New charge limits for flammable refrigerants in commercial refrigeration: Impacts of the IEC 60335-2-89 standard revision

Virtual MOP32 Side Event

26th November 2020, 12:00-1:00 pm (EAT time, Nairobi)
Facilitators: Janna Breitfeld, Julia Schabel

Please note that the event will be recorded

giz Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH

On behalf of
Federal Ministry for Economic Cooperation and Development

Federal Ministry for the Environment, Nature Conservation and Nuclear Safety

PROKLIMA NATURALLY COOL

Agenda

Welcome Remarks	GIZ Proklima
Climate relevance of the commercial refrigeration sector	Philipp Munzinger, GIZ Proklima
Potential of the revised standard for different applications	Marek Zgliczynski, Embraco North Amercia
Experiences from Thailand's commercial refrigeration sector	Ekkapong Tangsirimanakul, Patana Intercool
Questions and Answers	All
Closing	Philipp Munzinger, GIZ Proklima

Climate Relevance of the Commercial Refrigeration Sector

Philipp Munzinger, Team Lead Asia, GIZ Proklima

Climate Relevance of the Commercial Refrigeration Sector

26th November 2020, GIZ Proklima virtual side-event, MOP32

Philipp Munzinger, GIZ Proklima

giz Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH

On behalf of
Federal Ministry for Economic Cooperation and Development

Federal Ministry for the Environment, Nature Conservation and Nuclear Safety

PROKLIMA NATURALLY COOL

Sub-sector Commercial Refrigeration

Appliances Types:

Stand-alone Equipment

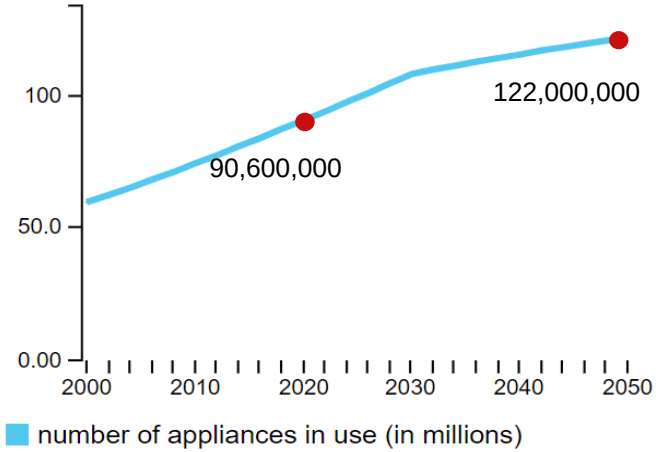
Condensing Units

Centralised Systems for supermarkets

Cold stores

Annual Growth: 3.3%

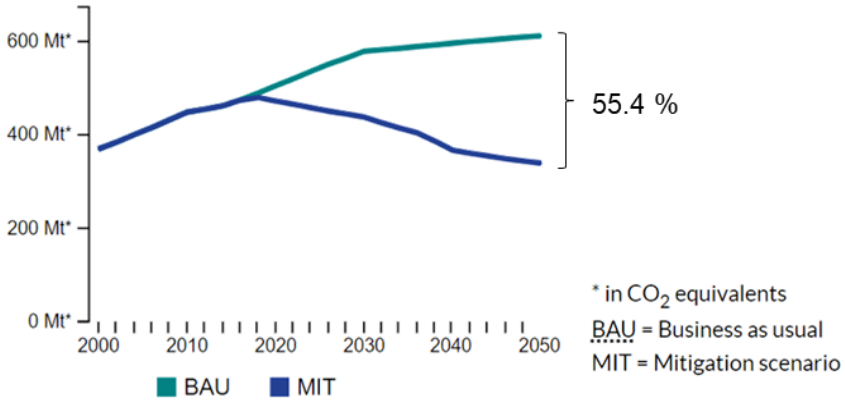
Appliances in use (World)
Commercial Refrigeration



Source: Green Cooling Initiative

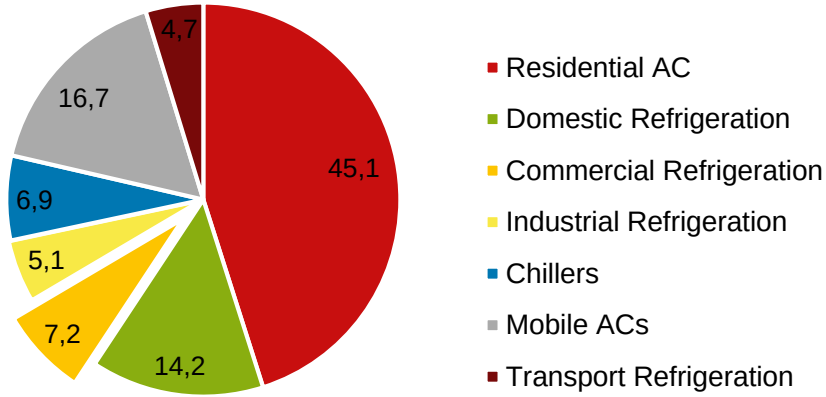
Climate impact and mitigation potential

Total GHG Emissions of Commercial Refrigeration (World)



