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Information

on the “green” hydrocarbon-based refrigerant

R443A

…a superior alternative for R410A, R32 and others

March 2024

The Climate Friendly Refrigerant
HCR 188 C
ASHRAE Nos. R441A & R443A
The Climate Friendly Energy Saving Refrigerant

Legacy F-Gases, but also A2L alternatives containing R1234yf and other HFOs heavily under attack - past, present & future

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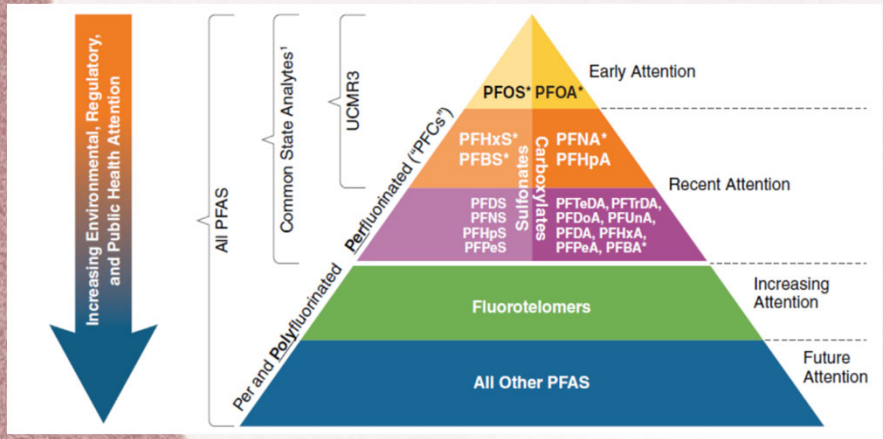
20.5.2014 EN Official Journal of the European Union L 150/195

REGULATION (EU) No 517/2014 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL
of 16 April 2014
on fluorinated greenhouse gases and repealing Regulation (EC) No 842/2006
(Text with EEA relevance)

https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32014R0517



www.milieu-nieuws.blogspot.com/2019/10/pfas-poly-en-perfluoralkyl-stoffen.html

National Institute for Public Health and the Environment, Ministry of Health, Welfare and Sport
baua: Bundesanstalt für Arbeitsschutz und Arbeitsmedizin
KEMI Swedish Chemicals Agency
NORWEGIAN ENVIRONMENT AGENCY
Ministry of Environment and Food of Denmark Environmental Protection Agency

2nd Stakeholder Consultation on a Restriction for PFAS

I. Reasons and aims of this analysis

The competent authorities for REACH of the Netherlands, Germany, Denmark, Sweden and Norway are currently preparing a REACH Annex XV Restriction Dossier for the group of PFAS (per- and polyfluoroalkyl substances) described below (as defined under Section II. Substances) since all these substances are considered to be persistent.

www.reach-clp-biozid-helpdesk.de/SharedDocs/Downloads/DE/REACH/...

HFO ban to come?

ECHA
EUROPEAN CHEMICALS AGENCY

HFCs: EU F-Gas phase down to be continued after 2030, following the Kigali amendment.

HFOs: Possible restriction of PFAS to come wordwide?

