EU Legislation Update

Commercial Refrigeration

Dec 2021

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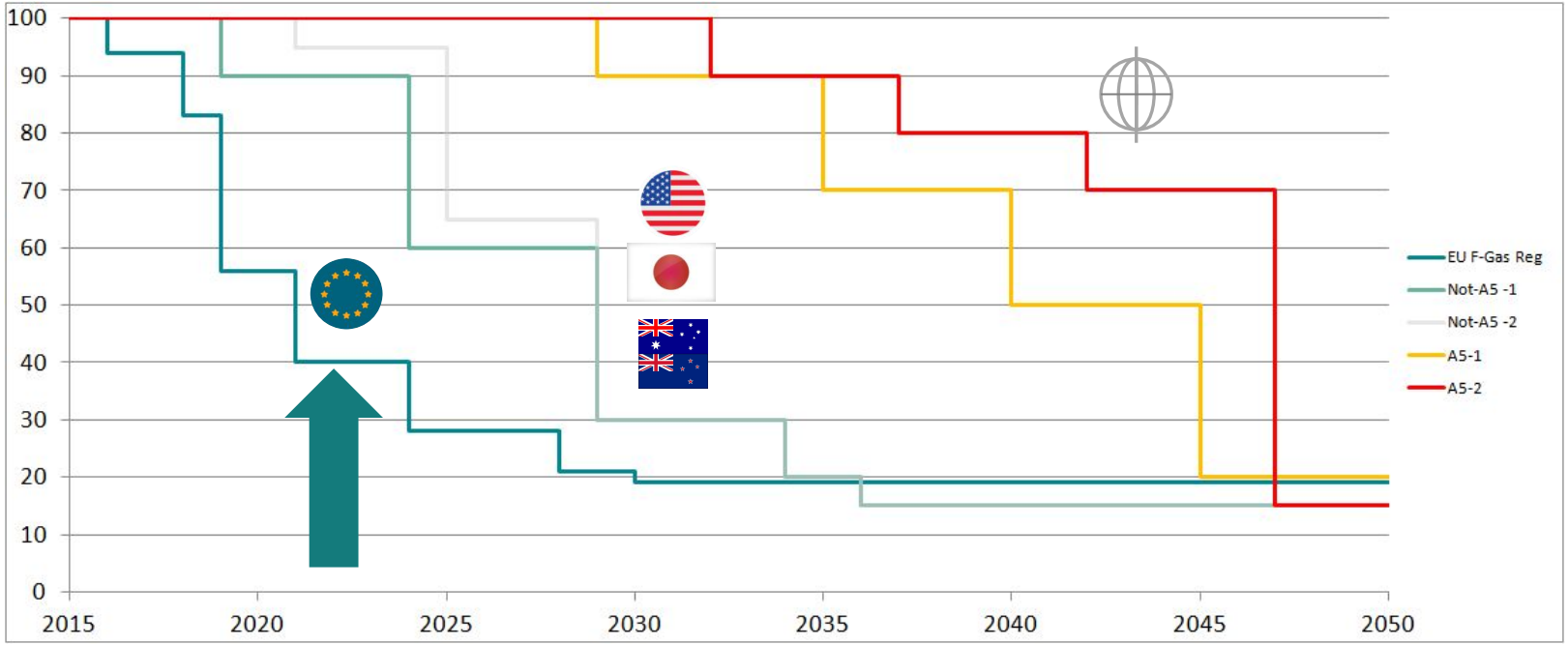
R&D Director
IEC SC61C Chair

CONTENT

F-GAS Phase Down Steps – Kigali Amendment

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



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

* Status on Dec,3 2021

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

EU F-GAS - Products Affected By Jan, 1 2022 Ban

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

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

EU F-GAS – Products NOT Affected By Jan, 1 2022 Ban

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 Fontains		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	

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

Planned EU F-GAS Update 2022 – Proposed New Prohibitions

Present 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
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11. Refrigerators and freezers for commercial use (hermetically sealed equipment)	that contain HFCs with GWP of 2 500 or more	1 January 2020
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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

