

EU Legislation Update

Commercial Refrigeration

June 2022

Marek Zgliczynski
R&D Director
IEC SC61C Chair



GLOBAL F-GAS DEADLINES

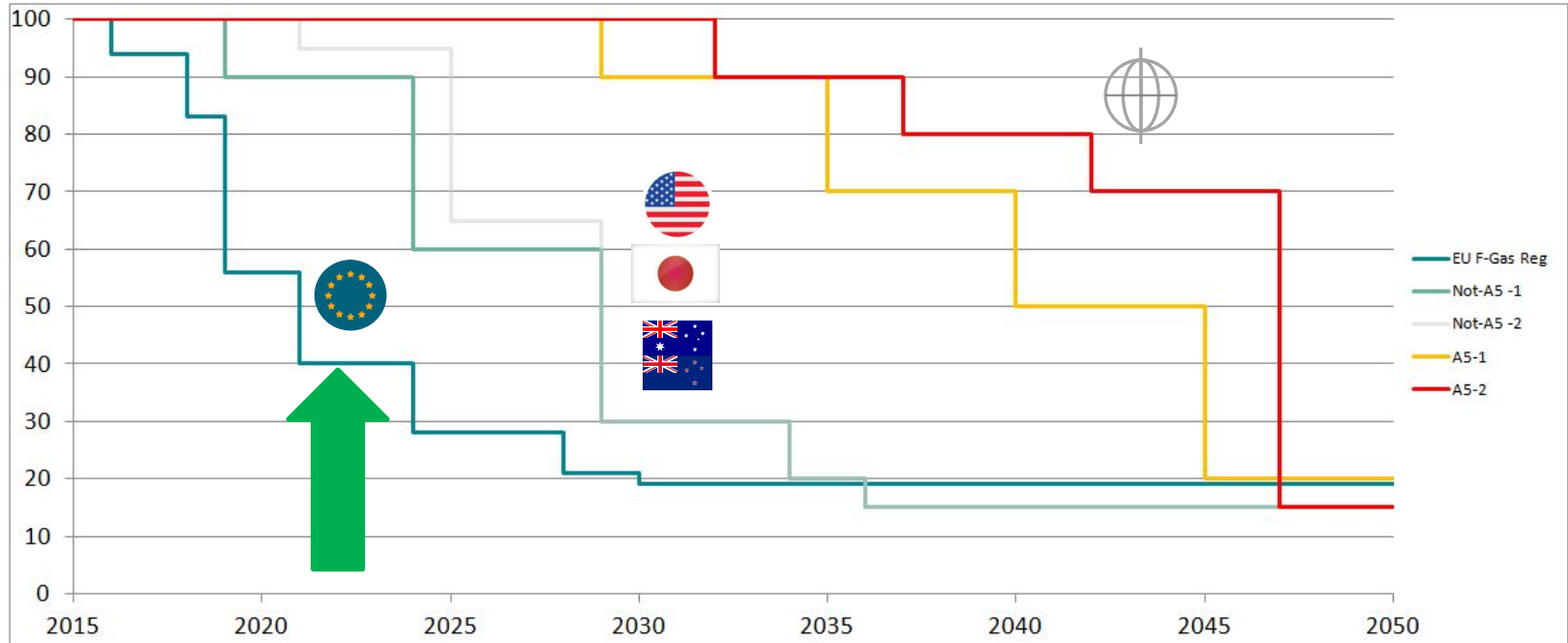
PROPOSED EU F-GAS UPDATE

EU SAFETY STANDARDS UPDATE

NEW REACH EU DIRECTIVE - PFAS

F-GAS Phase Down Steps – Kigali Amendment

% CO2 eqv emissions for refrigerants placed on the market vs 2015 baseline



132* Countries Ratified Kigali Agreement , EU is Leading In F-Gas Regulations

Present EU F-GAS Regulation Bans

Products and equipment Where relevant, the GWP of mixtures containing fluorinated greenhouse gases shall be calculated in accordance with Annex IV, as provided for in point 6 of Article 2		Date of prohibition
10. Domestic refrigerators and freezers that contain HFCs with GWP of 150 or more		1 January 2015
11. Refrigerators and freezers for commercial use (hermetically sealed equipment)	that contain HFCs with GWP of 2 500 or more	1 January 2020
	that contain HFCs with GWP of 150 or more	1 January 2022
12. Stationary refrigeration equipment, that contains, or whose functioning relies upon, HFCs with GWP of 2 500 or more except equipment intended for application designed to cool products to temperatures below – 50 °C		1 January 2020
13. Multipack centralised refrigeration systems for commercial use with a rated capacity of 40 kW or more that contain, or whose functioning relies upon, fluorinated greenhouse gases with GWP of 150 or more, except in the primary refrigerant circuit of cascade systems where fluorinated greenhouse gases with a GWP of less than 1 500 may be used		1 January 2022
14. Movable room air-conditioning equipment (hermetically sealed equipment which is movable between rooms by the end user) that contain HFCs with GWP of 150 or more		1 January 2020
15. Single split air-conditioning systems containing less than 3 kg of fluorinated greenhouse gases, that contain, or whose functioning relies upon, fluorinated greenhouse gases with GWP of 750 or more		1 January 2025



Present EU F-GAS - Products Affected By **Jan, 1 2022 Bans***