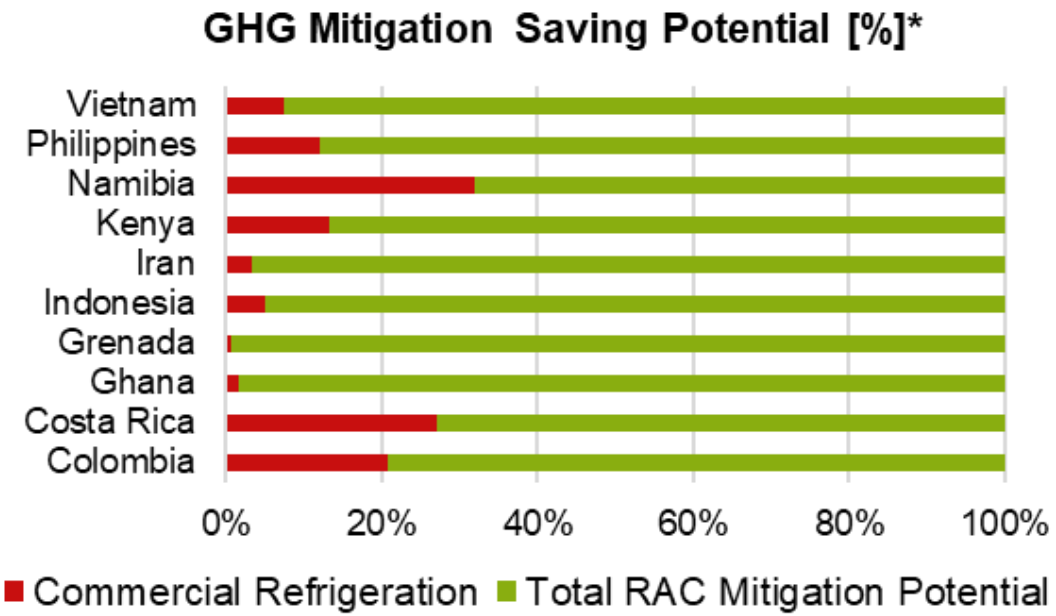
Source: Green Cooling Initiative

GHG Mitigation Saving Potential ** [%, annually in 2050] *



* Data from the prepared GHG inventory reports of GIZ
** comparison between BAU (business as usual) and EER (best & most energy efficient technologies)

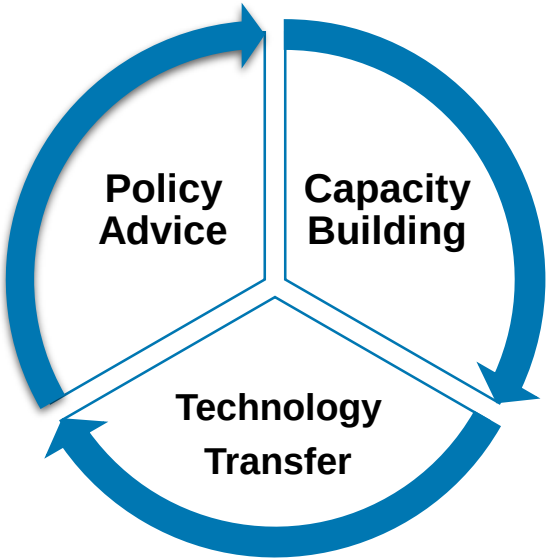
Climate impact and mitigation potential (2)



* Data from the prepared GHG inventory reports of GIZ; comparison between BAU (business as usual) and EER (best & most energy efficient technologies)

GIZ Proklima‘s work on commercial refrigeration

- Development of sub-sector market inventories, technology impact assessments and subsector roadmaps
- Technical advice in revising and adopting national commercial refrigeration efficiency and safety standards based on international best-practice



- Training of RAC technician trainers and technicians based on latest inernational standards (i.e. Cool Training, in-country training programmes

- Technology demonstration (Conversion of commercial refrigeration equipment in PicknPay Supermarkets in ZA)
- Technical advice to commercial refrigeration equipment manufacturers