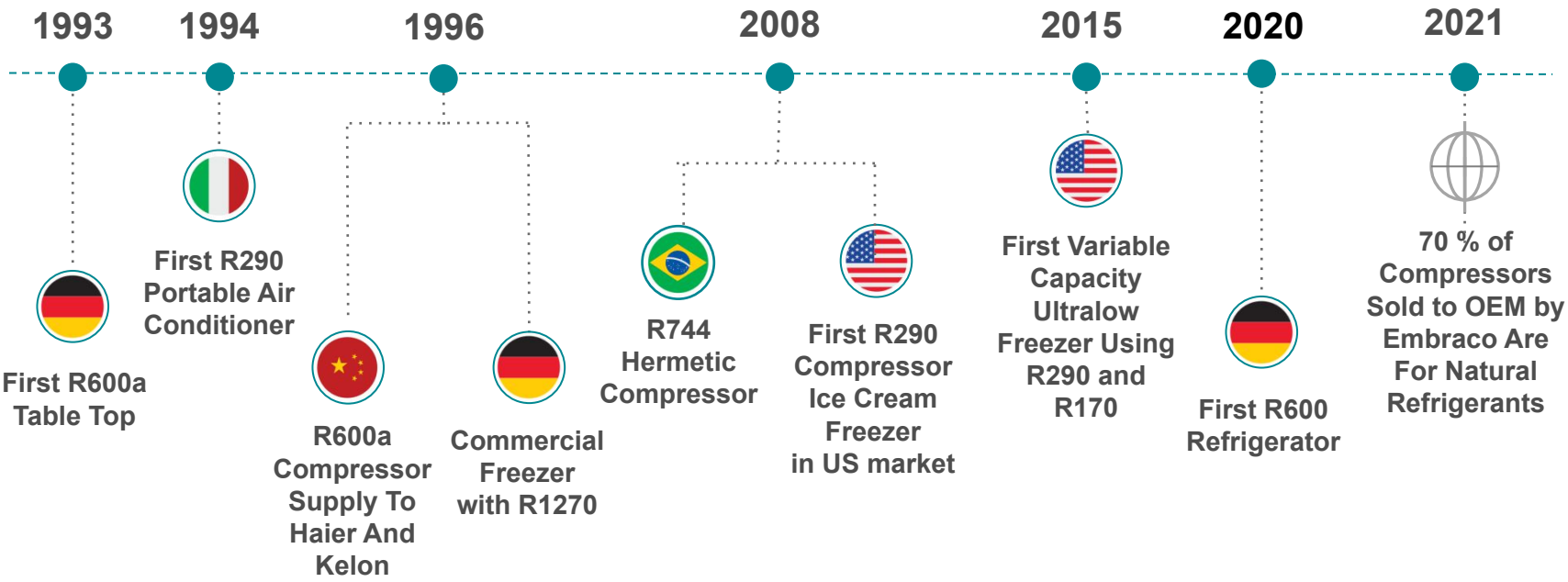
Proposed Bans

- New POM prohibition for stationary air-conditioning and heat pump equipment
  - of a rated capacity of up to 12 kW that contain, or whose functioning relies upon fluorinated greenhouse gases with a GWP of 150 or more
  - of a rated capacity of more than 12 kW that contain, or whose functioning relies upon fluorinated greenhouse gases with a GWP of 750 or more
- New POM prohibition for stationary refrigeration
  - Small hermetic units for commercial and household use that contain or whose functioning relies upon fluorinated greenhouse gases (e.g. ice cream makers, milk coolers attached to coffee machines, Chantilly machines, juice makers, beer coolers)
- Remove exemption for stationary refrigeration below – 50 °C
  - Only recycled or reclaimed HFCs with a GWP of 2500 or more to be used
- Remove exemption for servicing and maintenance of refrigeration equipment
  - With a charge size below 40 tonnes of CO_2 eq with virgin fluorinated gases

The Draft of EU F-GAS Update To Be Published in March/April 2022 After Ongoing Cost Impact Assessment

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

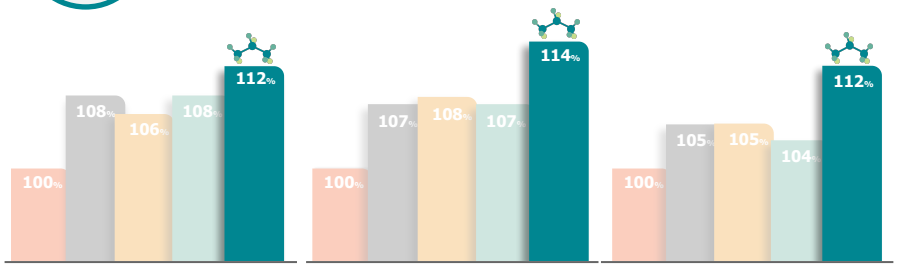
Embraco NATREF Projects History



Why Natural Refrigerants?