Equipment Category	EU 517/2014 regulation GWP limit		
	2015	2020	2022
Household Refrigerators and Freezers (herm. sealed)	150		
Commercial Refrigerators and Freezers (herm. sealed)			
Display Cabinets		2500	150
Beverage Coolers		2500	150
Ice Cream Freezers		2500	150
Reach-in Cabinets		2500	150
Service Counters		2500	150
Multideck Cabinets		2500	150
Gondola Cabinets		2500	150
Preparation Tables		2500	150
Gelato Counters		2500	150
Vending Machines		2500	150
Serve-over Cabinets		2500	150

*) This is an Embraco interpretation of the regulation. Questions on the interpretation of this regulation can be addressed directly thru the European Commission (DG Clima) website or to major industry associations (e.g. ASERCOM, EPEE, AREA), and/or by contacting the national authority in charge of EU F-gas regulations.

Only Hydrocarbons, Carbon Dioxide and A2L's Refrigerants Below 150 GWP Will Be Allowed

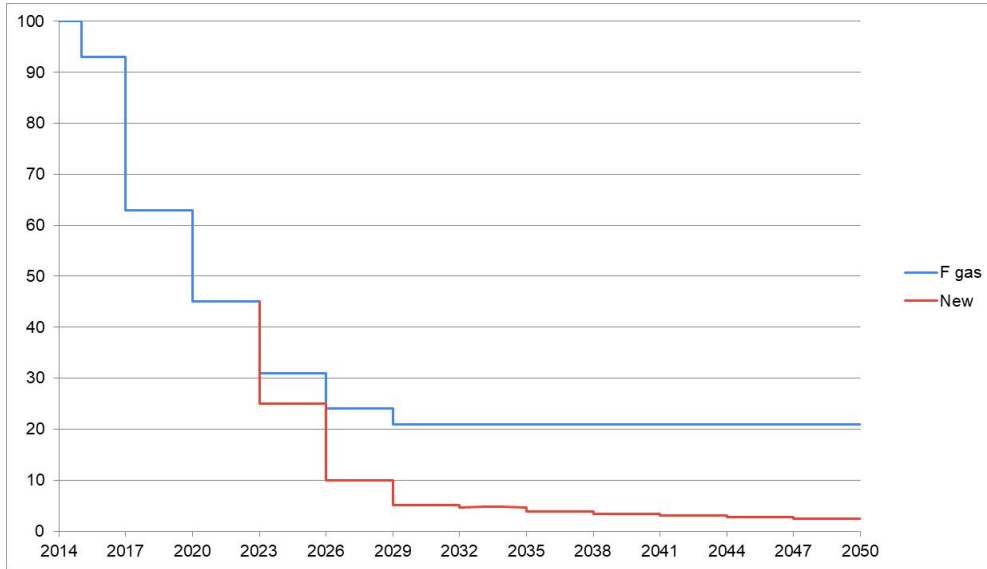
Present EU F-GAS – Products **NOT** Affected By Jan, 1 2022 Bans*

Equipment Category	EU 517/2014 regulation GWP limit		
	2015	2020	2022
Stationary Refrigeration Equipment			
Commercial Ice Machines (cubes, flakes)		2500	
Ice Cream Makers		2500	
Milk Coolers		2500	
Water Fountains		2500	
Blast Chillers		2500	
Blast Freezers		2500	
Refrigerated Food Processors (meat, whipped cream, etc)		2500	
Granita Machines		2500	
Chantilly Machines		2500	
Beer dispensers		2500	
Small Chillers for Aquarium		2500	
Chillers for Electric Equipment		2500	
Chillers for Industrial Equipment (Laser, Welding, etc)		2500	
Ultralow Freezers Below -50°C (high stage)		no limit	
Ultralow Freezers Below -50°C (low stage)		no limit	
Laboratory Equipment		2500	
Cold rooms		2500	

*) This is an Embraco interpretation of the regulation. Questions on the interpretation of this regulation can be addressed directly thru the European Commission (DG Clima) website or to major industry associations (e.g. ASERCOM, EPEE, AREA), and/or by contacting the national authority in charge of EU F-gas regulations.

