in Europe freezer compartment temperature determination with load (packages)**

Overview current performance standards – cooling performance determination

region	Europe	Austalia/ New Zealand	US	Japan
standard	EN 62552-2013	AS/NZS 4474.1:2007	AHAM HRF-1 2008	JIS C 9801(2006)
performance test in different ambient temperatures				
ambient temperature	10/16 till 32/38/43°C	10/32/43°C	--	15°C/30°C
cooling compartment temperature	0 - 4°C	0,5 - 6°C	--	0 - 4°C
freezer compartment temperature	≤ -18°C	≤ -15°C	--	≤ -18°C
load in freezer compartment	yes	yes	--	yes
freezing capacity test	yes	no	no	yes
temperature rise test	yes	no	no	yes
Pull down test	no	yes	no	yes
ice production test	yes	yes	no	yes
wine cooler test	yes	no	no	no

➢**Less difference compared to energy consumption test conditions**

New IEC Global Standard - energy consumption determination

		NEW IEC
	standard	IEC 62552 -1,2-3: 2015
energy consumption test		
	ambient temperature	16°C & 32°C
	cooling compartment temperature	4°C
	freezer compartment temperature	-18°C (average)
	load in freezer compartment	no
	door openings	no

Differences compared to the current EN 62552:

- Energy consumption determination in two ambient temperatures
- freezer compartment temperatures measured without load and average calculated out of 5 or 7 thermocouple positions

Formula for the calculation of the total energy consumption

- $E_{total} = f\{E_{daily\ 16°C}, E_{daily\ 32°C}\} + E_{aux}$

New IEC Global Standard - cooling performance determination

		NEW IEC
	standard	IEC 62552 -1,2-3: 2015
performance test in different ambient temperatures		
	ambient temperature	10/16 till 32/38/43°C
	cooling compartment temperature	0 - 4°C
	freezer compartment temperature	≤ -18°C
	load in freezer compartment	yes
freezing capacity test		yes
cooling capacity test		yes
temperature rise test		yes
load processing efficiency test		yes
Pull down test		yes
ice production test		yes
wine cooler test		yes

Differences compared to the current EN 62552:

- four additional tests (yellow marked)
- no changes for the cooling performance tests

Items with special focus during the test conditions development

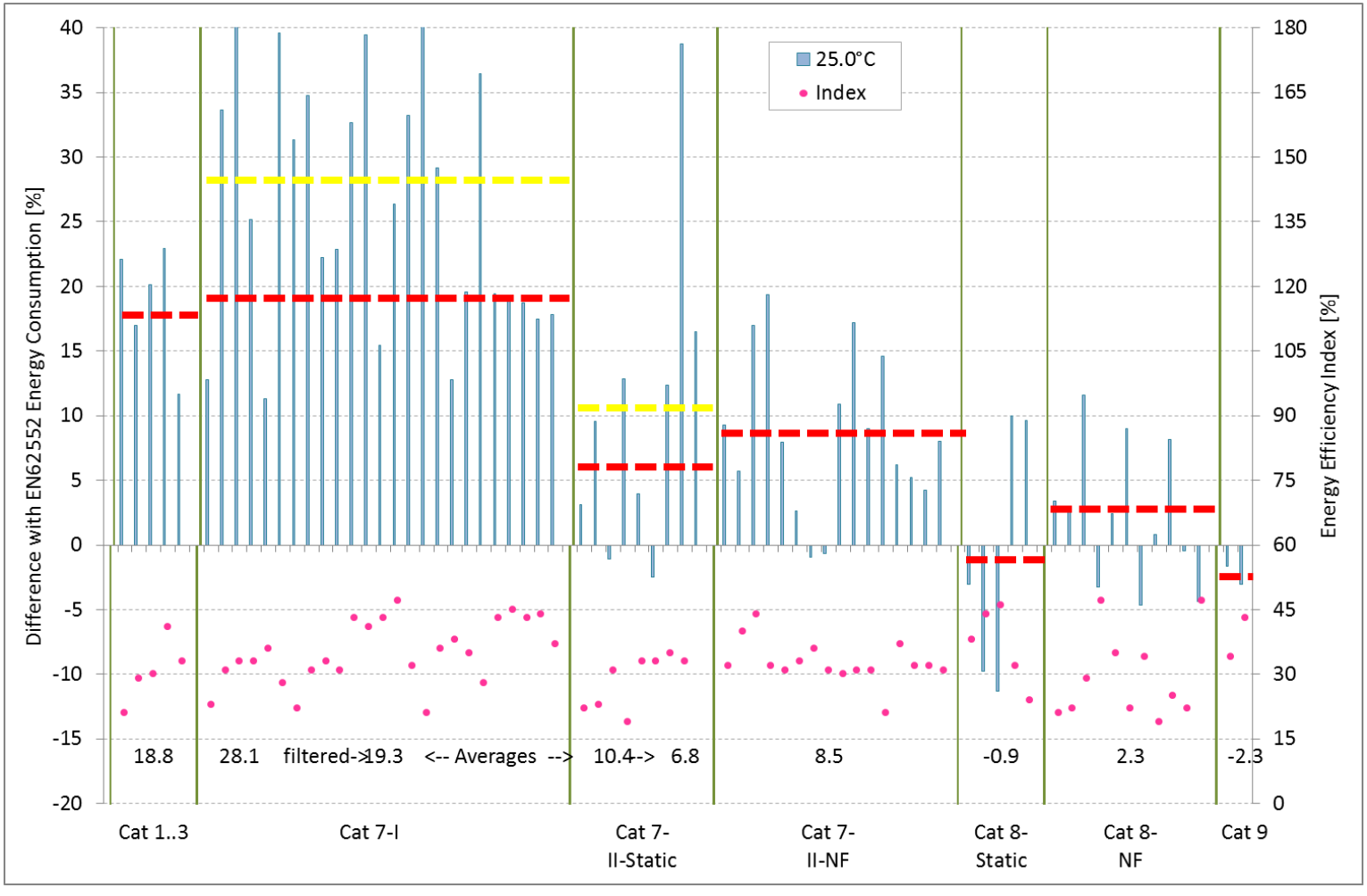
- **to reflect real usage conditions**
  performing the test in two different ambient temperatures
- **to deliver accurate and reproducible test results**
  measuring power consumption steady state
  determining separately the defrost and recovery energy consumption increment for NF appliances
- **to show the differences between different design variants**
  measuring the load processing efficiency
- **to be used for a wide range of appliance models**
  defining a wide range of different compartment types
- **to keep test costs on a moderate level**
  performing the energy consumption test with unloaded freezer compartment
- **to be adjustable to new technologies**