Potential of the revised standard for different applications

Marek Zgliczynski, R&D Director, Embraco North America

Embraco Portfolio For Commercial Refrigeration







Merchandiser | **Food Service | Food Retail** | **Medical**

Fixed Speed












EM | F | NE | EM | F | NE | NT | NJ | SCROLL | NE | NT | NJ

Variable Speed








FMF | FMX | VES | FMF | VNE | FMX | VNE | FMF

Condensing Units / Systems

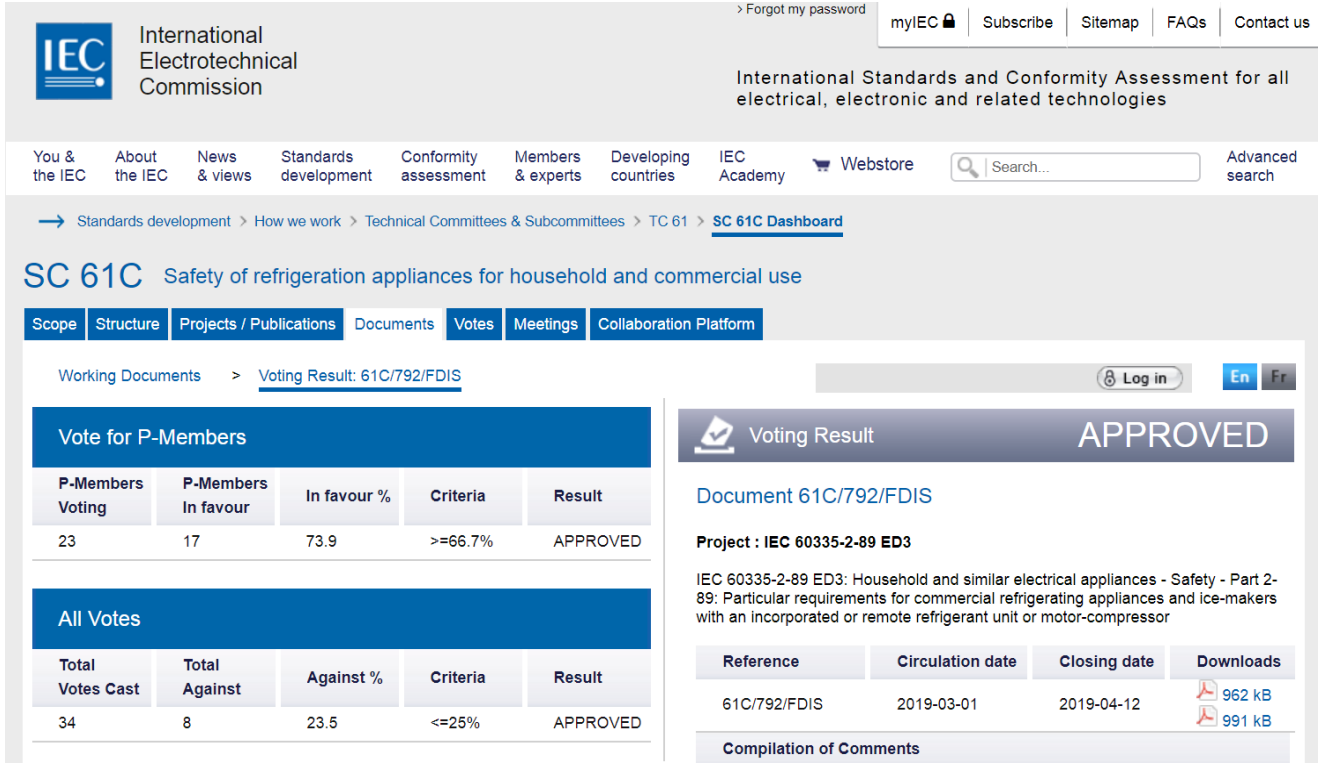





Cond. Unit | Cond. Unit | Plug n' cool | Falcon | Bioma | Cond. Unit

RECIPROCATING: 2-38CC **| SCROLL:** 2-13HP **AVAILABLE FOR LBP, MBP, HBP APPLICATIONS**

Commercial Appliances - IEC Product Standard Status



› Forgot my password | myIEC | Subscribe | Sitemap | FAQs | Contact us

International Electrotechnical Commission

International Standards and Conformity Assessment for all electrical, electronic and related technologies

You & the IEC | About the IEC | News & views | Standards development | Conformity assessment | Members & experts | Developing countries | IEC Academy | Webstore | Search... | Advanced search

Standards development › How we work › Technical Committees & Subcommittees › TC 61 › SC 61C Dashboard

SC 61C Safety of refrigeration appliances for household and commercial use

Scope | Structure | Projects / Publications | Documents | Votes | Meetings | Collaboration Platform

Working Documents > Voting Result: 61C/792/FDIS

Log in | En | Fr

Vote for P-Members

P-Members Voting	P-Members In favour	In favour %	Criteria	Result
23	17	73.9	>=66.7%	APPROVED

All Votes

Total Votes Cast	Total Against	Against %	Criteria	Result
34	8	23.5	<=25%	APPROVED

Voting Result APPROVED

Document 61C/792/FDIS

Project : IEC 60335-2-89 ED3

IEC 60335-2-89 ED3: Household and similar electrical appliances - Safety - Part 2-89: Particular requirements for commercial refrigerating appliances and ice-makers with an incorporated or remote refrigerant unit or motor-compressor

Reference	Circulation date	Closing date	Downloads
61C/792/FDIS	2019-03-01	2019-04-12	962 kB 991 kB

Compilation of Comments

- New Edition of **IEC 60335-2-89 ed.3** was published on **June 20, 2019**

New IEC Charge Limit For Flammables

- **Max** refrigerant **charge** for each circuit **13*LFL**, but not more than **1.2kg**

eg.