Refrigerant As R134a, R513A, R450A, R448A, R449A, R452A Are Still Allowed – See Quotas

Planned EU F-GAS Update 2022 – Proposed New Phase Down



Years	Maximum Quantity in tonnes CO ₂ equivalent
2024 – 2026	41 701 077
2027 – 2029	17 688 360
2030 – 2032	9 132 097
2033 – 2035	8 445 713
2036 – 2038	6 782 265
2039 – 2041	6 136 732
2042 – 2044	5 491 199
2045 – 2047	4 845 666
2048 onwards	4 200 133

The Draft of EU F-GAS Update Was Published in April 2022, To Be Formalized Early 2023

(11)	Refrigerators and freezers for commercial use (self-contained equipment)	-that contain HFCs with GWP of 2 500 or more.	1 January 2020
		-that contain HFCs with GWP of 150 or more.	1 January 2022
		-that contain other fluorinated greenhouse gases with GWP of 150 or more.	1 January 2024
(12)	Any self-contained refrigeration equipment that contains fluorinated greenhouse gases with GWP of 150 or more.		1 January 2025
(13)	Stationary refrigeration equipment that contains, or whose functioning relies upon, HFCs with GWP of 2 500 or more except equipment intended for application designed to cool products to temperatures below – 50 °C.		1 January 2020
(14)	Stationary refrigeration equipment, that contains, or whose functioning relies upon, fluorinated greenhouse gases with GWP of 2 500 or more except equipment intended for application designed to cool products to temperatures below – 50 °C.		1 January 2024



Planned EU F-GAS Update 2022 – Proposed New Bans*

Equipment Category	updated GWP limit		
	2015	2020	2025
Self Contained Refrigeration Equipment			
Commercial Ice Machines (cubes, flakes)		2500	150
Ice Cream Makers		2500	150
Milk Coolers		2500	150
Water Fontains		2500	150
Blast Chillers		2500	150
Blast Freezers		2500	150
Refrigerated Food Processors (meat, whipped cream, etc)		2500	150
Granita Machines		2500	150
Chantilly Machines		2500	150
Beer dispensers		2500	150
Small Chillers for Aquarium		2500	150
Chillers for Electric Equipment		2500	150
Chillers for Industrial Equipment (Laser, Welding, etc)		2500	150
Ultralow Freezers Below -50°C (high stage)		no limit	150
Ultralow Freezers Below -50°C (low stage)		no limit	150
Laboratory Equipment		2500	150
Cold rooms (w/monoblocks)		2500	150

All Self Contained Refrigeration Equipment With GWP Higher Then 150 Banned From January 1st, 2025