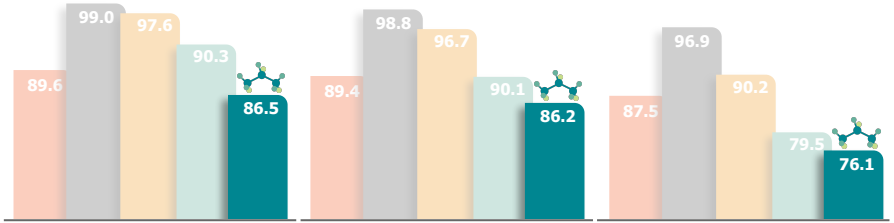
EFFICIENCY COMPARISON

% / Superheating 22.2 ºC / Middle point based



THERMAL REGIME EVALUATION

ºC / Superheating 22.2 ºC / 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 CO_2, All Low GWP Alternatives Are Flammable (A2L, A2, A3),

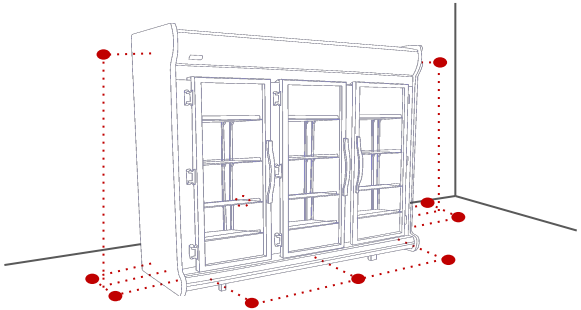
NEW CHARGE LIMITS IN THE COMMERCIAL SECTOR FOR **FLAMMABLE REFRIGERANTS**

Flammable Refrigerants Charge Limits In Safety Standards

INTERNATIONAL	EUROPE	UNITED STATES	JAPAN	AUSTRALIA & NEW ZEALAND	
ISO TC 86 SC1 ISO 5149	cen TC182WG6 EN378	ASHRAE SSPC 15 ASHRAE 15	METI High Pressure Act Electrical Safety Act	STANDARDS NEW ZEALAND / STANDARDS Australia JTC ME-006 AS/NZS 5149	GENERAL STANDARD
IEC TC61 SC61C IEC 60335-2-24 IEC 60335-2-89 TC61 SC61D IEC 60335-2-40	CENELEC CLC61 EN 60335-2-24 EN 60335-2-89 EN 60335-2-40	UL STP's UL250 UL60335-2-24 UL471 UL60335-2-89 UL474, UL484 UL60335-2-40	JIS C 9335-2-24 C 9335-2-89 C 9335-2-40	STANDARDS NEW ZEALAND / STANDARDS Australia 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

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

Most of the nations have already introduced the new Ed. 3 inside their standardization system.

JAPAN → The JIS 9335-2-98 standard was developed by the specific standardization committee (Secretariat: JRAIA) of METI. JRA4078 and JRA GL-21 guidelines are configured to enable the safe operation of appliances in accordance with the contents of JIS C9335-2-89

2014 2019 2020 2021 2022

IEC 61C WG4 task: amend the IEC 60335-2-89 to allow an higher charge of flammable refrigerant with necessary additional requirements to keep the risk the same as with the current limit of 150g.

In NEW ZEALAND and AUSTRALIA new edition of AS/NZS 60335.3.89 standard was published in July 2020.

In EUROPE → EN 60335-2-89 standard is intended to become a harmonized standard with EU Machine Directive (MD). Publication expected at the beginning of 2022.

USA and CANADA → Working group (WG12) with CANENA updated equivalent UL and CSA standard, UL 60335-2-89 was published on Oct, 2021. Several deviations to the IEC version are present.