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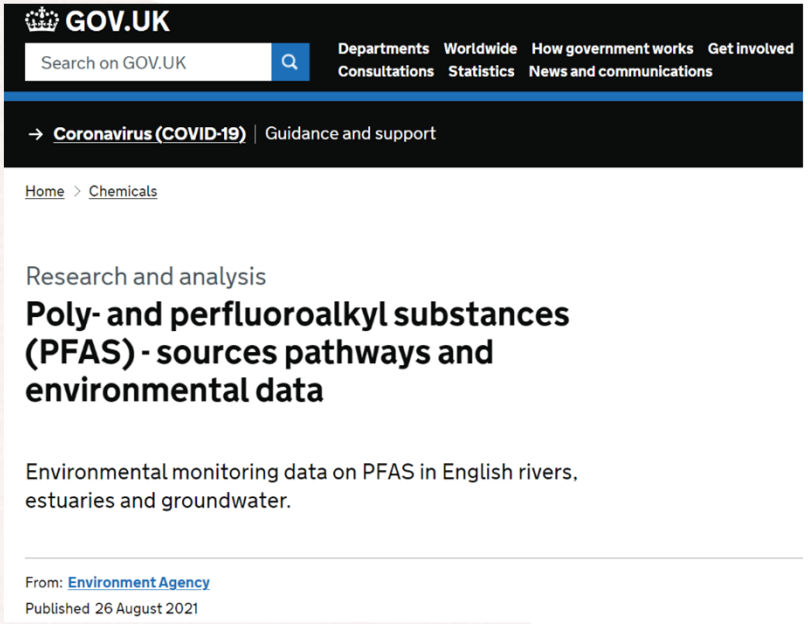
PFAS heavily under attack - not only in the European Union