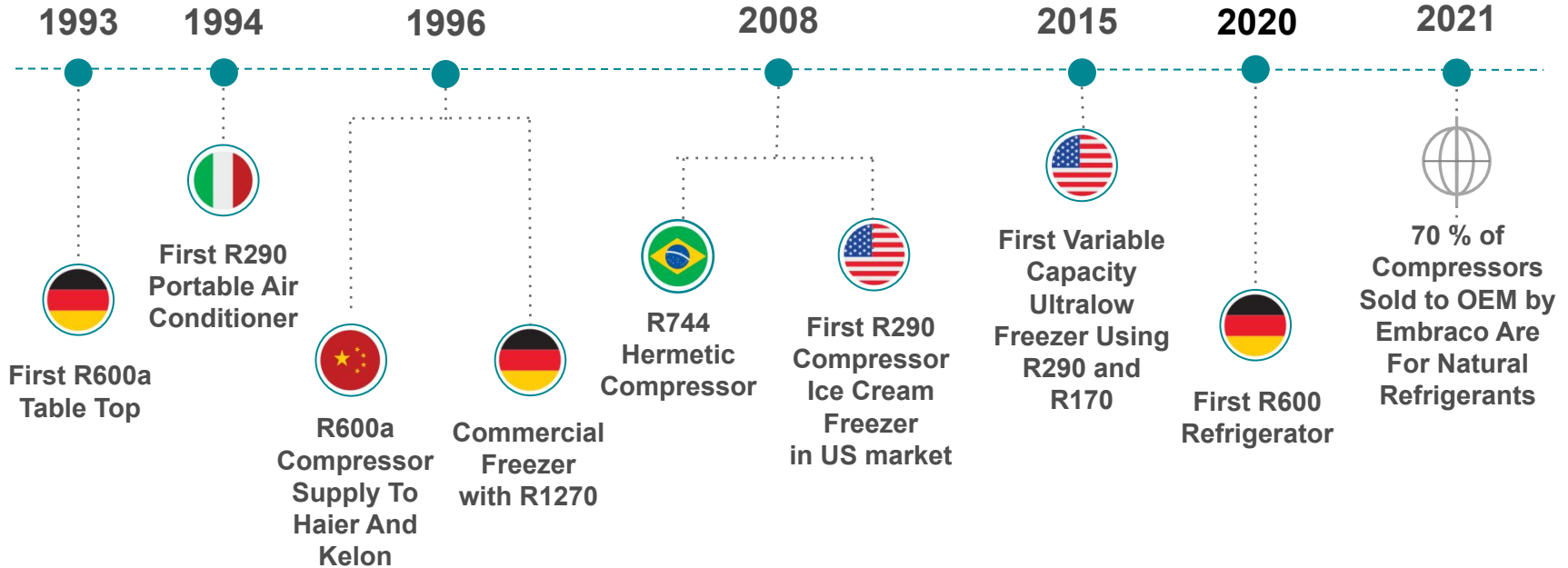


embraco
Nidec

WHY HYDROCARBONS ARE THE SOLUTION TO MEET F-GAS AND ENERGY EFFICIENCY REGULATIONS?



Embraco NATREF Projects History

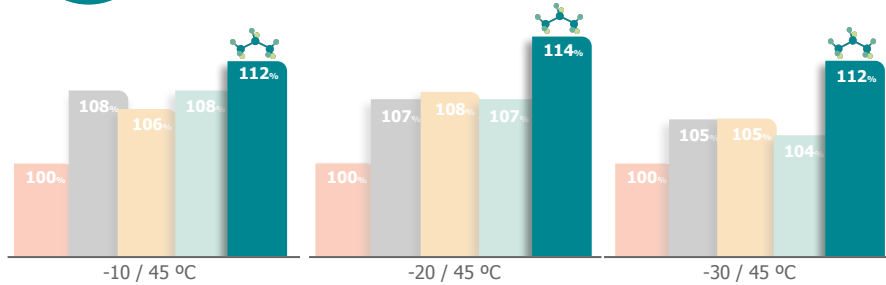


Why Natural Refrigerants?



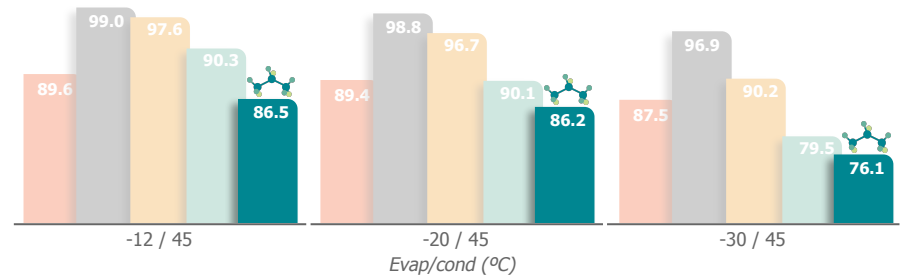
EFFICIENCY COMPARISON

% / Superheating 22.2 °C / Middle point based



THERMAL REGIME EVALUATION

°C / Superheating 22.2 °C / Dew point based



■ R404A
 ■ A2L #1
 ■ A2L #2
 ■ A2L #3
 ■ R290

Propane (R290) Is The Best In Efficiency And Has Lower TCO

Lower Operating Temperatures Lead To Longer Compressor Life

Why Natural Refrigerants?