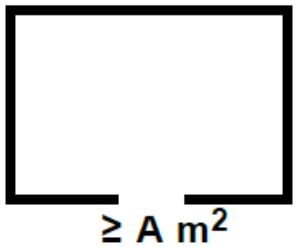
Refrigerant	LFL [kg/m^3]	13*LFL	IEC Approved
R290 (A3)	0.038	0.494 kg	**0.494 kg**
R32 (A2L)	0.307	3.991 kg	**1.2 kg**

- **Commercial Ice Makers** are now part of the standard **scope**
- **Remote Systems** with more than 150 g of flammables **are excluded** from the scope of this new edition
- **Requirements** for systems **below 150 g** are **not** changing

New IEC Charge Limit For Flammables

Main new requirements above 150g of charge:

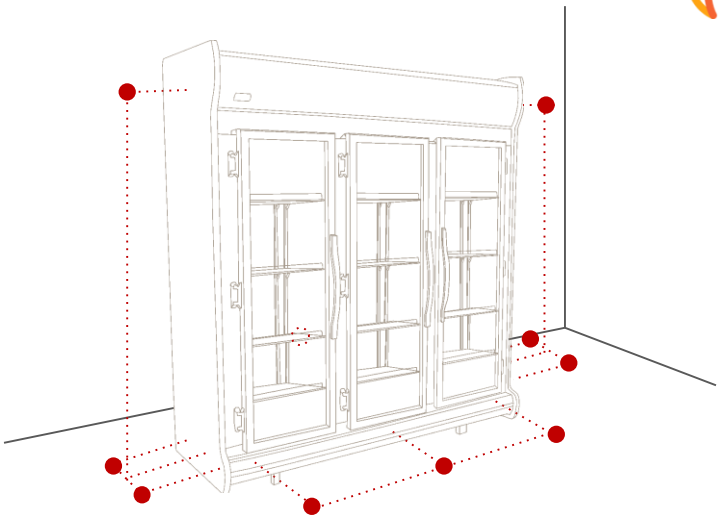
- Refrigeration circuit has to be **hermetically sealed**
- Refrigerant-containing parts shall be **protected** and **not** be an **accessible** part
- Appliance shall be constructed to **not cause excessive vibration or resonance**
- Appliance shall be **marked** with the **minimum room floor area** in which the appliance is permitted to be installed (With some exceptions)



New IEC Charge Limit For Flammables

Main new requirements above 150g of charge:

- **Air-flow** is the main factor **to minimize the risk** of flammable cloud around the appliance
- Appliance shall be constructed to pass the **Annex CC test** to prevent flammable refrigerant concentration
- In case of doors/drawers the Annex CC includes **door opening test** after full charge release inside closed cabinet.



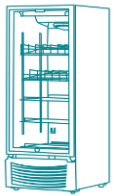
giz

Charge Increase Implementation Status

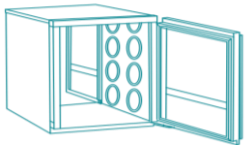
- Most of the **nations** have already introduced the **new Ed. 3** inside their standardization system.
- In Europe **CENELEC TC61** is working on the conversion of the standard IEC 60335-2-89 into **EN** version.This standard is intended to become a **harmonized standard** with EU Machine Directive (MD). Final Vote Target Date – **March 2021.**
- **USA** and **Canada** formed a working group (WG12) with **CANENA** to update equivalent UL and CSA standards. Several deviations to the IEC version are expected. Target publication date by **mid 2021.**
- In **New Zealand** and **Australia, new edition of** AS/NZS 60335.3.89 standard was published in **July 2020.**
- **Japan** - Working Group **WG3** under Japan Refrigeration and Air Conditioning Industry Association (**JRAIA**) is working on Japanese version of IEC 60335-2-89 standard with target date for its publication still in **2020?.**