Impact on the energy consumption due to the global standard test method

➢**Tests performed by CECED members as input for the preparatory study for the upcoming European energy efficiency label**

Group	main characteristic	number of products
Category 1,2,3	fridges with or without chill compartments	5
Category 7, single control (Type 1)	combination appliances such as top and bottom mounted freezers	25
Category 7, double control (Type II) + Category 10, static type	combination appliances	9
Category 7, double control (Type II) + Category 10, frost free	combination appliances	16
Category 8, static	upright freezer	5
Category 8, frost free	upright freezer	11
category 9	chest freezer	2

Impact on energy consumption - overview test results



Impact on energy consumption – detailed look to product categories (1)

- **category 1, 2, 3:**
  for 5 evaluated fridge there is an average increase of rounded 19%

-> reduction in fresh food target temperature
from 5°C to 4°C
-> reduction of efficiency of the refrigeration system
due to lower compartment temperature and
higher ambient temperature

Impact on energy consumption – detailed look to product categories (2)

- **category 7, type I, static:**
  for 25 products filtered average increase of rounded 19%

-> for single control combination appliance it is nearly impossible to optimize them towards the new standard, so that the energy consumption increases in average by 10%

-> some of the tested units switch on a heater at 16°C ambient temperature, therefore the increase of more than 30%. This could be avoided in future

Impact on energy consumption – detailed look to product categories (3)

- **category 7, type II, static:**
  for 9 products filtered average increase of rounded 7%

  -> in contrary to type I models, it is possible to optimize these appliances to two ambient temperatures

- **category 7, type II, frost free:**
  for 16 products average increase of rounded 9%

  -> compared to type II static appliances, the higher increase is caused by the more stringent consideration of the defrost cycle

Impact on energy consumption – detailed look to product categories (4)

- **category 8, static:**
  for 5 products average decrease of rounded -1%

  -> this slight reduction is caused by the different evaluation
  evaluation of the compartment temperature
  -18°C in average instead of -18°C at the warmest package

- **category 8, frost free:**
  for 16 products average increase of rounded 2%

  -> compared to static appliances, the higher increase
  is caused by the more stringent consideration of the defrost
  cycle

What are the benefits for end consumers? (1)

➢. **Fridge compartment target temperature 4°C**

the fridge compartment default setting of most of the appliances on the market is 4°C, so the energy consumption is determined in the delivered setting

➢**Test in two different ambient temperatures**

a consumption optimization to just one ambient temperature will not be any longer possible for the manufacturer, so that in general the customer should get a more sophisticated technology, if this will be proved as more efficient

➢. **More stringent consideration of the defrost and recovery energy**

the maximum permitted time between two defrost cycles for frost free appliances is significantly reduced and therefore much more realistic than in the current standard, in which only the storage mode is considered

What are the benefits for end consumers? (2)

➢. **Additional cooling capacity test**

with this test the manufacturer could not only focus on the lowest energy consumption but also a reasonable cooling down time for the fridge has to be achieved, which might be a contrary target.

➢. **Load processing efficiency test**

with this new test, the efficiency of the cooling system is evaluated and so this is a real benefit for the consumers since it is normal to take out and bring in goods to the compartments.

In which countries will this IEC standard be used?

Since the determination of the energy consumption is for all countries new and different, the introduction of this standard can only be done together with a new energy efficiency label regulation.
This is region or country specific, therefore introduction speed is different.

- **2016 (realized/confirmed):**
  Japan: April
  China: October
- **2018 (intended):**
  Australia
- **2019 (expected):**
  Europe

Thank you
for
your attention!