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	= In EU easier PED compliance

Except CO₂, All Low GWP Alternatives Are **Flammable** (A2L, A2, A3),



NEW CHARGE LIMITS IN THE COMMERCIAL SECTOR FOR FLAMMABLE REFRIGERANTS

Flammable Refrigerants Charge Limits In Safety Standards



INTERNATIONAL



EUROPE



UNITED STATES



JAPAN



AUSTRALIA & NEW ZEALAND



TC 86 SC1
ISO 5149



TC182WG6
EN378



SSPC 15
ASHRAE 15



High Pressure Act
Electrical Safety Act



JTC ME-006
AS/NZS 5149

GENERAL
STANDARD



TC61 SC61C
IEC 60335-2-24
IEC 60335-2-89
TC61 SC61D
IEC 60335-2-40



CLC61
EN 60335-2-24
EN 60335-2-89
EN 60335-2-40



STP's
UL250
UL60335-2-24
UL471
UL60335-2-89
UL474, UL484
UL60335-2-40



C 9335-2-24
C 9335-2-89
C 9335-2-40



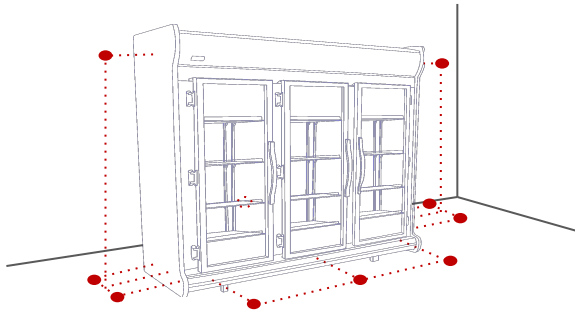
JTC EL-002
AS/NZS 60335.2.24
AS/NZS 60335.2.89
AS/NZS 60335.2.40

PRODUCT
STANDARD

New IEC Charge Limit For Flammables



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



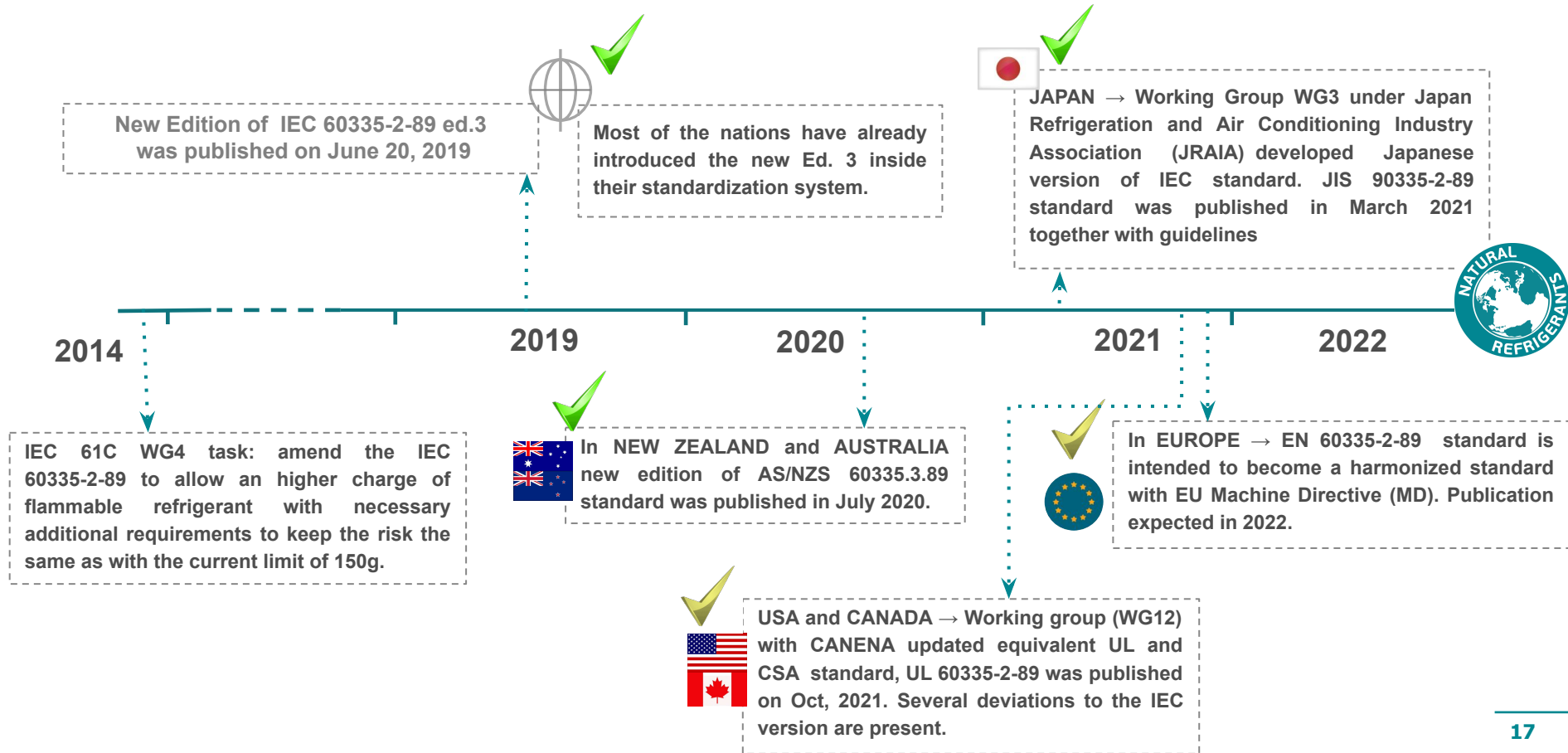
Refrigerant	LFL [kg/m ³]	13*LFL	IEC Approved
R290 (A3)	0.038	0.494 kg	0.494 kg
R32 (A2L)	0.307	3.991 kg	1.2 kg
R1234yf	0.283	3.679 kg	1.2 kg



- >>> **Additional requirements** must be fulfilled.
- >>> Surrounding concentration test of **Annex CC** mandatory.

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

Charge Increase Implementation Status



EN 60335-2-89 Implementation Status

EN 60335-2-89:2021



- ❑ Voted positively by CENELEC member states in August 2021
- ❑ In Feb, 2022 EU common modification Annex was judged positively by MD harmonization consultant
- ❑ CENELEC TC61 decided to go for publication once editorial issues are solved by TC61 Editorial Team, expected in **July 2022**
- ❑ Standard will become a harmonized standard with EU Machine Directive (MD) not earlier than by end of 2022.
- ❑ **No significant changes are present in relation to the IEC version**

Equipments Covered By IEC 60335-2-89

BOTTLE COOLERS



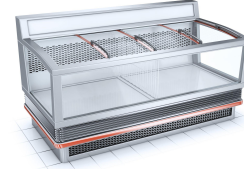
BLAST FREEZERS



ICE-CREAM FREEZERS



GONDOLA CABINETS



RECH-IN CABINETS



ICE MAKERS

NEW



PREPARATION COUNTERS



SERVE-OVER CABINETS



MULTI-DECK CABINETS



GELATO COUNTERS



DISPLAY CABINETS



ICE-CREAM MARKERS



IEC 60335-2-118

LAB EQUIPMENT



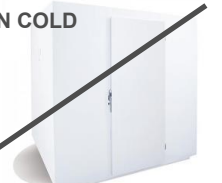
IEC 61010-2-011

VENDING MACHINES



IEC 60335-2-75

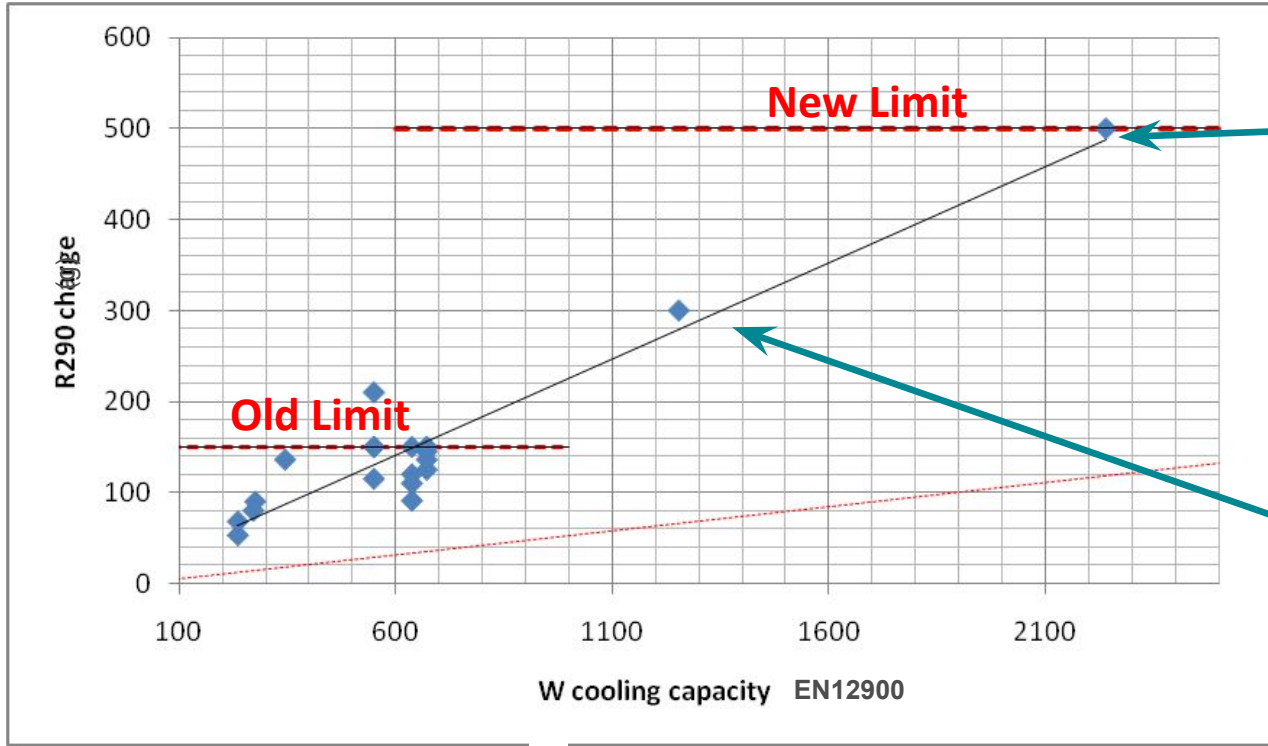
WALK-IN COLD ROOMS



ISO 5149-1

R290 500g Charge Limit

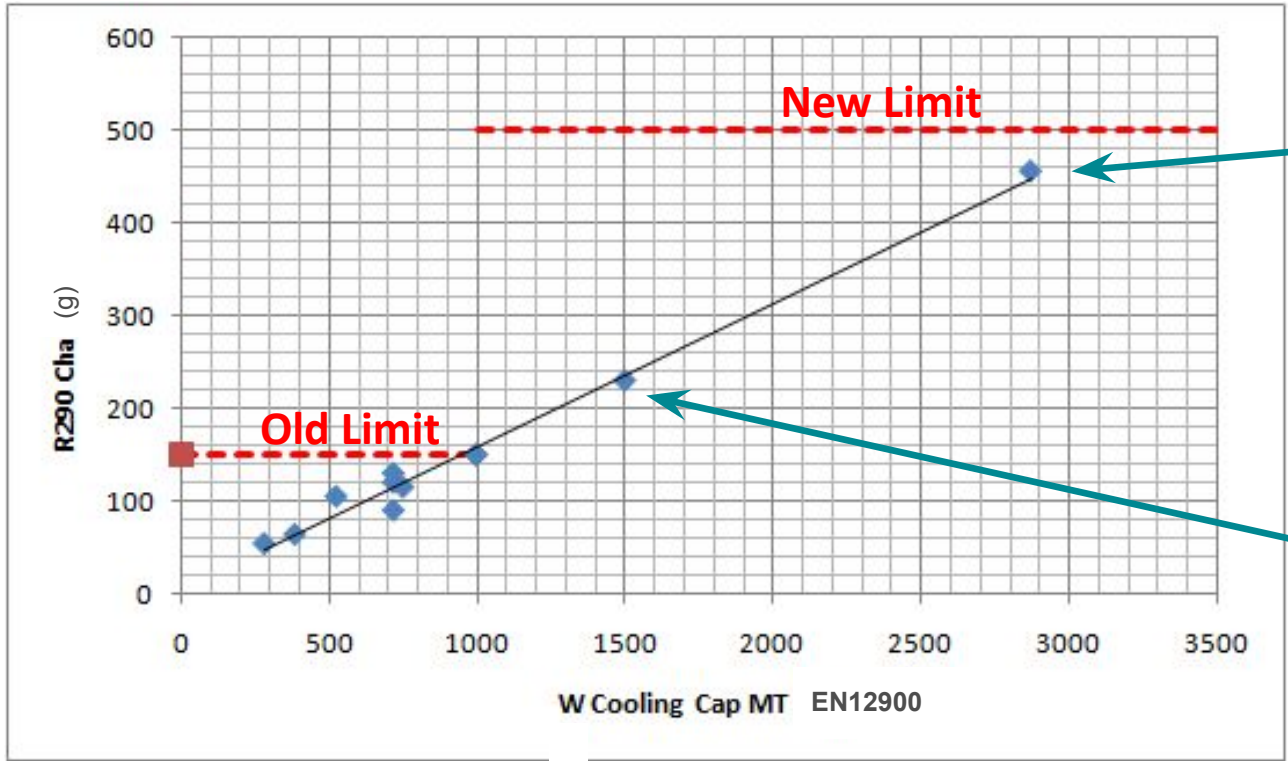
LOW TEMP. CABINETS



Typical R290 Charge In LBP Systems In Function Of Cooling Capacity

R290 500g Charge Limit

MEDIUM TEMP. CABINETS



Typical R290 Charge In MBP Systems In Function Of Cooling Capacity

R290 500g Charge Limit

PROS AND CONS OF MULTI CIRCUIT VS SINGLE CIRCUIT USED FOR THE SAME SYSTEM

	MULTI CIRCUIT 150g max EACH	SINGLE CIRCUIT 500g max
# of Components	Larger	Lower
Tube Diameter	Smaller	Larger
Overall Size	Larger	Smaller
Assembly Complexity	Higher	Lower
Redundancy	Yes	No
Capacity Regulation	Multistep Possible	Only With Inverter
Room Area Restriction	No	Yes
Annex CC Test	No	Yes



embraco
Nidec

REACH DIRECTIVE UPDATE PROPOSED PFAS BAN



News About REACH Directive



In 2020, Germany, the Netherlands, Norway, and Denmark agreed to prepare a joint **REACH** (Registration, Evaluation, Authorization and Restriction of Chemicals) proposal **restricting the use of PFAS**. PFAS—Per- and Polyfluoroalkyl substances—are a complex group of more than 5000 chemicals that have been linked to **environmental contamination and negative health effects in humans**.

Aim to restrict all PFAS in non-essential uses

Process schedule:



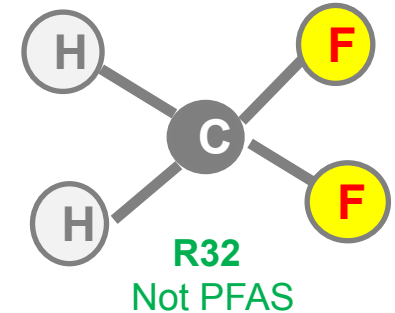
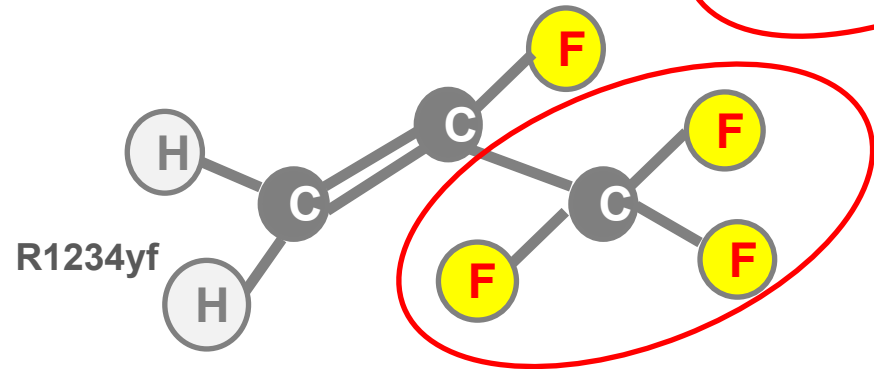
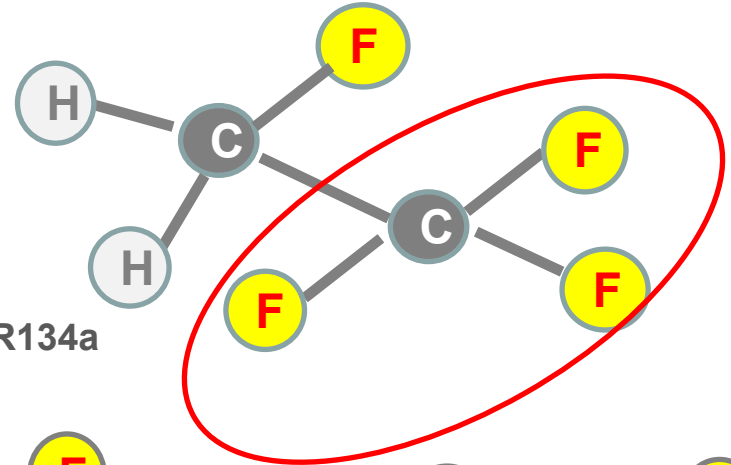
PFAS Definition

Examples:

PFAS = Per-and polyfluoroalkyl substances

All substances with at least one fully fluorinated $-CF_2-$ or $-CF_3$ group (without any H/Br/Cl/I-atom bound to it)

5,000 – 10,000 different PFAS



Most Of HFC Refrigerants (A1, A2L) Can Be Affected By PFAS Ban

Thank You



Nidec

Global Appliance