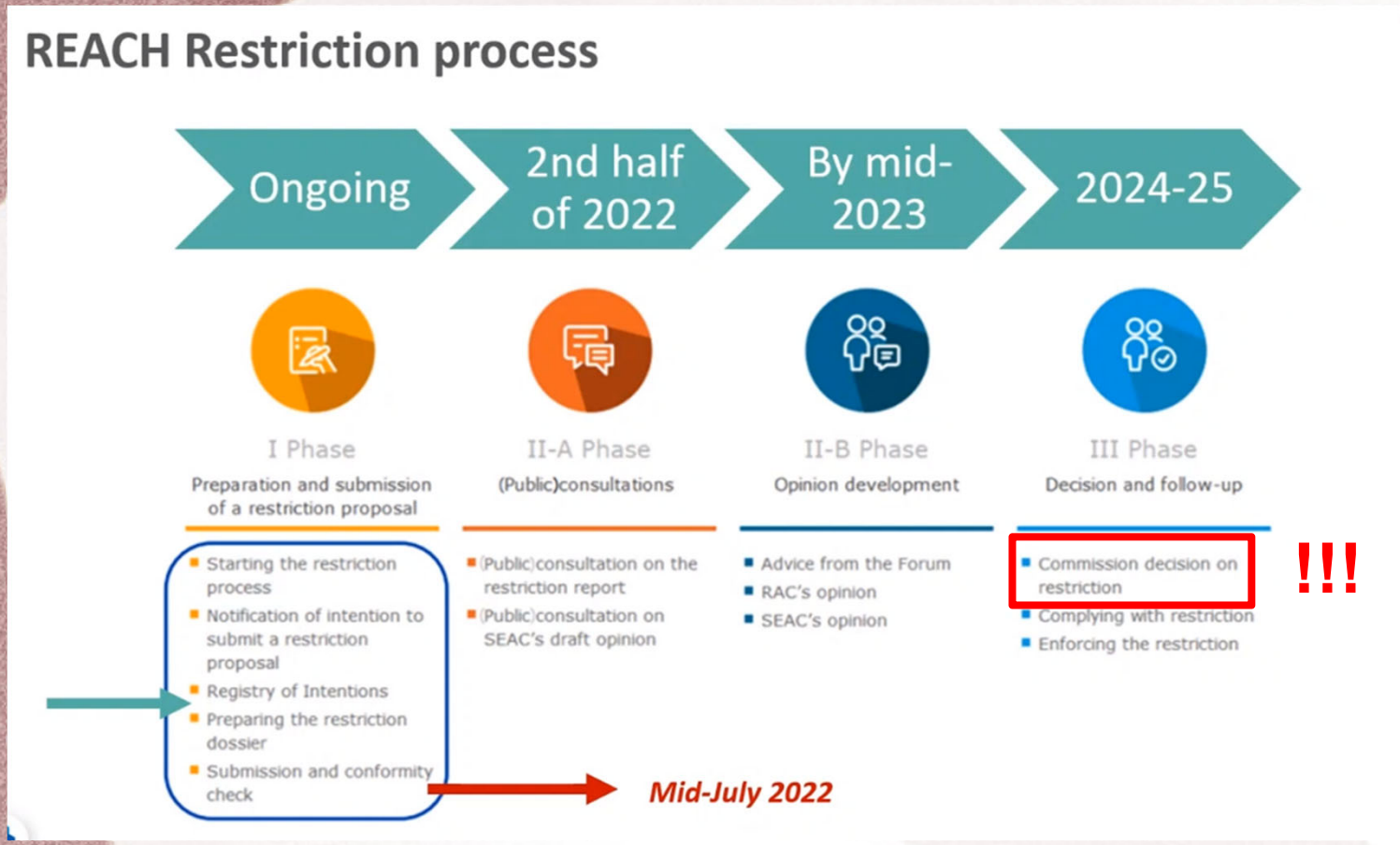
www.epa.gov/pfas



www.gov.uk/government/publications/poly-and-perfluoroalkyl-substances-pfas-...

Threathening R1234yf/ HFO ban possibly to come mid term anywhere in the world. What about new generation A2L´s containing R1234yf and other HFOs - banned in future as well?!

REACH Restricion Process in the European Union - Roadmap



www.fluorocarbons.org

Decision on possible restrictions not before 2024 - far too late for any OEM to react. Immediate actions needed?

PFAS not compliant with Europe´s Green Deal

European Commission

Home > Strategy > Priorities 2019-2024 > A European Green Deal

A European Green Deal

Striving to be the first climate-neutral continent

https://ec.europa.eu/info/strategy/priorities-2019-2024/european-green-deal_en

One third of the 1.8 trillion euro investments from the Next Generation EU Recovery Plan, and the EU's seven-year budget will finance the European Green Deal.


reduce emissions


create jobs and growth


address energy poverty


reduce external energy dependency


improve our health and wellbeing

https://ec.europa.eu/info/strategy/priorities-2019-2024/european-green-deal/delivering-european-green-deal_en

Leading the third industrial revolution - not achievable using R1234yf and its derivates.

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…but there is a fully compliant hydrocarbon alternative in heat pumps and similar applications!

- a mixture existing of Propene, Propane and Isobutane (R1270/ 290/ 600a)
- a non-toxic formulation to replace HFCs AND A2L blends designed for HP-applications
- cost effective compared to the pricing levels of the fluorinated alternatives
- great savings in terms of energy consumption
- great savings in terms of the total charging amount of the system
- benefits to human health and the environment since the mixture is proven to be
- NON TOXIC
- compatible with all types of refrigerant oils
- compatible with all type of materials used in heat pump units

R443A

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R443A - Certification, Availability & Characteristics

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Patent · Certification

US ASHRAE Safety Classification

US EPA - Completed Application

US Patent No. 8,721,916

ETL Certification

Manufacturing · Availability

Under negotiation

Characteristic

Hydrocarbon (HC)

GWP 3

Non-Toxic

NO PFAS

non-destructive for the ozone layer

No chemical emissions

No collection/disposal required

Reduced Price, HC components

Reduced charge amount

All Lubricant Use

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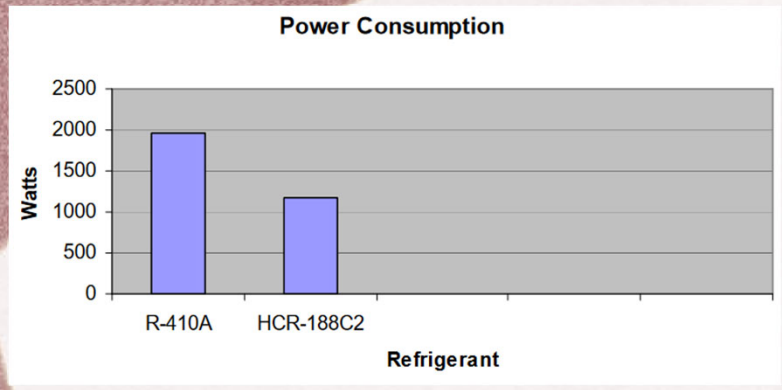
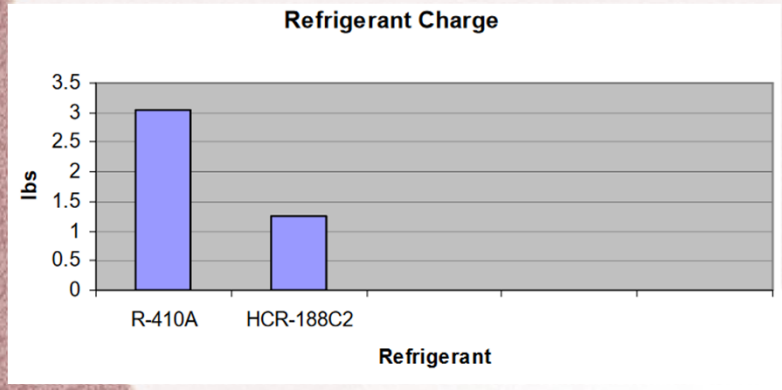
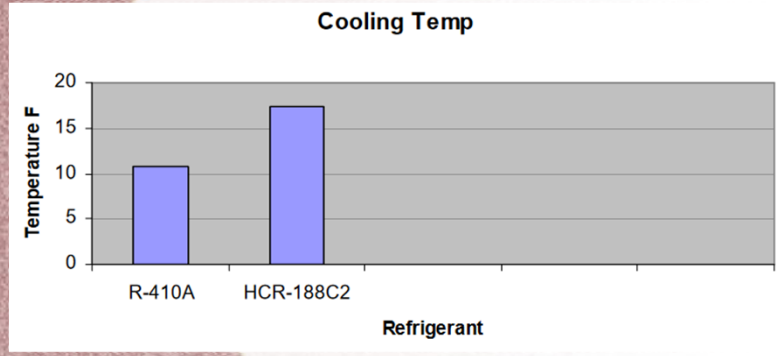
Measurements of the R443A vs. R410A (performed at Intertek Lab, Ohio, USA)







Conclusion Intertek Lab:
‘‘HCR-188C2, when substituted into an R-410A system as a drop in replacement for R-410A, appears that it would have a lower cooling capacity than R-410A, based on higher steady state temperatures, but would require a refrigerant charge of only about 41% of the mass of R-410A, and the compressor would use approximately 40% less energy than when used to operate with R-410A when viewed from an instantaneous power consumption standpoint.”

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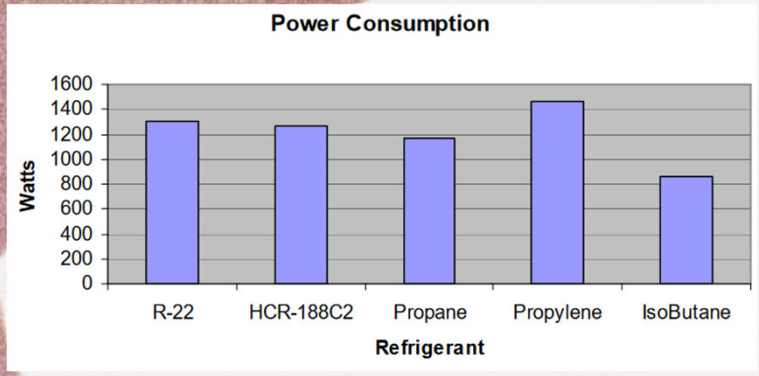
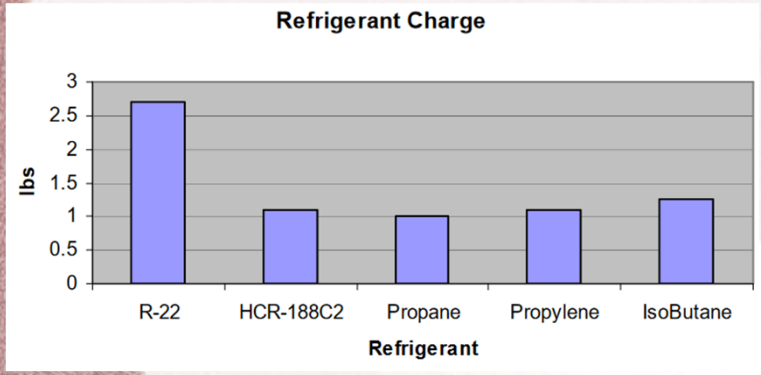
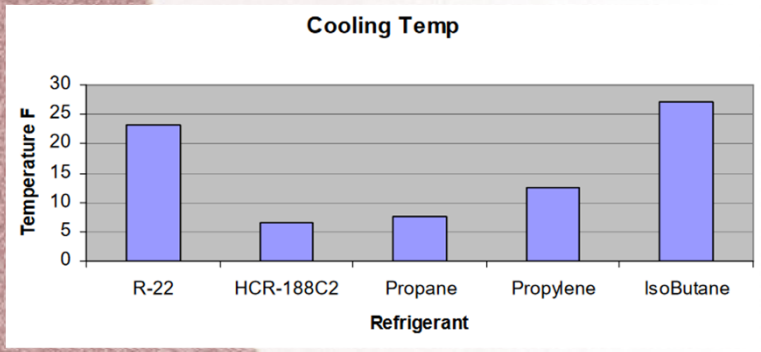
Measurements of the R443A vs. other (HC- & HCFC-) Refrigerants (performed at Intertek Lab, Ohio, USA)







Conclusion Intertek Lab:
‘‘HCR-188C2, when substituted into an R-22 system as a drop in replacement for R-22, would require a refrigerant charge of only about 41% of the mass of R-22, and the compressor would use approximately 3% less energy than when used to operate with R-22 when viewed from an instantaneous power consumption standpoint. Cooling capacity cannot be determined, but of the four substances compared to R-22, HCR-188C2 appears to operate at the coldest temperature.”

More concrete testing necessary to validate the performance of R443A against R290 in detail.

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R32 vs. R443A Field Test: replacement of the refrigerant (R443A used as Drop-In) - Bangkok, Thailand, Feb. 2019.

Customer/ลูกค้า	M Hermate Hair Design shop Senanikom 1 BKK					
AC Model : Condensing outdoor		Central Air	CFW-IFE25-1/CCS-IFE25-1			New
Cooling Capacity : 7200 w , 25363 Btu/h				Test date: 27/2/2019		
Desription	**Before Replacing Refrigerant**			**Replace Refrigerant to R443A**		
	Type	kg		% feed	kg	
Refrigerant weight (kg)	R32	1.400		30%	0.460	
Refrigerant copper tube	4.0	m		40%	0.540	
Set temperature	C	25			25	
AC air outlet temperature	C	16			11	
Current amp.	Amp.	9.15			5.2	
kWh	kW	2.062			1.172	
Saving	Amp.			3.95	Amp	43%
Electricity price	4.00	baht/kW				
	8.248	baht/h		4.687	baht/h	
Electricity cost saving			Saving	3.561	baht/h	43%
Payment cost for replace refrigerant and wage fee				4000	baht	
		Payback		1123	h	
		If running 8 hr/day		5	month	Payback return

Amp. Current before replacement (using R32): 9.15 amp.
Amp. Current after replacement (using R443A): 5.2 amp

Energy savings R443A vs. R32: 43%,
charge amount reduction 60%.

No alterations to the R32-based original system.

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Summary

- hydrocarbon blend
- sustainable
- cost effective compared to any F-gas
- great savings in terms of energy consumption
- great savings in terms of refrigerant charging amount
- compatible with all types of refrigerant oils
- compatible with all type of materials used in HP units
- **NON-TOXIC, SUSTAINABLE, HIGH PERFORMING & CHEAP ! ! !**

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Thank you for your attention!

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