EN 60335-2-89 Implementation Status

EN 60335-2-89:2021

- Voted positively by CENELEC member states in August 2021
- EU common modification Annex judged negativelly by MD harmonization consultant because of minor editorial issues
- CENELEC TC61 decided to go for publication once editorial issues are solved by TC61 Editorial Team
- Standard will become a harmonized standard with EU Machine Directive (MD) not earlier then mid 2022.
- No significant changes are present in relation to the IEC version

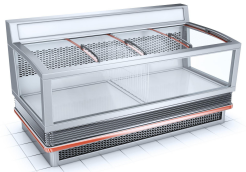
Equipments Covered By IEC 60335-2-89

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

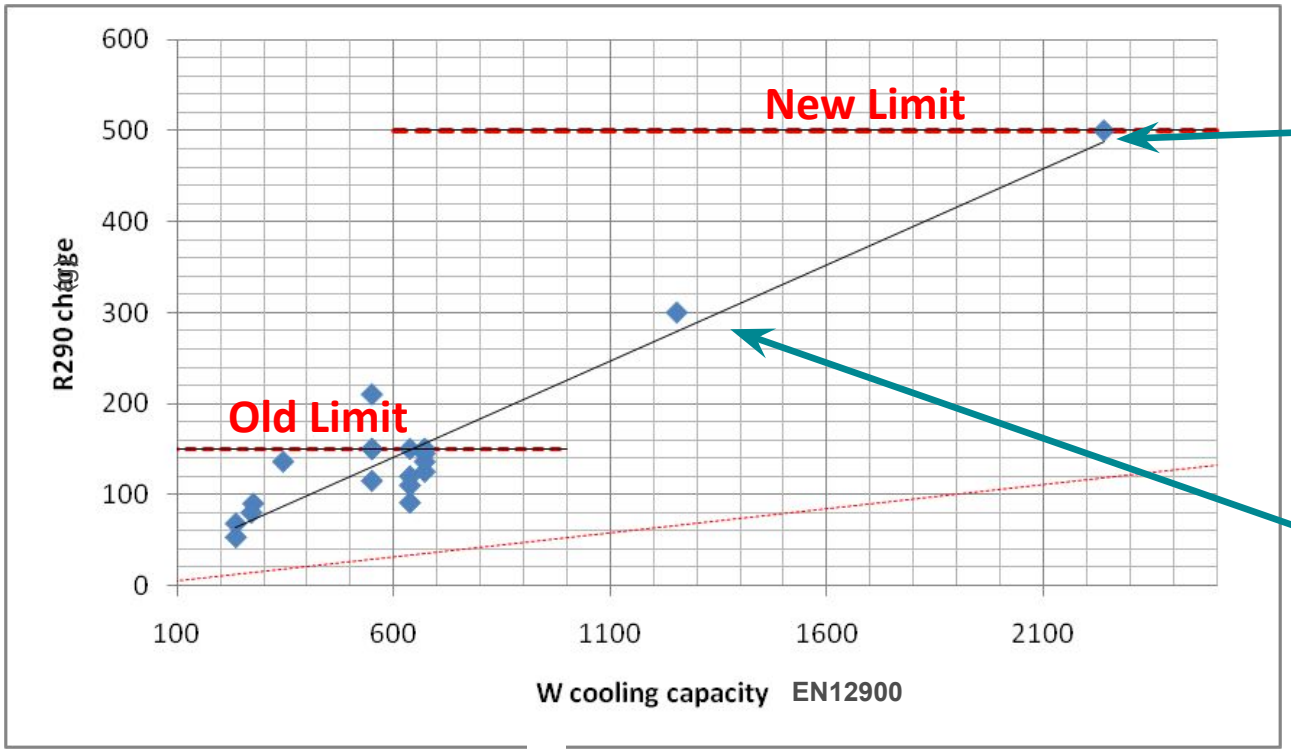
IEC 60335-2-75

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

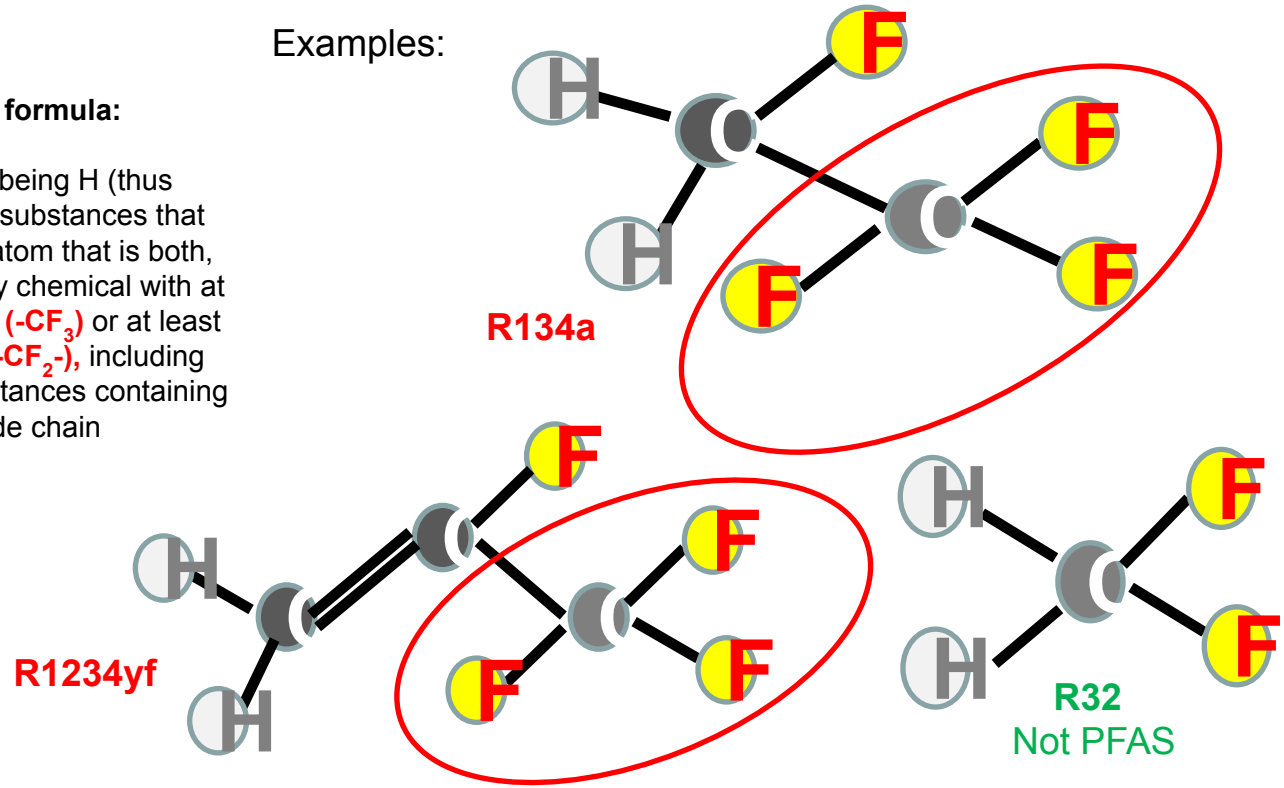
REACH DIRECTIVE UPDATE
PROPOSED PFAS BAN

PFAS Definition

PFAS have the following structural formula:

X-(-CF_2-)n-X' with n ≥ 1 and X, X' not being H (thus including X-CF_3) meaning fluorinated substances that contain at least one aliphatic carbon atom that is both, saturated and fully fluorinated, i.e. any chemical with at least one perfluorinated methyl group **(-CF_3)** or at least one perfluorinated methylene group **(-CF_2-),** including branched fluoroalkyl groups and substances containing ether linkages, fluoropolymers and side chain fluorinated polymers.

Examples:



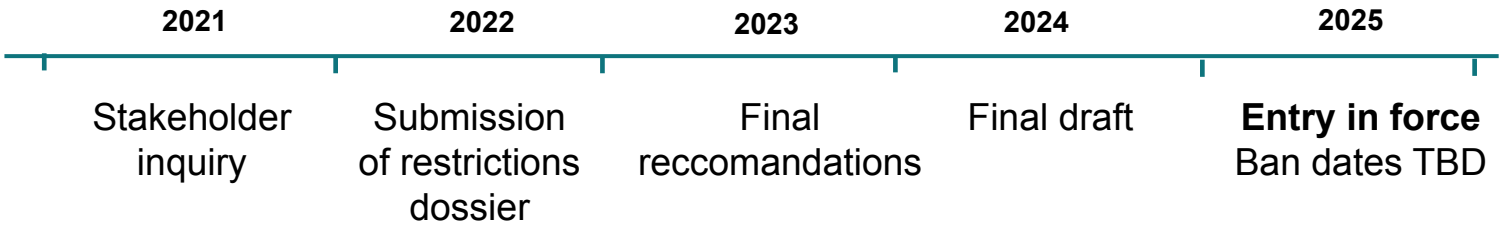
Most Of HFC Refrigerants (A1, A2L) Can Be Affected By PFAS Ban

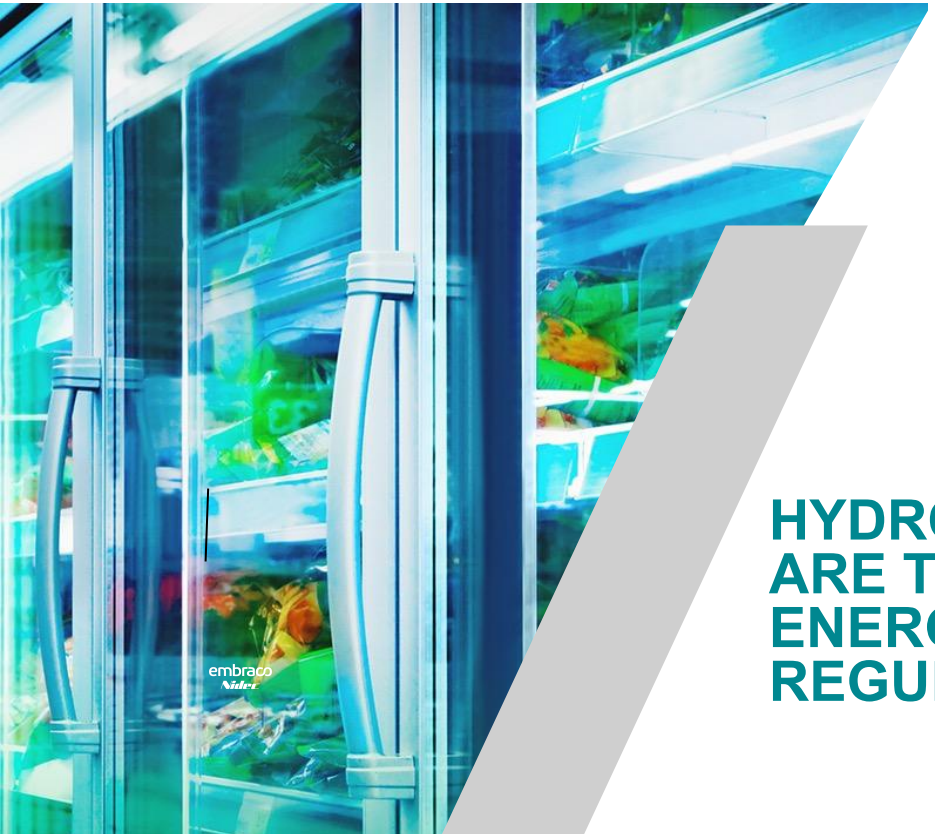
News About REACH Directive

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:





HYDROCARBONS ARE THE SOLUTION TO MEET ENERGY EFFICIENCY REGULATIONS

EU Ecodesign Regulations by Cabinet Type

Household refrigeration

Ecodesign: (UE) 2019/2019
Labelling: (EU) 2019/2016

Household

ENER Lot 13

Professional refrigerated stora
cabinets, blast cabinets, condensi
units and process chillers

Ecodesign:(EU)2015/1095
Labelling: (EU) 2015/1094

Professional

ENTR Lot 1

from 1st March 2021

Refrigerating appliances with a direct sales functions

Ecodesign: (EU) 2019/2024
Labelling:: (EU) 2019/2018

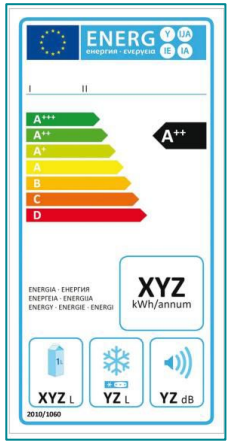
Commercial Refrigeration

ENER Lot 12

Ecodesign Lot 12

This Regulation applies to appliances with a direct sales function, including appliances sold for refrigeration of items other than foodstuffs.

- **Supermarket refrigerating remote-integral (freezer or refrigerator) cabinets**
- **Beverage coolers**
- **Ice-cream freezers**
- **Gelato scooping cabinets**
- **Refrigerated vending machines**



This Regulation **does not apply** to:

- ✔ *Refrigerating appliances that are only powered by energy sources other than electricity*
- ✔ *The remote components, such as the condensing unit, compressors or water condensed unit, to which a remote cabinet needs to be connected in order to function*
- ✔ *Food processing refrigerating appliances with a direct sales function;*
- ✔ *Refrigerating appliances specifically tested and approved for the storage of medicines or scientific samples*
- ✔ *Refrigerating appliances with a direct sales function that have no integrated system for producing cooling, and function by ducting chilled air that is produced by an external air chiller unit*
- ✔ *Professional refrigerated storage cabinets, blast cabinets, condensing units and process chillers*
- ✔ *Wine storage appliances and minibars*

Thank You


Nidec
Global Appliance