Equipments covered by IEC 60335-2-89

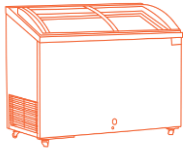
BOTTLE COOLERS



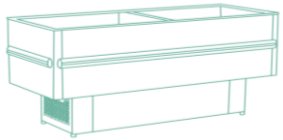
BLAST FREEZERS



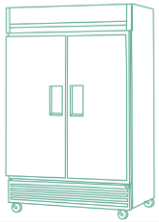
ICE-CREAM FREEZERS



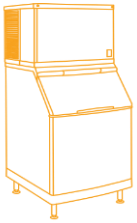
GONDOLA CABINETS



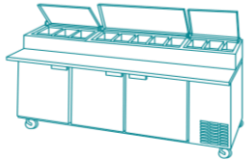
RECH-IN CABINETS



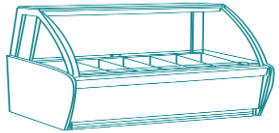
ICE MAKERS



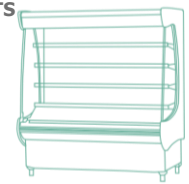
PREPARATION COUNTERS



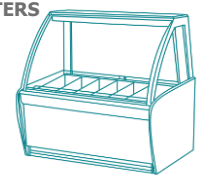
SERVE-OVER CABINETS



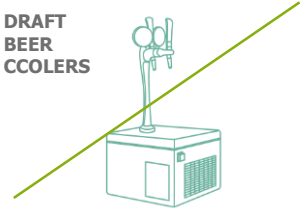
MULTI-DECK CABINETS



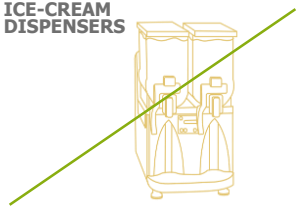
GELATO COUNTERS



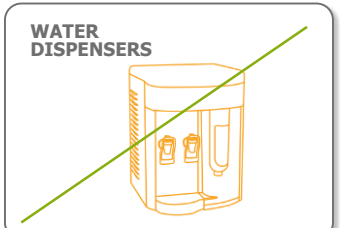
