

Efficiency Standards for Horizontal Cooling Cabinets in Pakistan

1st Consultative Meeting

28th June 2022

Avari Hotel, Lahore

Hosted by NEECA & CLASP



Background

As part of the effort to develop a broad range of efficiency standards in Pakistan, CLASP and HIMA^Verte are supporting NEECA and PSQCA with the development of MEPS and Labels for horizontal cooling cabinets. The overriding goal of the CLASP, NEECA and PSQCA collaboration being to reduce energy consumption across the economy and contribute towards reduced greenhouse gas (GHG) emissions.

The first stakeholder consultation on horizontal cooling cabinets focusing on the market summary, potential test method and first draft of proposed MEPS and labelling of horizontal cooling cabinets in Pakistan generated a lot of interest and debate among participants and resulted in some positive outcomes. The meeting was preceded by extensive bilateral consultation meetings between HIMA^Verte / CLASP and various stakeholders to understand the market.

Objectives

The main objective was to provide a forum to all stakeholders in the cooling industry so that they could actively participate in the horizontal cooling cabinets' MEPs, Standards and Labels process including:

- Agreeing a clear scope; i.e. agreeing which products should form part of the scope
- Validating our understanding of the market of Horizontal Cooling Cabinets: Sales, stock, and lifetime and for us to make corrections guided by manufacturers and traders.
- Presenting a proposed methodology for drafting a reasonable, actionable, implementable and adequately ambitious policy for MEPS
- Presenting proposed test method, 1st draft MEPS and 1st draft label levels and get real time responses and reactions of the audience who are to be directly affected by the roll out of these policies and get first hand feedback on how achievable these may be and what might be the road blocks if any.
- Finally take on board valuable suggestions from participants and come back in September with a more refined proposal.

Proceedings:

Salman kicked off the meeting with a round of introductions and thanked the stakeholders for their participation in the workshop. Salman then briefed the participants on the work being done by HIMA^Verte in collaboration with CLASP. HIMA^Verte/CLASP has covered several appliances including motors, water heaters and visi cooler.

From that point onward presentations followed the agenda. Please refer to the following Annexes for relevant additional information:

- Annex 1 for the Agenda
- Annex 2 for the Proposed MEPS and start levels
- Annex 3 for listing of participants
- Annex 4 Photographs
- Annex 5 Technical options to improve the energy performance of beverage cooler cabinets

Key Takeaways:

To maintain a “level playing field” with competing vertical products, agreement was reached as follows:

- It is appropriate to seek to regulate horizontal (chest) domestic freezers and fridge-freezers, and horizontal (chest) beverage cabinets
- Testing for the domestic freezers and fridge-freezers should be conducted following IEC 62552 (at 32C) and testing of the beverage cabinets should be conducted following ISO 22044 (at K1, CC2 conditions). CLASP team will however revisit this and make sure that these classes are the correct ones for adoption.
- Minimum performance and labelling thresholds for horizontal fridge-freezers and beverage cabinets should fully align with the previously agreed thresholds for equivalent sized upright units. Performance requirements for freezers should be developed based on “pro-rata” adjustments relative to the U4E recommended MEPS levels.
- Recognising the U4E performance levels are an appropriate medium term objective for products within Pakistan, it is proposed that MEPS levels will be moved to the lower threshold of 2* in 2025 and the lower threshold of 3* in 2027.
- For horizontal beverage cooler, calculation for EEI, star levels and test methods (ISO-22044) should be same as Visi cooler.
- Due to low sales, regulation of open display cabinets, ice-cream cabinets and frozen food cabinets is not being considered during 2022 – 2023.

1st Presentation

Introduction to Standards and Labels:

Stuart described the function of MEPs to establish a floor of product efficiency. Any product that falls below a prescribed MEPs level is not allowed to be sold in the market. Labels provides a mechanism for efficiency ratings in the market. In Pakistan, a star rating is given according to the performance of a product. He explained the effects of

MEPS and labels in the market and gave examples of the labels used worldwide. He also made a differentiation between a voluntary and compulsory label and the difference between a rating label versus an endorsement label. A list of soon to be mandatory labels in Pakistan was shown which included Fans, ACs, Refrigerators, motors, water heaters, transformers, commercial refrigerators.

Market Analyses:

Stuart then went on to describe the current scenario of the Pakistani Horizontal Cooling cabinets market. He identified the major manufacturers and the current sales, stock and lifetime of Chest cooling cabinets.

Scope of Products:

Stuart explained to the participants about the products to be regulated. He spoke a bit about the work already done by JICA and CLASP in refrigeration. He explained that the current scope includes three kinds of products and gave rationale for striking out some of the other chest cooling cabinet type products. Our scope includes:

- Horizontal side by side chest refrigerator / freezer
- Horizontal chest freezer
- Horizontal beverage Cooler

2nd Presentation

Test method for Horizontal Cooling Cabinets:

Abdul Rehman in his presentation mentioned there are 20+ testing methods internationally prevalent for the regulation for refrigerators. Recently migration to a single, internationally recognized suite of standards: IEC62552 Parts 1, 2 and 3 has taken place. This method provides routes to test all types of domestic refrigerators and/or freezers at ambient and compartment temperatures to suit local conditions. To allow alignment with international trend, AND allow direct relationship with developed JICA fridge-freezer regulations, adopting the PS IEC62552 suite of standards for the regulation of chest fridge-freezer combination and freezer only units might well be the sensible option.

For vertical beverage coolers ISO 22044 has been proposed in February 2022 and is pending adoption by PSQCA. This test standard should also be followed for Horizontal beverage coolers.

3rd Presentation

Proposed MEPS and Labels:

Salman presented the energy consumption of locally manufactured horizontal cooling cabinets and compared them with international products. He mentioned there is a lot of room for savings.

In his presentation he mentioned, that MEPS for horizontal fridge-freezer are being proposed in line with the levels JICA defined for the upright fridge freezer, based on analysis JICA carried out in 2020. The MEPS level that JICA has proposed for vertical Fridge-Freezer is exactly twice the U4E proposed MEPS level. This JICA proposal coincides with South Africa MEPS of 2015. CLASP believes that initial MEPS could be set at these levels for the horizontal version of the Fridge-Freezer as well but MEPS should be revised in 2025 and 2027 to remove 1* and then 2* appliances from the market respectively. It was noted that one of the products tested at PCSIR failed to meet the MEPS level by 7%. However, manufacturers were confident that the MEPS levels being proposed were achievable.

A similar proposal was presented and agreed upon for Chest Freezers as well; i.e. a MEPS level of twice the ones suggested by U4E are being currently proposed. It is heartening to see that all three of the products tested at PCSIR fall in various star categories and all met the envisaged MEPS level.

Lastly MEPS and Label levels for the chest beverage coolers were also presented. These are in line with vertical beverage cooling cabinets [Visies] with the test methods as well as performance levels being similar.

Tables of suggested MEPS level and Labels is attached as ANNEX 2.

Discussion:

The representative from WAVES told the participants that they are currently at 1 or 2 star but aiming to achieve 3 star for visi coolers. To achieve 3-star or higher rating they are looking at technical options; one option is to use Energy Management Device (EMD) to improve the efficiency. However, there are a number of factors which are hindering their efforts. In the testing condition the cooler consumes less energy and is an efficient one. But in the market, it does not work well, as the EMD needs uninterrupted power supply to perform better. Firstly, the power outage effects the performance of EMD, 2ndly the shop keepers turn it off at night time. Stuart Jeffcott responded by saying that the team will respond later on this.

The project team presented a table of technical options to improve the performance of refrigerated cabinets along with the indicative energy savings and component costs for each (see annex 4).

Haier representative raised three points to explain why Pakistan market cooling cabinets consumes more energy.

- 1) Due to harsh climate most of the consumers want fast cooling option which is what the product design is tailored for and which is why the energy consumption for Pakistani refrigerators is also high
- 2) Ambient temperatures are higher than other (European) countries.
- 3) In Pakistan virtually all the horizontal cooling cabinets are on direct cooling (without automatic defrost). Due to these factors energy consumption for refrigerators/freezer is higher in Pakistan. How can they meet higher rating criteria?

CLASP team responded that for household appliances there can be a separate mode of operation for faster freezing (usually manually switched on and off by the user). During all tests under PS 62552 this option is turned off. The testing under proposed star ratings for household refrigerating appliances in Pakistan includes the 'load processing efficiency' test (of PS 62552-3) and the annual energy consumption on the label takes into account this 'pull-down' energy (this adds around 4% to the daily consumption for typical appliances). Similarly, ISO 22044 includes a 'half-reload' test that appliances have to achieve within a number of hours stated in ISO 22044 (6.3.2.3 table 3). The energy consumption on graph for the Topten Europe models has been adjusted to ambient 32°C.

Jeremy response: In European energy label and MEPS regulations for professional refrigerated storage cabinets (as used in commercial kitchens), a MEPS concession was made for 'heavy duty' appliances designed to operate in particularly hot conditions (climate class 5, 40°C), intended to allow for additional energy consumption by larger compressors and higher cooling capacity. However, analysis of cabinet performance

and EU registration database entries showed that the heavy duty appliances achieved equal or better energy efficiency than their standard class equivalents. The concession is proposed to be removed in the regulatory review that is currently ongoing¹. This evidence is relevant to the situation in Pakistan, as it suggests that units designed for hot climatic conditions tend to be more energy efficient because of the higher level of engineering in their design to operate effectively in a harsh environment.

Take away from discussion: The conditions for Pakistan will be taken into account in proposed regulations.

Waves is one of main suppliers to Coca Cola. Their testing requirements specify 32 degrees ambient temperature. However, complaints have been received from locations such as Multan where ambient temperatures can go up to 48 – 50 degrees. As a result, there is now a proposal being considered by Coca Cola to increase ambient temperature requirement for testing.

Stuart said that the team looked at average yearly temperatures for cities in Pakistan and only one location had average temperature exceeding 32 degrees with annual averages mostly between 22 and 27°C (Skardu has 12°C average). So, from a testing perspective the 32 degree ambient temperature requirement will give energy consumption figures that are reasonably representative of Pakistan conditions. Jeremy pointed out that a well-engineered product can meet the 32C requirement and function in harsher conditions as well. It is something for us to think about and we will revert with options.

Representative from PCSIR advised to manufactures that they need to use the thermostat carefully. Three-star knob setting should achieve as close to -18C as possible in the compartment during the energy test. He said, “During testing at some manufacturer labs we have observed some freezer temperature goes below the -18C and the unit end up consuming more energy. This energy can be saved. “

Salman at the end again clarified the process of how CLASP/HIMA[^]Verte help the government in developing the standards and that some things were part of their mandate while other aspects such as helping with technology upgrades was outside their scope of work currently. He further said that through a rigorous consultative process CLASP determines the industry capability and benchmarks it against similar economies so that international experiences can be shared. The standards and labelling also help open up the market for export. For example, fan brands such as Starco and Belvin (two small/medium SMEs) are now competing with large fan manufacturers and exporting to Bangladesh and Africa as they are also producing 3 star energy labelled fans.

Salman thanked all participants on behalf of NEECA, CLASP/HIMA[^]Verte. All the points discussed in the workshop will be taken into consideration and the team will try and come up with suitable solutions for the issues. He stated that meeting minutes and the presentations would be shared with all the participants.

¹ See <https://ecoprarefrigeration.eu> for the regulatory review project website.

Annex 1: Proposed MEPS and star levels

The following agenda was followed at the consultative meeting.

**CLASP cordially invites you to
A Workshop on Efficiency Standards for Chest Cooling Cabinets in
Pakistan**

Hosted by: CLASP & NEECA

Venue: Satluj Hall Avari, Lahore

Time: 10:30 am to 12:30 pm.

Date: 28th June, 2022

TIME	AGENDA ITEM
10.30 – 10.40 am	Welcome note & Round of Introductions
10.40 – 11.05 am	Introductory presentation on the chest cooling cabinet market - sales / stock / suppliers / buyers / afterlife market <i>Stuart Jeffcott – Team Leader, CLASP</i>
11.05 – 11.30 pm	Overview of current test methodologies and regulations used elsewhere and in Pakistan, results from testing <i>Abdul Rehman / Jeremy Tait – CLASP</i>
11.30 – 12.00 pm	International regulation (Including JICA Work on Refrigerators) and potential options for MEPS and Labels in Pakistan <i>Muhammad Salman Zaffar – Technical Lead, CLASP</i>
12.00 – 12.30 pm	Q and A session <i>Muhammad Salman Zaffar, Stuart Jeffcott</i>
12.30 – 1.00 pm	LUNCH and informal chat

Annex 2: Proposed MEPS and star levels

This table assumes that the freezers are rated for temperature and performance as three star or four star compartments (as required under PS 62552) with a target temperature of -18°C and volume adjustment factor of 1.79; the refrigerator compartments are rated for 'fresh food' with a target temperature of 4°C and volume adjustment factor of 1.

The numbers shown in the tables are the rated Comparative Energy Consumption (CEC) of the appliance in kWh/day. The appliance test result must be less than or equal to the stated figure to qualify for the star rating at the head of the relevant column.

The MEPS level for horizontal freezers and horizontal refrigerator-freezers is proposed as:

- The 1-star threshold from January 2023 (appliances unable to achieve at least 1-star would not be eligible for sale)
- The 2-star threshold from January 2025 (appliances unable to achieve at least 2-star would not be eligible for sale)
- The 3-star threshold from January 2027 (appliances unable to achieve at least 3-star would not be eligible for sale)

Horizontal Freezer						
Tables of Volume and Energy Consumption Values by Star Rating for Freezer						
Freezer Volume (Litres)	Total adjusted volume (litres)	1-Star	2 Stars	3-Stars	4-Stars	5-Stars
0	0	1.35	1.19	1.02	0.88	0.68
20	36	1.41	1.23	1.06	0.91	0.70
40	72	1.46	1.28	1.10	0.95	0.73
60	107	1.51	1.32	1.13	0.98	0.76
80	143	1.56	1.37	1.17	1.02	0.78
100	179	1.62	1.42	1.21	1.05	0.81
120	215	1.67	1.46	1.25	1.08	0.83
140	251	1.72	1.51	1.29	1.12	0.86
160	286	1.77	1.56	1.33	1.15	0.89
180	322	1.83	1.60	1.37	1.19	0.91
200	358	1.88	1.65	1.41	1.22	0.94
220	394	1.93	1.69	1.45	1.25	0.97
240	430	1.98	1.74	1.49	1.29	0.99
260	465	2.04	1.79	1.53	1.32	1.02
280	501	2.09	1.83	1.57	1.36	1.04
300	537	2.14	1.88	1.61	1.39	1.07
320	573	2.19	1.92	1.65	1.43	1.10
340	609	2.25	1.97	1.69	1.46	1.12
360	644	2.30	2.02	1.73	1.49	1.15
380	680	2.35	2.06	1.77	1.53	1.18
400	716	2.40	2.11	1.81	1.56	1.20
420	752	2.46	2.15	1.84	1.60	1.23
440	788	2.51	2.20	1.88	1.63	1.26
460	823	2.56	2.25	1.92	1.66	1.28
480	859	2.62	2.29	1.96	1.70	1.31
500	895	2.67	2.34	2.00	1.73	1.33
520	931	2.72	2.38	2.04	1.77	1.36
540	967	2.77	2.43	2.08	1.80	1.39
560	1002	2.83	2.48	2.12	1.84	1.41
580	1038	2.88	2.52	2.16	1.87	1.44
600	1074	2.93	2.57	2.20	1.90	1.47
620	1110	2.98	2.62	2.24	1.94	1.49
640	1146	3.04	2.66	2.28	1.97	1.52
660	1181	3.09	2.71	2.32	2.01	1.54
680	1217	3.14	2.75	2.36	2.04	1.57
700	1253	3.19	2.80	2.40	2.07	1.60

Side by Side Refrigerator and Freezer

Tables of Volume and Energy Consumption Values by Star Rating								
Refrigerator Volume (litres)	Freezer Volume (Litres)	Total volume	Total adjusted volume (litres)	1-Star	2 Stars	3-Stars	4-Stars	5-Stars
0	0	0	0	1.15	1.01	0.86	0.75	0.58
20	20	40	56	1.24	1.09	0.93	0.81	0.62
40	40	80	112	1.33	1.16	1.00	0.86	0.66
60	60	120	167	1.41	1.24	1.06	0.92	0.71
80	80	160	223	1.50	1.32	1.13	0.98	0.75
100	100	200	279	1.59	1.39	1.19	1.03	0.80
120	120	240	335	1.68	1.47	1.26	1.09	0.84
140	140	280	391	1.77	1.55	1.33	1.15	0.88
160	160	320	446	1.86	1.62	1.39	1.21	0.93
180	180	360	502	1.94	1.70	1.46	1.26	0.97
200	200	400	558	2.03	1.78	1.52	1.32	1.02
220	220	440	614	2.12	1.86	1.59	1.38	1.06
240	240	480	670	2.21	1.93	1.66	1.43	1.10
260	260	520	725	2.30	2.01	1.72	1.49	1.15
280	280	560	781	2.38	2.09	1.79	1.55	1.19
300	300	600	837	2.47	2.16	1.85	1.61	1.24
320	320	640	893	2.56	2.24	1.92	1.66	1.28
340	340	680	949	2.65	2.32	1.99	1.72	1.32
360	360	720	1004	2.74	2.40	2.05	1.78	1.37
380	380	760	1060	2.82	2.47	2.12	1.83	1.41
400	400	800	1116	2.91	2.55	2.18	1.89	1.46

For Horizontal Beverage Cooler

These tables show threshold for label classes in terms of EEI and in terms of maximum daily energy consumption – these are directly equivalent. The appliance test result must be less than or equal to the stated figure to qualify for the star rating at the head of the relevant column.

The MEPS level for horizontal beverage coolers is proposed as:

- Maximum EEI of 100 from publication of the regulation until 31 December 2024
- Maximum EEI of 80 from 1 January 2025

Tables of Volume and Maximum EEI and Energy Consumption Values by Star Rating

Star Value Maximum EEI

Volume (Litres)	1-Star	2 Stars	3-Stars	4-Stars	5-Stars
0	100	80	65	35	10
20	100	80	65	35	10
40	100	80	65	35	10
60	100	80	65	35	10
80	100	80	65	35	10
100	100	80	65	35	10
120	100	80	65	35	10
140	100	80	65	35	10
160	100	80	65	35	10
180	100	80	65	35	10
200	100	80	65	35	10
220	100	80	65	35	10
240	100	80	65	35	10
260	100	80	65	35	10
280	100	80	65	35	10
300	100	80	65	35	10
320	100	80	65	35	10
340	100	80	65	35	10
360	100	80	65	35	10
380	100	80	65	35	10
400	100	80	65	35	10
420	100	80	65	35	10
440	100	80	65	35	10
460	100	80	65	35	10
480	100	80	65	35	10
500	100	80	65	35	10
520	100	80	65	35	10
540	100	80	65	35	10
560	100	80	65	35	10
580	100	80	65	35	10
600	100	80	65	35	10
620	100	80	65	35	10
640	100	80	65	35	10
660	100	80	65	35	10
680	100	80	65	35	10
700	100	80	65	35	10

Star Value Maximum Daily Energy Consumptions (kWh)

Volume (Litres)	1-Star	2 Stars	3-Stars	4-Stars	5-Stars
0	2.10	1.68	1.37	0.74	0.21
20	2.24	1.79	1.45	0.78	0.22
40	2.37	1.90	1.54	0.83	0.24
60	2.51	2.01	1.63	0.88	0.25
80	2.64	2.11	1.72	0.92	0.26
100	2.78	2.22	1.81	0.97	0.28
120	2.91	2.33	1.89	1.02	0.29
140	3.05	2.44	1.98	1.07	0.30
160	3.18	2.55	2.07	1.11	0.32
180	3.32	2.66	2.16	1.16	0.33
200	3.45	2.76	2.25	1.21	0.35
220	3.59	2.87	2.33	1.26	0.36
240	3.73	2.98	2.42	1.30	0.37
260	3.86	3.09	2.51	1.35	0.39
280	4.00	3.20	2.60	1.40	0.40
300	4.13	3.31	2.69	1.45	0.41
320	4.27	3.41	2.77	1.49	0.43
340	4.40	3.52	2.86	1.54	0.44
360	4.54	3.63	2.95	1.59	0.45
380	4.67	3.74	3.04	1.64	0.47
400	4.81	3.85	3.13	1.68	0.48
420	4.94	3.96	3.21	1.73	0.49
440	5.08	4.06	3.30	1.78	0.51
460	5.22	4.17	3.39	1.83	0.52
480	5.35	4.28	3.48	1.87	0.54
500	5.49	4.39	3.57	1.92	0.55
520	5.62	4.50	3.65	1.97	0.56
540	5.76	4.61	3.74	2.02	0.58
560	5.89	4.71	3.83	2.06	0.59
580	6.03	4.82	3.92	2.11	0.60
600	6.16	4.93	4.01	2.16	0.62
620	6.30	5.04	4.09	2.20	0.63
640	6.43	5.15	4.18	2.25	0.64
660	6.57	5.26	4.27	2.30	0.66
680	6.71	5.36	4.36	2.35	0.67
700	6.84	5.47	4.45	2.39	0.68

Annex 3: List of Participants

Sr No.	Name	Organization
1	Muhammad Ashraf Palari	PSQCA
2	Mohammad Azhar	PCSIR
3	Syed Imad Hasani	Arcelik / Dawlance
4	Syed Shafat Hussain	Arcelik / Dawlance
5	Rizwan Yaqoob	Waves
6	Jawad Ahmed	Waves
7	Sohaib Siddique	Khan Brothers
8	Suleman Naqvi	PEL
9	Attique Ahmad	PEL
10	Abid Ali	WWF
11	Syed Hassam Ali	WWF
12	Ahmad Shafi	Varioline
13	Jeremy Tait (on zoom)	CLASP
14	Stuart Jeffcot	CLASP
15	Ali Habib	CLASP/HIMA^Verte
16	Muhammad Salman Zaffar	CLASP/HIMA^Verte
17	Amna Shahab	CLASP/HIMA^Verte
18	Abdul Rehman	CLASP/HIMA^Verte
19	Areeb Hussain	CLASP/HIMA^Verte

Annex 4: Photographs







Annex 5: Technical options to improve the energy performance of beverage cooler cabinets

All options shown, except EMD and glazing, are also valid for household appliances. Sources: Various EU, US, U4E. Assumes cost of cabinet is US\$ 500.

Technical measure	Efficiency improvement %	Incremental cost US\$	Incremental cost %	Comment
Use of Energy Management Device	20%	US\$ 15	3%	Automatic switch off lights, fans compressor in quiet periods or allow product temperature to float upwards
Switch to hydrocarbon refrigerant with optimised charge size (R290 or R600a)	8%	US\$ 30	6%	Assumes additional safety features needed
Efficient ECM or DC evaporator fan motor	10%	US\$ 8	1.5%	Electronic or DC motors can halve fan power; extra savings from less heat load inside compartment
Improved fixed speed compressor	3%	US\$ 5	1%	Example in shop: SECOP FR11G, has COP 1.51 and bottom 20% of SECOP range for this application. A good household fridge has COP 1.8 (20% better). Variable speed as further option to achieve best in class.
Electronic thermostat	3%	US\$ 10	2%	Closer temperature control; less overshoot; less cycling
Improved design of evaporator and condenser	5%	US\$ 25	5%	Larger heat exchange area; better fins for heat exchange. Higher scope for savings from evaporator design, with higher associated cost
Increased insulation of body	5%	US\$ 30	6%	Add 1.25cm to thickness
Efficient ECM or DC condenser fan motor	0.7%	US\$ 5	1%	Electronic or DC motors can halve fan power
Improved LED lighting	0.5%	US\$ 5	1%	Extra savings by reducing heat load inside the cooled compartment
Better double glazing for door	TBD	TBD	TBD	K-glass; argon filled. Triple glazing is an option for best in class.