DRAFT BEER CCOLERS



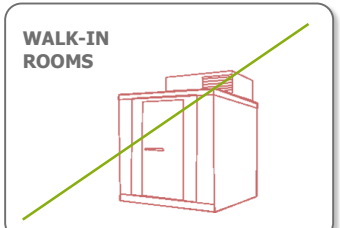
ICE-CREAM DISPENSERS



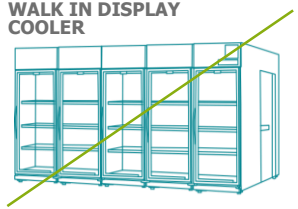
WATER DISPENSERS



WALK-IN ROOMS

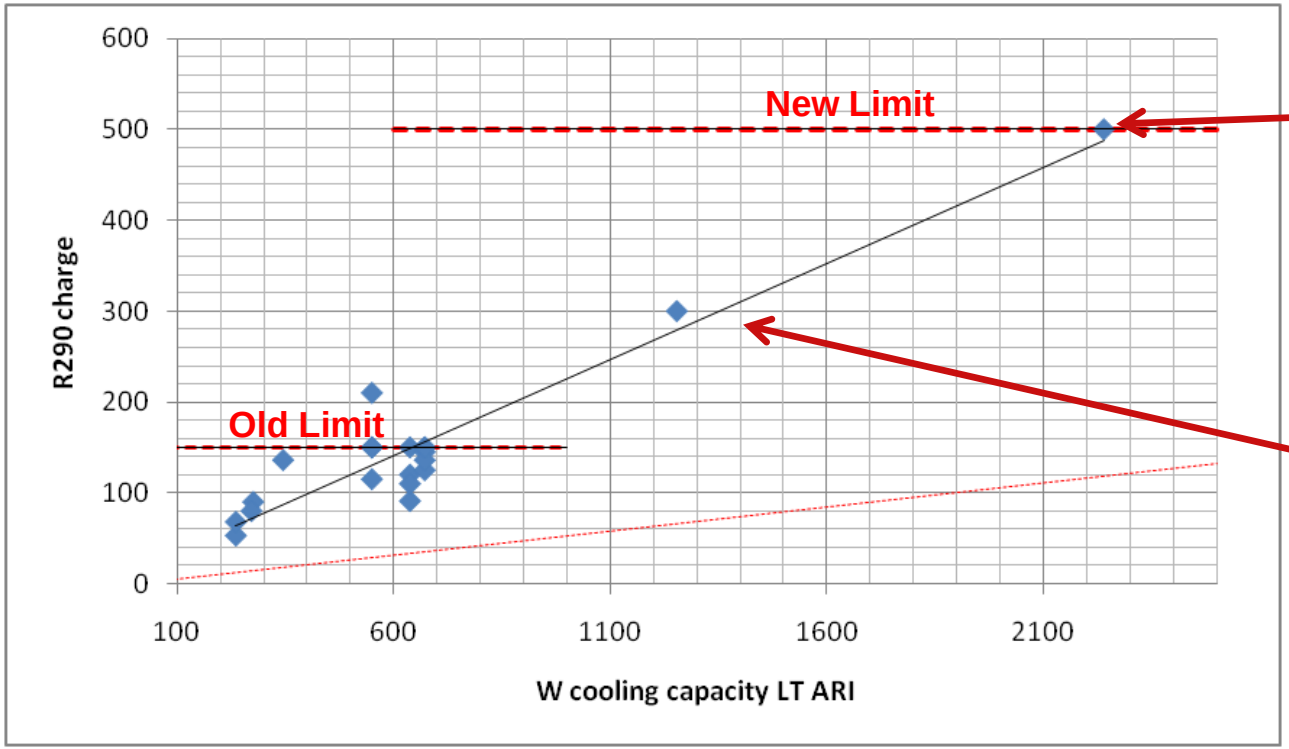


WALK IN DISPLAY COOLER



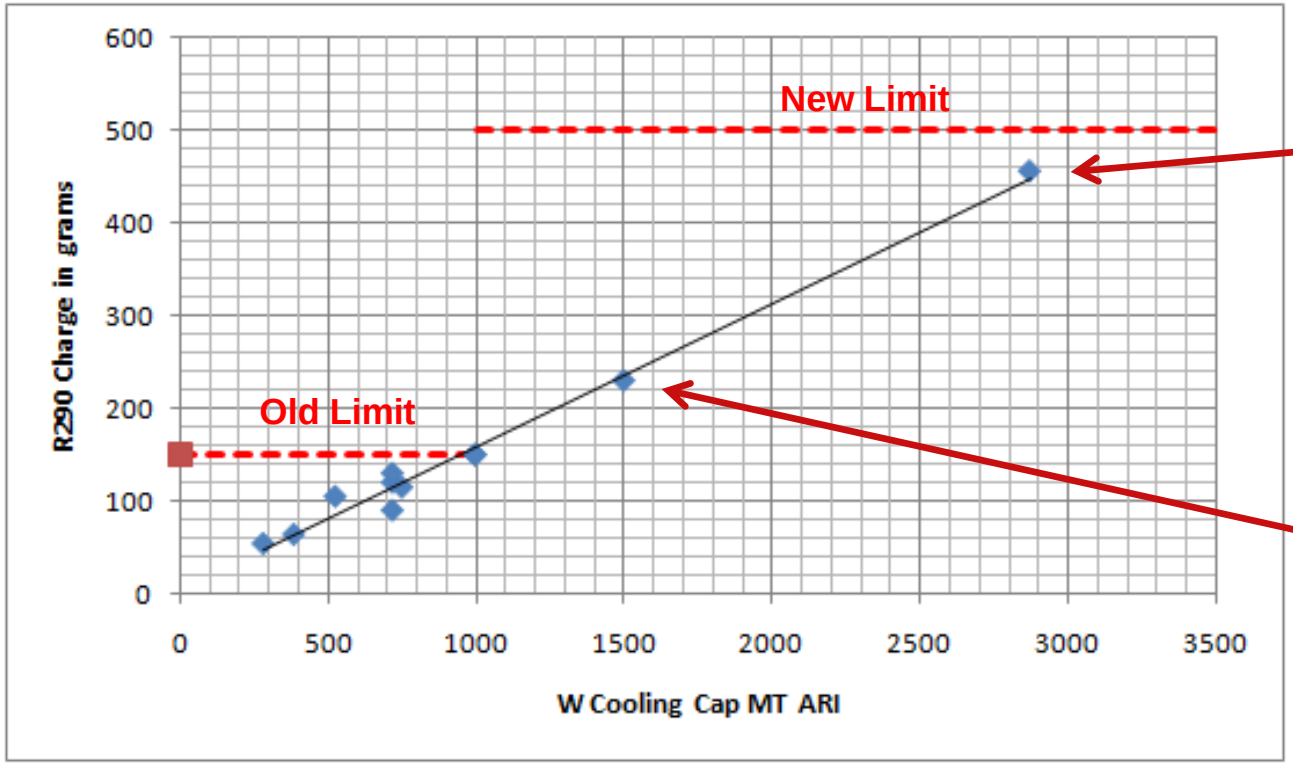
500g CHARGE LIMIT

LT PROPANE CABINETS CHARGE



500g CHARGE LIMIT

MT PROPANE CABINETS CHARGE



500g CHARGE LIMIT

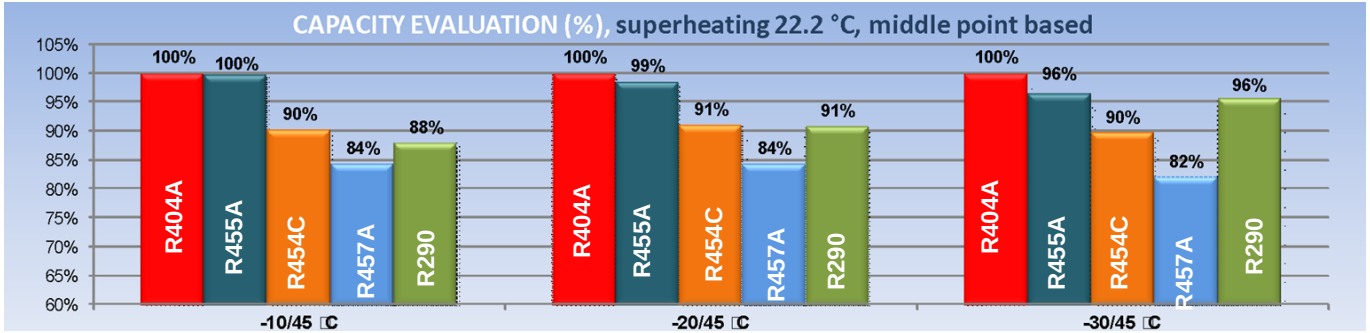
MULTI CIRCUIT VS SINGLE CIRCUIT

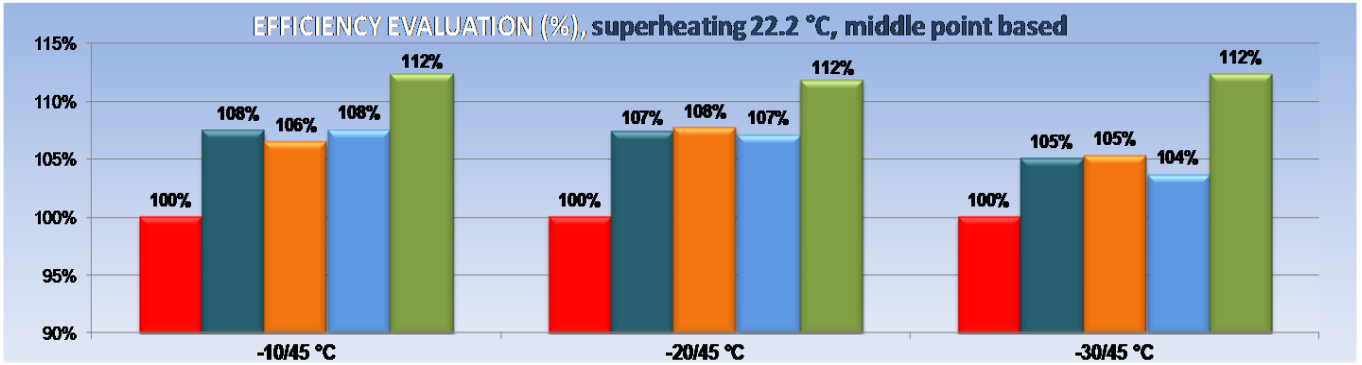
	MULTI CIRCUIT – 150 g MAX	SINGLE CIRCUIT – 500g MAX
PROS	- Multistep capacity regulation possible - Smaller tubes diameter - No need to test for leakage with Annex CC - No restriction in room area - Redundancy	- Simple assembly process - Less components - Condensing unit requires much less space
CONS	- More complex assembly process - More components - Condensing unit requires much more space - Not practical in compact machines	- Capacity regulation more expensive - Larger tubes diameter - Must pass the test for leakage of Annex CC - Restrictions for room area

Commercial Refrigeration - R404A Low GWP Alternatives

Refrigerant	GWP	Class	Composition [%]					LFL [kg/m^3]	1 bar(a) glide
			R290	R32	yf	R744	R152a		
R455A	146	A2L	0	21.5	75.5	3	0	0.431	12.4K
R454C	146	A2L	0	21.5	78.5	0	0	0.293	8.2K
R457A	139	A2L	0	18	70	0	12	0.216	7.1K
R290	3	A3	100	0	0	0	0	0.038	0K

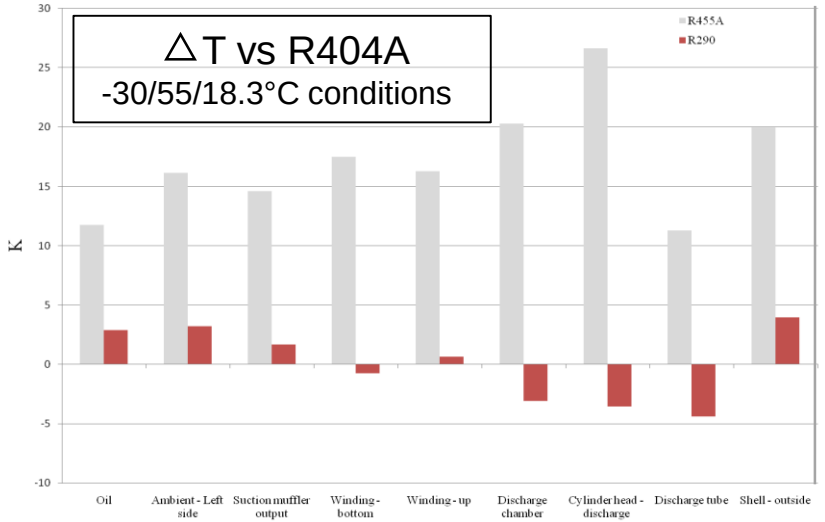
R290 vs A2L

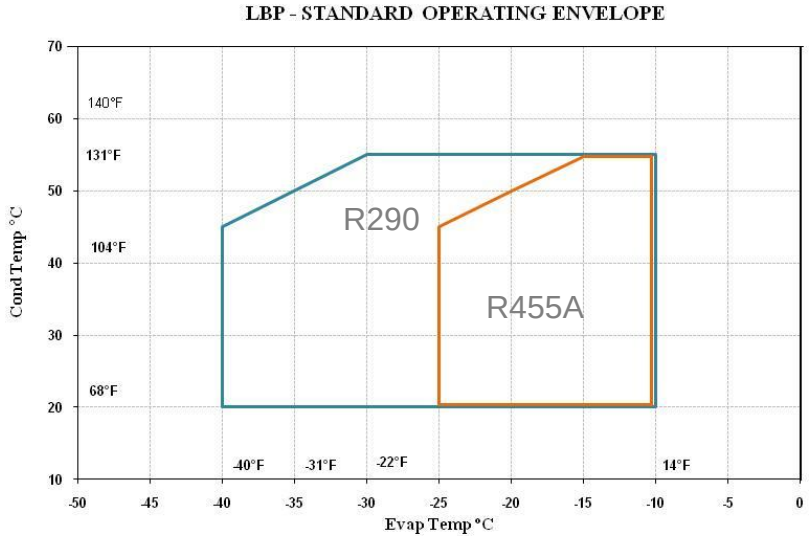




Propane Is Most Efficient Low GWP Alternative To R404A

R290 vs A2L





Higher Thermal Level Causes Compressor Operating Envelope Limitation With A2L

R290 vs A2L

The main advantages of R290 vs A2L alternatives:

- excellent thermodynamic efficiency = higher COP, lower indirect impact
- low discharge temperature = higher reliability, larger envelope
- no temperature glide = simple heat exchanger design
- low refrigerant charge = higher resistance to liquid return
- natural refrigerant with low price = lower production and service cost
- extremely low GWP = very low direct impact, future proof
- lower operating pressures = easier to meet PED compliance

Thank you!

Experiences from Thailand´s commercial refrigeration sector

Interview with Ekkapong Tangsirimanakul, General Manager at Patana Intercool

Experiences from Thailand‘s commercial refrigeration sector

Interview with Ekkapong Tangsirimanakul
General Manager at Patana Intercool

1. What opportunities does Patana Intercool see in the raised charge limits (150g to 500g), as stipulated in the updated IEC standard 60335-2-89?

2. Have you already designed new commercial refrigeration equipment, taking the increased charge limits into account?

3. How did or does Patana Intercool overcome other barriers towards larger hydrocarbon charge sizes?

Questions & Answers

Feel free to write your questions & remarks into the chat!

Philipp Munzinger
GIZ Proklima Germany
Team Lead Asia

Marek Zgliczynski
Embraco North America
R&D Director

Ekkapong Tangsirimanakul
Patana Intercool
General Manager

Closing

Philipp Munzinger, GIZ Proklima

Contact

Bernhard Siegele
Project Manager

Bernhard.Siegele@giz.de

Philipp Munzinger
Team Lead Asia

Philipp.Munzinger@giz.de

Janna Breitfeld
Communications Advisor

Janna.Breitfeld@giz.de

Julia Schabel
Communications Advisor

Julia.Schabel@giz.de

www.green-cooling-initiative.org/

https://twitter.com/GCIGreenCooling

Dig deeper:

twitter.com/GCIGreenCooling

www.green-cooling-initiative.org

Thank you!

Deutsche Gesellschaft für
Internationale Zusammenarbeit (GIZ) GmbH

Registered offices
Bonn and Eschborn

Friedrich-Ebert-Allee 36 + 40
53113 Bonn, Germany
T +49 228 44 60 - 0
F +49 228 44 60 - 17 66

Dag-Hammarskjöld-Weg 1 - 5
65760 Eschborn, Germany
T +49 61 96 79 - 0
F +49 61 96 79 - 11 15

E info@giz.de
I www.giz.de

giz Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH