

# SISTEMAS DE ÁGUA GELADA



PROGRAMA  
BRASILEIRO DE  
ELIMINAÇÃO DOS

**HCFCs**  
Projeto para o Gerenciamento de Chillers

**Projeto Demonstrativo para o Gerenciamento  
Integrado no Setor de Chillers**

## **FLUIDOS REFRIGERANTES ALTERNATIVOS PARA CHILLERS**

**Manoel L. S. Gameiro – TRANE  
24/02/2016 - Rio de Janeiro**

Execução



Implementação



*Empoderando vidas.  
Fazendo a diferença.*

Realização

Ministério do  
**Meio Ambiente**

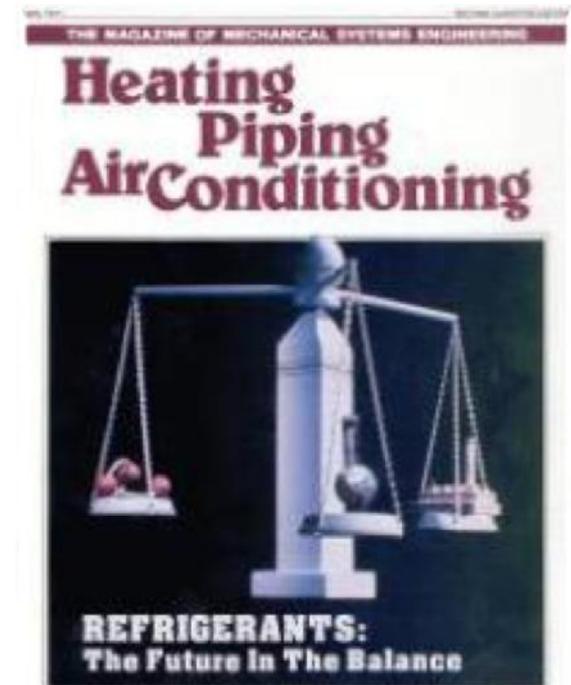


# Transição para a nova geração de Refrigerantes



Trane declarou a 25 anos atrás: Depleção da Camada de Ozônio, aquecimento global e eficiência energética são igualmente importantes.

Artigo da Trane de 1991 Trane na revista HPAC .



# Transição para a nova geração de Refrigerantes



Abordagem equilibrada minimiza o impacto ambiental global:

- Eficiência Energética
- Emissões de Refrigerante
- Aquecimento Global
- Depleção camada Ozônio
- Vida na Atmosfera



# Grande Pressão Mundial sobre os HFCs



- R-134a banido no uso em carros novos em 2013 na Europa;
  - R-134a “incentivado a uso de refrigerante alternativo” para uso em novos carros nos Estados Unidos em 2016 e banido 2021;
  - EU aprovou lei para “Phase Down” / “Phase Out” dos HFCs, com redução de HFCs em 79% até 2030;
  - Alguns países Europeus como Dinamarca, Áustria e suíça já baniram o uso de HFCs;
  - Fabricantes trabalhando de forma muito agressiva em produtos para a nova geração de refrigerantes com baixo GWP
- USA/ México /Canada estão propondo uma “phase down HFC’s” (70% de redução até 2029).
- E muitas outras ações em andamento!



# Índia concorda com “Phase Down” dos HFCs



“Phase Down” de refrigerantes HFCs altamente prejudiciais ao clima.



NEW DELHI: Reversing its several years of opposition, India has, in a major decision relating to a global treaty, made a formal proposal to amend the Montreal Protocol to phase down the climate-damaging refrigerant HFCs which are used in air-conditioners, refrigerators and insulating foams.

...The country's amendment proposal is in tune with what the Prime Minister Narendra Modi had promised to the American president Barack Obama during his visit to the US in September last year.

Under the UPA rule, India had been the most vocal opponent to phasing down HFCs under the Montreal Protocol, a strategy first proposed in 2009 by the Federated States of Micronesia, and quickly followed by a proposal by the US, Mexico, and Canada.

"With India emerging as the leader of the HFC phase down, we are moving into position to finish the amendment at the November Meeting of the Parties, and provide a boost to the UN climate negotiations in Paris the following month", said Zaelke. The Africa group of 54 countries had endorsed the HFC amendment last month, and Senegal has requested on their behalf that formal negotiations start on the amendments.



Índia se convenceu sobre o “Phase Down” dos refrigerantes HFCs...

# 500.000 carros Alemães utilizam R1234yf



Postado por Cooling Post- 20 de Agosto de 2015

GERMANY: Despite strong German opposition to the new car air conditioning refrigerant R1234yf, around 500,000 cars have already been registered in the country with the new gas.

Figures showing that 458,532 new vehicles were registered and using the new refrigerant between January 2013 and June 2015



# Novos Esforços para o “Phase Down” do HFC nos EUA



On September 16, 2014, the Obama Administration announced new efforts to phase down HFC use.

- [22 companies](#) have committed to cutting HFC emissions by 2020 by pledging:

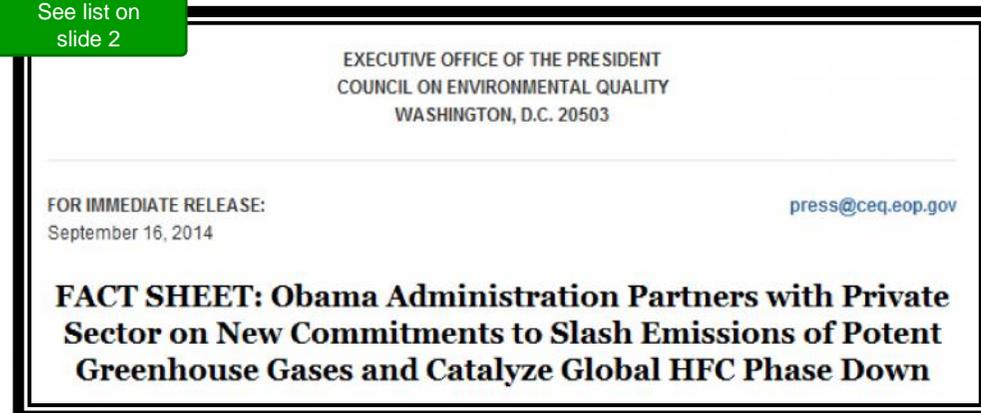
Industry groups pledge to increase R&D.

Chemical companies pledge to phase down the manufacture of HFCs & to accelerate the production of HFC-alternatives.

- ▶ Beverage companies and retailers pledge to buy HFC-free equipment.

According to the administration, the steps announced on Tuesday are designed to **reduce HFCs, especially R-134a**, causing a drop in greenhouse gases by 1.5% from 2010 levels. That is the equivalent of removing about 15 million vehicles from U.S. highways.

See list on slide 2



# Parceria entre o Governo Americano e a Indústria



## Ação executiva para reduzir as emissões de gases do efeito estufa e estimular o “Phase Out” global do HFC.



White House statement: “These industry associations and companies are making significant commitments to phase out or phase down their use of HFCs and transition to climate-friendly alternatives, good for the environment and good for business,”

“Presidente e CEO AHRI Stephen Yurek declarou: “Perto de US \$ 2 bilhões foram gastos pela indústria desde 2009 pesquisando equipamentos energeticamente eficientes e a utilização de fluidos refrigerantes de baixo GWP”, Yurek afirmou, “e ao longo dos próximos 10 anos, a indústria de HVACR vai investir um adicional de US \$ 5 bilhões para P & D e despesas de capital para desenvolver e comercializar tecnologias de baixo GWP”.

## Em 2014 22 empresas se comprometeram a reduzir emissões de HFC até 2020!

	<i>Carrier, announced that its commitment to pursue the commercialization of HFC-free refrigerants in road transportation refrigeration by 2020.</i>
	<i>Danfoss, announced that it's championing a stakeholder task force to accelerate adoption of standards and building codes for next generation, low-GWP refrigerants.</i>
	<i>Johnson Controls, announced that it commits to using the lowest GWP option for each application that best fits the needs of its customers. It also committed to spend an additional \$50 million over the next three years to develop new products and improve and expand its existing portfolio.</i>
	<i>Goodman Manufacturing Company, commitment to help slash greenhouse gas emissions by developing low-global warming potential (GWP) air conditioners and/or heat pumps. Daikin aims to reduce its greenhouse gas emissions in 2020 to one-quarter of its 2005 emissions.</i>
	<i>Ingersoll Rand, commitment to slashing greenhouse gas emissions at their operations by 35%, reduce GHG associated with our products by 50% (increased unit efficiency and the transition to lower GWP refrigerants) and will invest \$500M in research and development... all by 2020</i>

Apoio de toda a indústria de HVAC

# Compromisso da Ingersoll Rand



## Redução das emissões de Gases de Efeito Estufa.

“Nossa empresa está a ajudando a resolver alguns dos desafios mais urgentes do mundo - incluindo a demanda insustentável para os recursos energéticos e impacto sobre as emissões de gases de efeito estufa”.



### Nossos Produtos

Redução de 50% dos GHG através:

- 1) Aumento da eficiência energética de nossos produtos;
- 2) Uso da nova geração de refrigerantes com baixo GWP em nossa linha de produtos até 2020

50%



### Nossa operações

Redução de 35% dos GHG em nossos escritórios, fábricas e frota de carros até 2020

35%



### Liderança no Mercado

Vamos investir \$500M em pesquisa e desenvolvimento para promover a eficiência energética e resolver as lacunas de refrigerante através da inovação, investigação, ensaio, política ao longo dos próximos cinco anos

\$500M

Ingersoll Rand e Trane Comprometidas & Focadas em todos os aspectos do negócio

# EPA está analisando o banimento futuro dos HFCs



## Novo rodada de anúncios sobre HFCs

September 23, 2015

*"... EPA anunciou que está considerando listar vários refrigerantes em várias utilizações finais no futuro como inaceitáveis. Isto inclui R134a, R407C e R410A em chillers; R134a, R404A e R507A no processamento de alimentos refrigerados e distribuição; e R134a, R407C, R404A e R507A em câmara fria e armazéns. Ele também está considerando a eliminação do R134a no uso em refrigeradores domésticos".*

Fonte: <http://www.coolingpost.com/world-news/us-epa-considers-future-ban-on-r134a-chillers/>

**COOLING POST**

### US EPA considers future ban on R134a chillers

Posted on Wednesday, September 23, 2015

USA: The US Environmental Protection Agency (EPA) is considering declaring refrigerant R134a as being unsuitable for use in chillers.

This potential future prohibition was one of a number of end-uses and refrigerants revealed as being under consideration for action in future changes to the EPA's SNAP listing at a recent stakeholder meeting in Washington.

In July, the EPA listed as unacceptable under SNAP several common high GWP refrigerants from certain end uses from as early as January 1, 2017, as part of President Obama's Climate Action Plan. This included the refrigerants R134a and R404A in certain retail food refrigeration system applications.

Going forward, the EPA announced that it is considering listing as unacceptable a number of refrigerants in several end-uses in the future. This includes R134a, R407C and R410A in chillers; R134a, R404A and R507A in refrigerated food processing and dispensing; and R134a, R407C, R404A and R507A in cold storage warehouses. It is also considering delisting R134a from use in domestic refrigerators.

The EPA said it was not considering any across-the-board GWP cut-offs or the banning of HFCs as a whole or in any one sector, but would continue to consider individual end-uses.

The EPA revealed that it was also looking at listing new HFCs or HFC blends if they posed no greater risk than other available substitutes.

R134a could in the future be deemed unacceptable for use in chillers

EPA está considerando listar R-134a, R-407C & R-410A como "inaceitáveis"

# Indústria aceita a direção de “Phase-Down” dos HFCs



## AHRI apoia alteração no Protocolo de Montreal

November 9, 2015

*"AHRI elogiou a decisão das Partes do Protocolo de Montreal para trabalhar em direção a uma emenda em 2016 para incluir HFCs da competência do tratado, com o objetivo de trabalhar em direção a um cronograma para redução gradual na sua utilização em todo o mundo .*

*AHRI Presidente e CEO , Stephen Yurek , disse: "Assim como outros signatários PM têm debatido a proposta norte-americana original para incluir HFCs , as empresas associadas da AHRI - incluindo produtores de refrigerantes e fabricantes de equipamentos estão proativamente pesquisando potenciais alternativas ao HFC ... "*

Fonte: [http://www.racplus.com/newsletter/news/usa-focus/ahri-applauds-hfc-phase-down-decision/8691735.article?WT.tsrc=email&WT.mc\\_id=Newsletter](http://www.racplus.com/newsletter/news/usa-focus/ahri-applauds-hfc-phase-down-decision/8691735.article?WT.tsrc=email&WT.mc_id=Newsletter)

REFRIGERATION AND AIR CONDITIONING MAGAZINE  
**rac**  
“ – Daimler needs to have the book thrown at it click here for editor’s view ”  
Andrew Gaved, Editor

### AHRI applauds HFC phase-down decision

9 November 2015 | By Julian Milnes

The Air-Conditioning, Heating, and Refrigeration Institute (AHRI) commends decision to work toward an amendment to include HFCs in the Montreal Protocol

AHRI has commended the decision of the Parties of the Montreal Protocol (MP) to work toward an amendment in 2016 to include HFCs in the treaty’s purview, with a goal of working toward a schedule to phasedown their use across the globe. AHRI has long supported including HFCs in the phasedown plan under the MP.

AHRI President and CEO, Stephen Yurek, said: “Even as other MP signatories have debated the original North American Proposal to include HFCs, AHRI’s member companies – including refrigerant producers and original equipment manufacturers – have been proactively researching potential alternatives to HFCs to ensure that air conditioning and refrigeration manufacturers have access to appropriate refrigerants.”

Currently, AHRI is managing a research program, known as the Low-Global Warming Potential Alternative Refrigerants Evaluation 2011.

Subsequent to the results of the program, AHRI established a committee to investigate flammable refrigerants that are being considered as alternatives to high-GWP refrigerants such as HFCs.

“This is a revolutionary agreement and we are looking forward to being part of the process of developing an amendment in 2016.” said Mr Yurek.

**RELATED ARTICLES**

- ▶ AHRI applauds HFC phase-down decision  
9 November 2015
- ▶ AHRI to reinforce refrigerant R&D commitment at White House event  
16 October 2015
- ▶ AHRI to reinforce refrigerant R&D commitment at White House event  
15 October 2015
- ▶ A fork in the road  
4 August 2015
- ▶ Why natural refrigerants?  
17 December 2014

Indústria suporta as discussões de “Phase-Down” do Protocolo de Montreal

# Consenso e concordância da Indústria com NRDC



## AHRI suporta o “Phase-out” dos HFCs



AHRI and NRDC have engaged in discussions on the importance of responsibly moving beyond high-GWP refrigerants used in chillers. Considerations have included the safety of alternatives, the continued improvement of system energy efficiency, reasonable product development timelines, and the avoidance of market migration. With these factors in mind, AHRI and NRDC support EPA finalizing the following changes of status:

- Remove R-134a, R-410A, and R-407C from the list of acceptable substitutes in all new air-cooled and water-cooled chillers using centrifugal, screw, scroll, and all other compressor types effective January 1, 2025

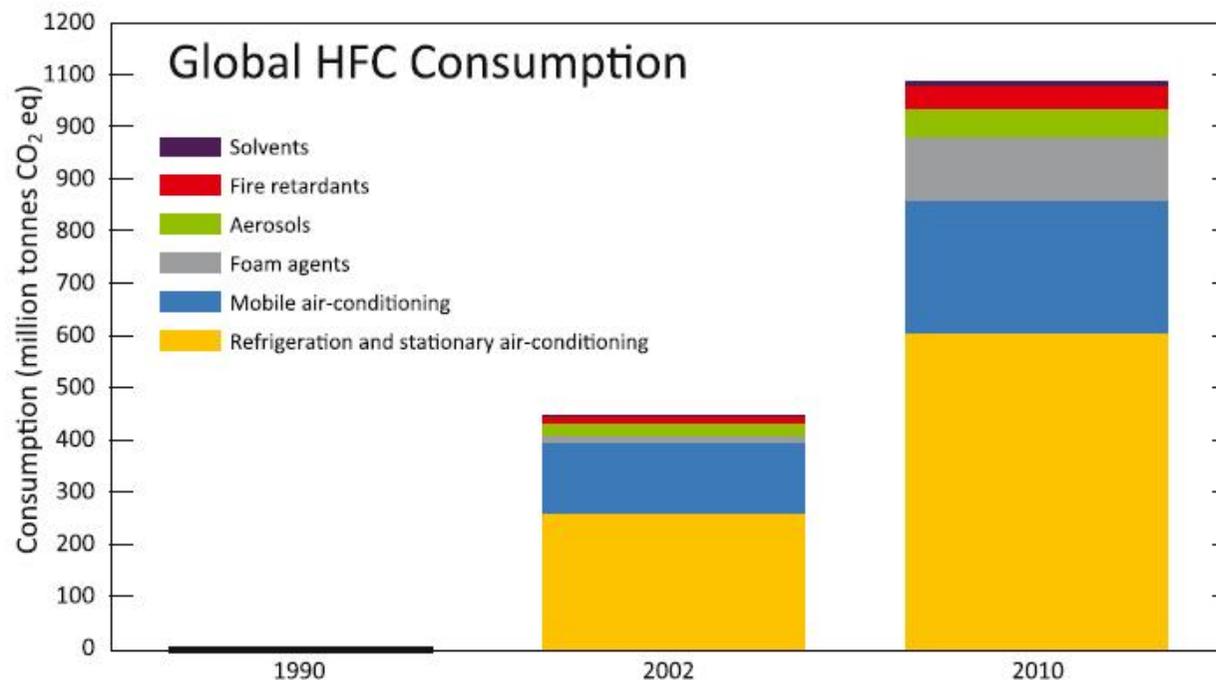
This proposal allows eight years from the publication of the final rule for industry to finish designing and

bring to market chillers using alternative refrigerants. Manufacturers will be designing and releasing products with alternative refrigerants before 2027; the proposed date simply indicates the endpoint of the long process members of industry face redesigning their product lines. The proposed transition period may permit some manufacturers to adopt near-zero GWP, energy-efficient refrigerants directly, without interim adoption of mid-GWP blends that suffer from lower energy efficiency compared to R-134a. All compressor-bearing equipment is likely to undergo some technology overhaul to convert from R-134a or R-410A to newly-identified refrigerants during the transition period. In addition, this conversion is anticipated to involve use of new 2L flammable refrigerants, which are severely restricted by current

\* **NRDC: National Resources Defense Council**

Indústria suporta o a eliminação do HFC para Janeiro de 2025

# Porque a preocupação com os HFCs?

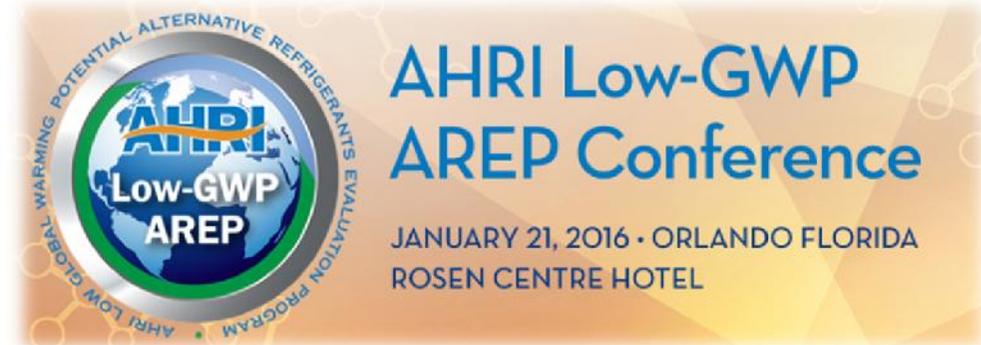
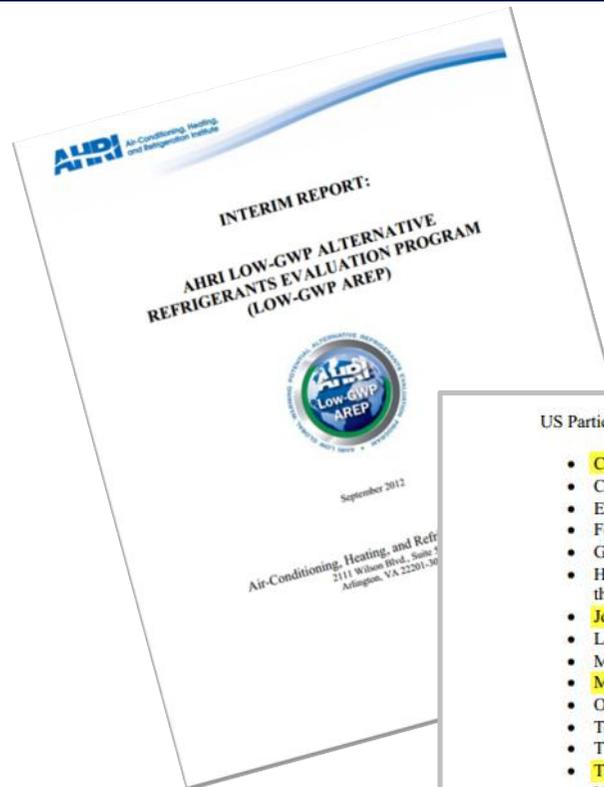


" Se não for controlada até 2050 , as emissões anuais de HFC poderia ser equivalente a 20% das emissões anuais de CO<sub>2</sub> em um cenário de negócios atual "

# Novas Tecnologias e Novos Refrigerantes



# O que a Indústria está fazendo...



#### US Participants performing tests:

- Carrier Corporation
- Climate Master
- Emerson Climate Technologies
- Follett Corporation
- Goodman Manufacturing
- Hussmann Corporation (contributing the results of tests w the start of the program.)
- Johnson Controls, Inc.
- Lennox Industries Inc
- Manitowoc Ice, Inc.
- McQuay International
- Oak Ridge National Laboratory
- Tecumseh Company Co.
- Thermo King / Ingersoll Rand
- Trane/ Ingersoll Rand
- University of Maryland

#### International Participants performing tests:

- ARMINES-MINES ParisTech (France)
- Daikin Industries Ltd (Japan)
- Embraco Brazil (Brazil)
- Embraco Slovakia Sro (Slovakia)
- GD Midea Air-conditioning Equipment Co. Ltd (China)
- Shanghai Hitachi Electrical Appliances CO. LTD (China)

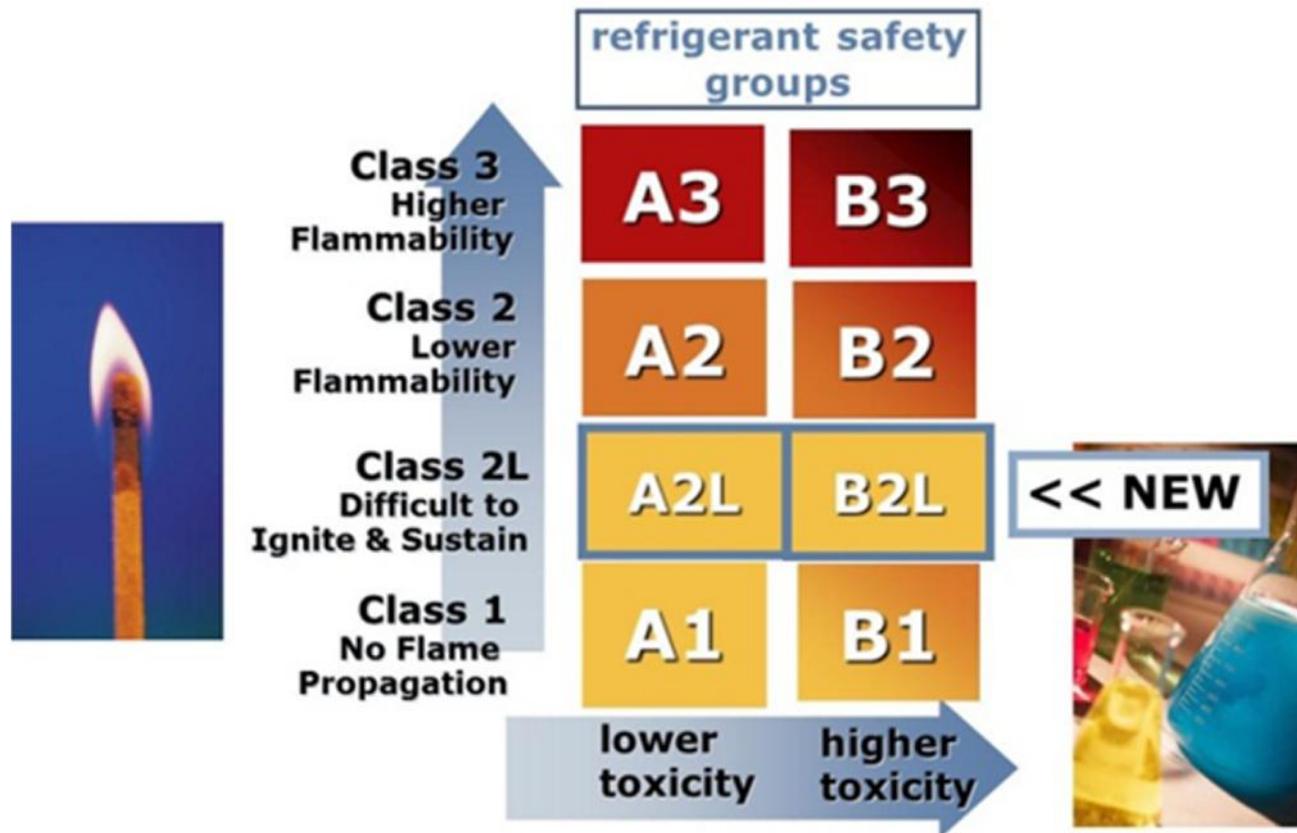
- Iniciado em 2011
- Fase I Finalizada em Dez 2013
  - *Foram Testados mais de 30 Refrigerantes*
- Fase II Começou em Jan 2014
  - *Estão sendo Testados cerca de 20 Novos Refrigerantes*
- Prévia dos Resultados em Jan 2015
- 2016 continuará com a evolução...

Grande oportunidade para os fabricantes liderarem esse processo

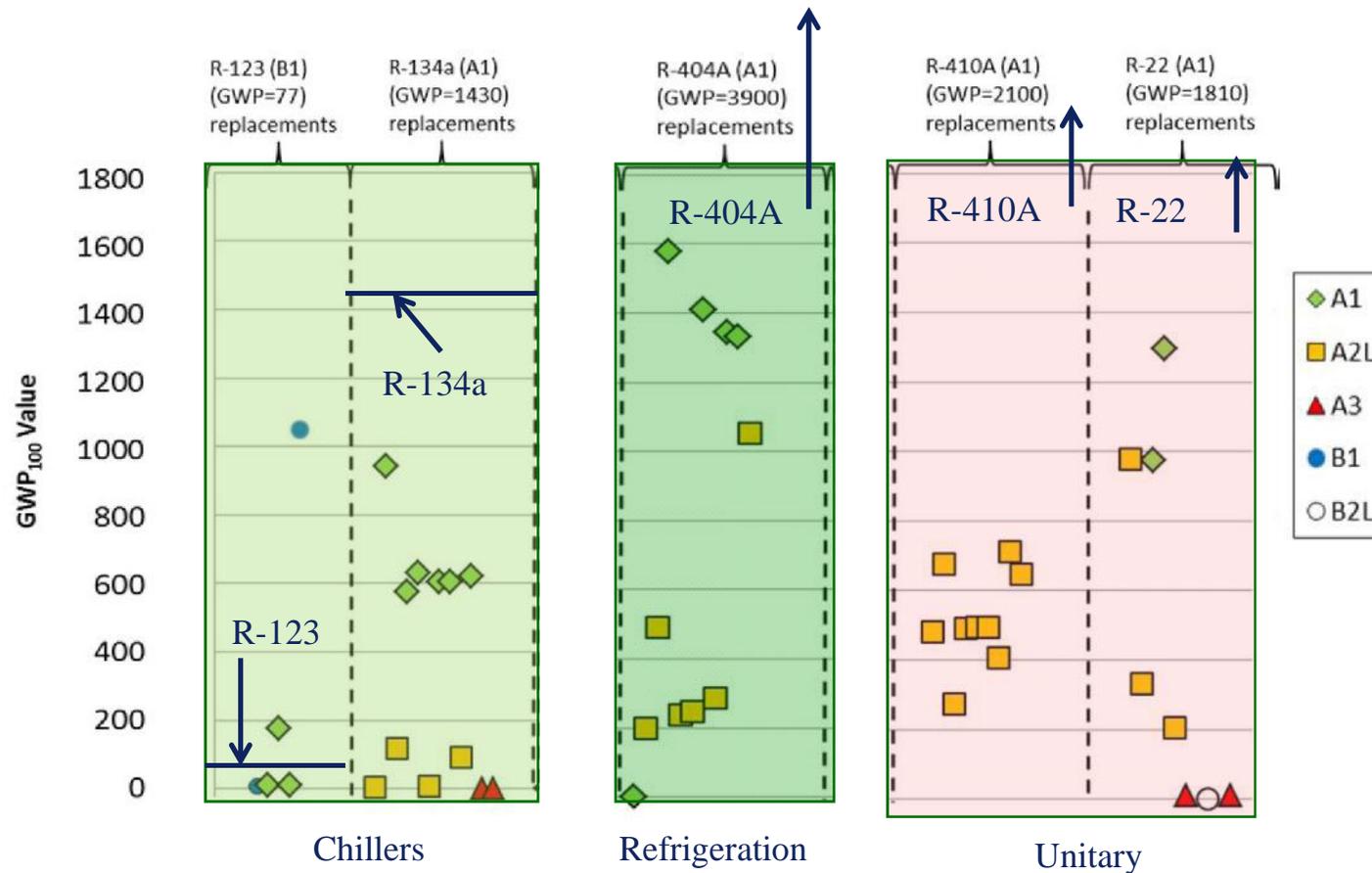
# Considerações com os novos Refrigerantes



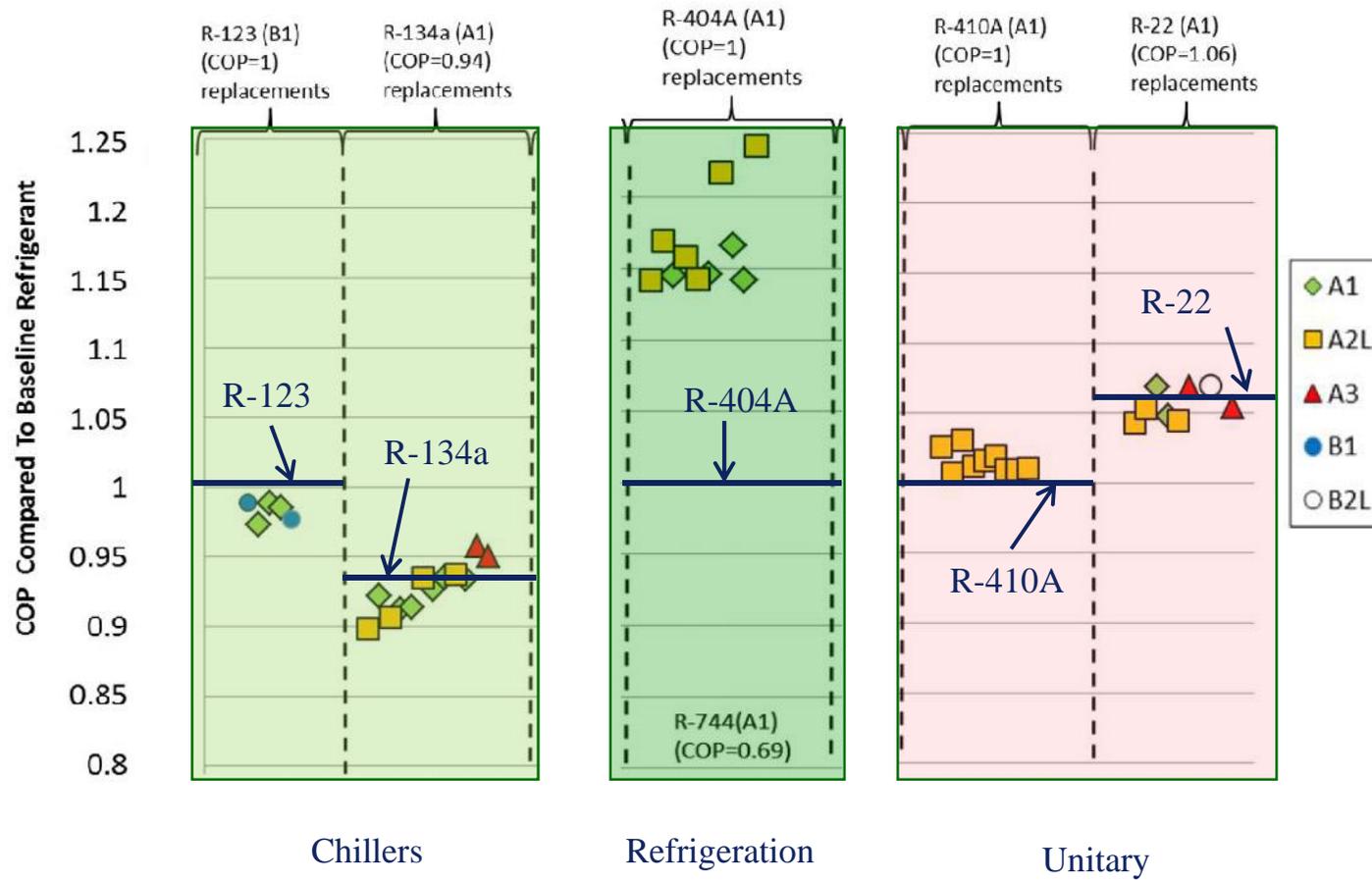
# Mudança na Classificação de Segurança de Refrigerantes



# Candidatos Potenciais: GWP



# Candidatos Potenciais: COP



# Candidatos Potenciais: Baixa Pressão



	R-123	R-1233zd(E)	R-245fa
<b>Flammability</b>	Non (1)	Non (1)	Non (1)
<b>Toxicity</b>	Higher (B)	Lower (A)	Higher (B)
<b>Fluid Efficiency</b>	8.95 COP	8.85 COP	8.78 COP
<b>GWP</b>	76	<1	1030
<b>ODP</b>	0.012	~0	0
<b>Atmospheric Life</b>	475 days	26 days	2,628 days

Já existem produtos no mercado com esses candidatos

# TRANE: 1º Chiller Centrífugo utilizando R1233zd



Primeiro Chiller Centrífugo utilizando R1233zd da TRANE – Julho 2014

## Trane First with 1233zd Centrifugal Chiller

Air conditioner manufacturers are working to quickly meet the revised EU F-gas Regulation. At the end of June, long-time centrifugal chiller manufacturer Trane (Ingersoll Rand) announced in France the launch of the Series E CenTraVac centrifugal chiller, which adopts next-generation refrigerant HFO-1233zd(E). This is the first commercialized chiller in the world to adopt the new refrigerant. According to Trane, the Series E CenTraVac water-cooled centrifugal chiller will be available in Europe with capacities from 2,600 kW to 14,000 kW for applications such as comfort cooling of large commercial buildings including district cooling. It is up to 10% more energy efficient than the next-best chiller available in this tonnage, delivering industry-leading efficiencies at both part-load and full-load capacity.

The Trane Series E uses an ultra-low global warming potential (GWP) hydrofluoroolefin (HFO) refrigerant and builds upon direct-drive, multi-stage, semi-hermetic, low-pressure design technology. It recently received Air-Conditioning, Heating

and Refrigeration Institute (AHRI) certification. The Series E CenTraVac allows for heat pump, heat recovery, and free-cooling applications to offer increased sustainability. Additionally, the unit offers an ice-making feature for ice-enhanced cooling during peak demand.



Trane Series E CenTraVac centrifugal chiller with HFO-1233zd(E) only for the European market

The Series E centrifugal chiller offers many different motor control offerings, including Trane's industry leading Adaptive Frequency Drive technology (variable speed). It does not use oil-free technology at this stage, but does employ Trane's latest proven oil-lubricated compressor

bearings. The Series E uses hydrodynamic or sleeve bearings, a proven bearing design leveraged around the world leading to increased reliability.

A single component refrigerant 1233zd(E) is described as non-flammable and having low toxicity. It was originally developed for use as a blowing agent but has also been found to be a high-efficiency alternative to R123. It has been submitted for American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) designation and classification and is expected to be classified as A1. Its GWP is low, listed under the F-gas Regulation as 4.5 but variously described as 6 by the United Nations Environment Programme (UNEP) and 1 by Honeywell.

Trane's strategy is to employ the right refrigerant, for the right application, at the right time. Trane has a wealth of technologies related to low-pressure centrifugal chillers, an area where it has particular expertise. Low-pressure chillers offer exceptional performance in high capacity

*[Continued on page 6]*

# Candidatos Potenciais: Média Pressão



## Ofertas TRANE

	Medium Pressure			
	R-134a	R-513A	R-1234yf	R-1234ze
Flammability	Non (1)	Non (1)	Slight (2L)	Slight (2L)
Toxicity	Lower (A)	Lower (A)	Lower (A)	Lower (A)
Fluid Efficiency	8.5 COP	8.3 COP	8.2 COP	8.5 COP
Capacity Change	1	Same	5% Loss	25% Loss
GWP	1300	573	1	1
	In Current Trane Product Offering		Under Evaluation for Trane Products	



RTAC



RTAE



RTWD



RTHD

Portfólio de Chiller com compressor parafuso com a nova geração de refrigerantes até 2020

# Sintesis™ Air-Cooled Chiller



**EcoWise™**



## Ingersoll-Rand EcoWise™ portfolio of products

Designed to lower environmental impact with next-generation, low global warming potential (GWP) refrigerants and high efficiency operation

## Sintesis air-cooled chiller

- Up to 25% better part load efficiency than ASHRAE 90.1-2013 requirements
- Operates with either R-134a or DuPont Opteon® XP10 (R-513A), a next-generation, low-GWP refrigerant

Projetado para hoje e para o futuro

# Candidatos Potenciais: Alta Pressão



- R 32 
- R 290 – Propano 
- DR 55



Já existem produtos no mercado com esses candidatos

# DR 55: Opção para substituir o R410A



- Ternary blend of R32 (67%), R1234yf (26%), and R125 (7%) ; class A2L
- GWP = 675 (equal to R32)
- Lowest flammability possible
  - Significantly lower than other option
  - Burning Velocity <4 cm/sec
  - Will be A2L
- Equals R410A capacity and pressure
  - No redesign
- Better efficiency than R410A
  - Equal to Slightly better than other options
  - High ambient performance 5-7% better than R410A
- Low compressor discharge temps
  - No redesign for compressor cooling like other alternatives
- Sustainable
  - Able to recycle R410A and repurpose to DR55
  - Blend of R32, R125 and R1234yf
  - Preserves investments in R410A technology

# Primeiro Chiller com Condensação a ar com DR 55



## TRANE exhibe o primeiro Chiller com condensação a ar com o refrigerante DR 55 – menos ofensivo ao meio ambiente

- This demonstration chiller is a Trane AquaTrine™ using DR-55, which is designed for top-grade apartments, luxury villas, office buildings, small restaurants, retail stores and hotels. It uses a high-efficiency hermetic scroll compressor and evaporator technology to provide a stable, reliable and highly efficient operation.
- DR-55, marketed by The Chemours Company as Opteon™ XL55, is a next generation low-GWP refrigerant with strong safety, design and sustainability performance compared to other refrigerant choices. An olefin-based blend, DR-55 is currently being evaluated by the HVAC industry for use in unitary and residential equipment.
- “We expect high performance HVAC systems to be available with next generation refrigerants like DR-55 within the next 12-18 months pending regulatory approval,” said Randal Newton, vice president of enterprise engineering for Ingersoll Rand. “This demonstration project is one way that Ingersoll Rand is delivering on our environmental commitment to identify, test and introduce technologies that are safe, increase efficiency and reduce climate impact.”



# Absorção de Simples Efeito com Água Quente



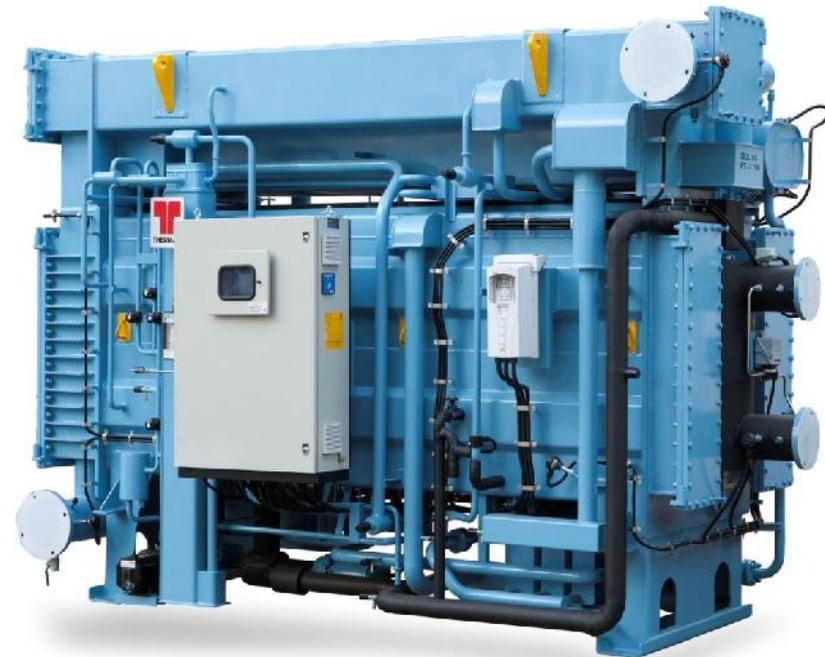
- Fonte de Calor:
  - Água Quente a baixa temperatura (85 – 121°C)
- Faixa de Capacidade: 100 – 210 TR
- COP: 0,72 – 0,74



# Absorção de Duplo Efeito com Vapor ou Água Quente



- Fonte de Calor:
  - Vapor Saturado (43 – 145 psig)
  - Água Quente a alta temperatura (150– 180°C)
- Faixa de Capacidade: 50 – 3500 TR
- COP: 1,38 – 1,43



# Absorção de Duplo Efeito com Queima Direta



- Fonte de Calor:
  - Gás Natural ou Óleo
- Faixa de Capacidade: 50 – 1350 TR
- COP: 1,39 – 1,45



# Absorção de Duplo Efeito com Gases de Exaustão



- Fonte de Calor:
  - Gases de Exaustão (275 – 600°C)
- Faixa de Capacidade: 50 – 3500 TR
- COP: 1,38 – 1,43



# Absorção de Triplo Efeito a Vapor



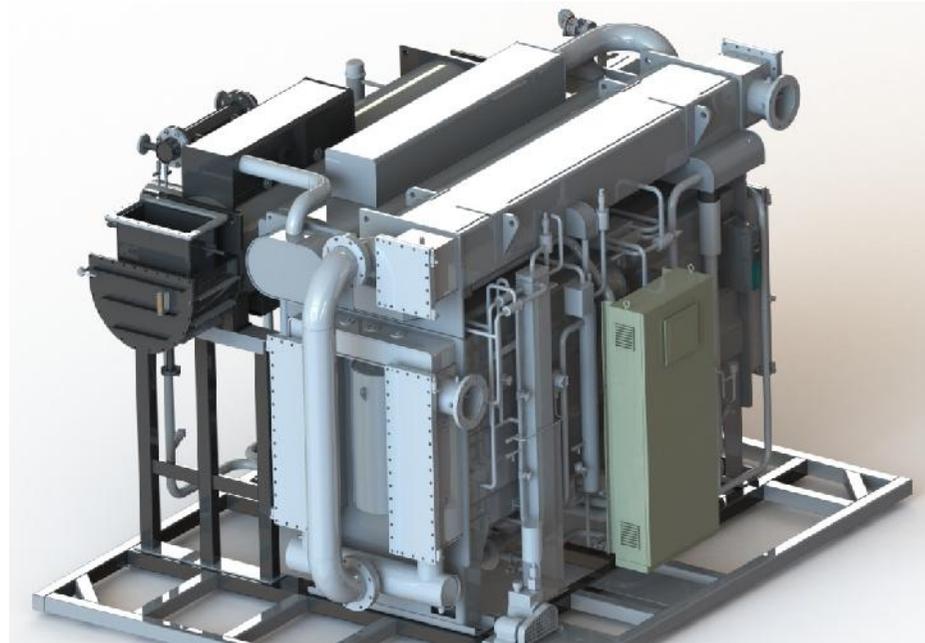
- **Fonte de Calor:**
  - Vapor Saturado (215 – 360 psig)
  - Consumo de Vapor: 6,2 – 6,4 lbs / hr / TR
- Faixa de Capacidade: 50 – 1000 TR
- COP: 1,7 – 1,8
- 25-30% mais Eficiente



# Absorção de Triplo Efeito com Gases de Exaustão



- Fonte de Calor:
  - Gases de Exaustão (299 – 593°C)
- Faixa de Capacidade: 50 – 500 TR
- COP: 1,7 – 1,8
- 25-30% mais Eficiente



# Como proteger meu investimento?



- **Não** existe um refrigerante perfeito;
- **Adote uma abordagem equilibrada:**  
*Segurança, impacto ao meio ambiente e eficiência;*
- **R-123, R134a, R410A, R407C são escolhas adequadas e responsáveis nos dias de hoje;**
- **Evitar / Eliminar vazamentos é muito importante:**  
*Significa menos emissões, maior eficiência e baixo custo de operação.*



Se manter informado é crítico

# Perguntas?



# SISTEMAS DE ÁGUA GELADA



PROGRAMA  
BRASILEIRO DE  
ELIMINAÇÃO DOS

**HCFCs**  
Projeto para o Cumprimento de CILBERT

Apoio Institucional:



Execução



Implementação



Empoderando vidas.  
Fazendo a diferença.

Realização

Ministério do  
Meio Ambiente



# As Ações da Ingersoll Rand



“... fazer o Phase Out dos HFCs de sua linha de produtos até 2030...”

## Ingersoll-Rand announces plan to convert to HFO refrigerants

22 September 2014 | By Andrew Gaved

Owner of Trane and Thermo King believes strategy of exiting HFCs by 2030 and halving CO<sub>2</sub> emissions by 2020 is more far-reaching than competitors

Ingersoll-Rand, owner of the Trane chiller and Thermo King transport refrigeration brands, has announced its intention to phase in HFCs from its product line by 2030 and replace them with HFOs.

Chief executive Mike Lamach said that the manufacturer is aiming to cut the CO<sub>2</sub> emissions of its products by 50 per cent by 2020. At the same time it has announced it will cut the emissions footprint of its own offices, factories and transport fleet by 35 per cent in the same period and committed \$500 million to product-related R&D over the next five years in a bid to reduce greenhouse gas emissions.

He said in so doing, the company is going further than its competitors and is bidding to win more work with the



sustainable solutions.

quires action now and can  
reenhouse gas emissions.  
ore sustainable world and  
ees and shareholders that  
y of efficient, reliable and



### RELATED ARTICLES

- US industry announces \$5 billion refrigerant research plan  
16 September 2014
- US industry announces \$5 billion refrigerant research plan  
17 September 2014
- China reveals energy plan slashing HFC use  
6 June 2014
- Trane launches 'European-focused' chiller range, including a centrifugal version using HFO refrigerant  
27 June 2014
- Danfoss Discusses CO<sub>2</sub> Refrigeration Benefits at ATMOSphere America

UN Headquarters  
New York  
23 September 2014



CLIMATE  
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CATALYZING ACTION

## FINANCIAL TIMES

September 22, 2014 1:15 pm

### Ingersoll-Rand to phase out chemicals linked to climate change

By Ed Crooks in New York



Ingersoll-Rand, the Dublin-based manufacturing group, plans to phase out hydrofluorocarbons (HFCs), which can have a much more powerful global warming effect than carbon dioxide, by 2030.

New York-listed Ingersoll-Rand, which owns brands such as Thermo-King refrigeration systems and Trane air conditioners, says its new commitments go well beyond regulatory requirements or pledges made by competitors.

It plans to cut the greenhouse gas impact of the refrigerants in its products by 50 per cent by 2020.

Ingersoll-Rand e Trane Liderando a indústria através dessa nova transição

# Candidatos Potenciais: Média Pressão



	Medium Pressure			
	R-134a	R-513A	R-1234yf	R-1234ze(E)
Flammability	Non (1)	Non (1)	Slight (2L)	Slight (2L)
Toxicity	Lower (A)	Lower (A)	Lower (A)	Lower (A)
Fluid Efficiency	8.5 COP	8.2 COP	8.2 COP	8.5 COP
Capacity Change	1	Same	5% Loss	25% Loss
GWP	1300	572	<1	<1
	In Current Trane Product Offering		Under Evaluation for Trane Products	

Já existem produtos no mercado com esses candidatos

# Mundo Concorda: “Phase Down” dos HFCs começa em 2016



Últimas novidades das reuniões sobre o Protocolo de Montreal

November 6, 2015

*“Pleased with the progress made, Stephen Yurek, president and CEO of the US Air Conditioning, Heating, and Refrigeration Institute (AHRI), said “AHRI’s member companies – including refrigerant producers and original equipment manufacturers – have proactively been researching potential alternative refrigerants to ensure that the world’s air conditioning and refrigeration equipment manufacturers will have access to appropriate refrigerants.”*

Fonte: <http://www.coolingpost.com/world-news/world-could-agree-hfc-phase-down-in-2016/>

**World could agree HFC phase-down in 2016**  
Posted on Friday, November 6, 2015 · Leave a Comment

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**DUBAI:** With HFCs now to be included within the Montreal Protocol, this week’s meeting in Dubai ended with real prospects of a global HFC phase-down agreement next year.

In the face of four amendments on the table from the Island Nations, India, the EU and North America, objections to forming an HFC contact group to begin negotiating an amendment were finally dropped.

US secretary of state John Kerry, in a US party of more than 20 led by Environmental Protection Agency administrator Gina McCarthy, hailed the negotiations as a major accomplishment that shows “that the world is ready for a new chapter in the fight against climate change.”

Pleased with the progress made, Stephen Yurek, president and CEO of the US Air Conditioning, Heating, and Refrigeration Institute (AHRI), said “AHRI’s member companies – including refrigerant producers and original equipment manufacturers – have proactively been researching potential alternative refrigerants to ensure that the world’s air conditioning and refrigeration equipment manufacturers will have access to appropriate refrigerants. AHRI, US government agencies, and energy efficiency advocacy groups have all worked diligently for many years to ensure a phase-down of these chemicals. This collaboration is an excellent example of what can be accomplished when all parties work together in good faith to achieve a common goal.”

Global agreement to include HFCs in Montreal Protocol

# “Phase Down” Global dos HFCs: Protocolo de Montreal



Novo capítulo na luta contra as mudanças climáticas

November 23, 2015

*“The end is near for hydrofluorocarbons (HFCs).*

*The 197 Parties to the Montreal Protocol agreed to begin work on an amendment that will reduce the global production and consumption of HFCs at the 27th Meeting of the Parties (MOP)... The amendment, deemed the “Dubai Pathway,” is expected to be completed in 2016 and puts to rest an ongoing discussion regarding HFC usage that’s persisted among Montreal Protocol members for more than five years.”*



Montreal Protocol targets HFC phasedown amendment completion in 2016

# Indústria Concorda: “Phase Out” dos HFCs em 2025



Últimas novidades das reuniões sobre o Protocolo de Montreal

February 3, 2016

*“US Environmental group the Natural Resources Defense Council (NRDC) and the Air Conditioning, Heating, and Refrigeration Institute (AHRI) are said to have agreed on a schedule for eliminating the use of the refrigerants in new chillers of all types and sizes.”*

Fonte: <http://www.coolingpost.com/world-news/r134a-faces-chiller-ban-from-2025/>

**COOLING POST**  
R134a faces chiller ban from 2025  
Posted on Wednesday, February 3, 2016 · Leave a Comment

**SHARE THIS ARTICLE** **JOIN OUR NEWSLETTER**

**USA:** HFC refrigerants R134a, R410A, and R407C could be banned from use in US chillers from 2025 under new industry proposals.

US Environmental group the Natural Resources Defense Council (NRDC) and the Air Conditioning, Heating, and Refrigeration Institute (AHRI) are said to have agreed on a schedule for eliminating the use of the refrigerants in new chillers of all types and sizes.

The NRDC/AHRI agreement was delivered on Monday to the Environmental Protection Agency. The EPA is preparing regulations under the Clean Air Act's Significant New Alternatives Policy (SNAP) programme with deadlines for ending use of HFCs in applications where safer alternatives are available. EPA issued a first-round SNAP rule in July 2015. The second SNAP rule will cover more categories of equipment, including chillers, and will be proposed and finalised this year.

The NRDC says it petitioned EPA last year to complete the phase-out of R134a, R410A, and R407C in new chillers by 2023. The manufacturers favoured longer timelines, ending as late as 2030 for some types of equipment.

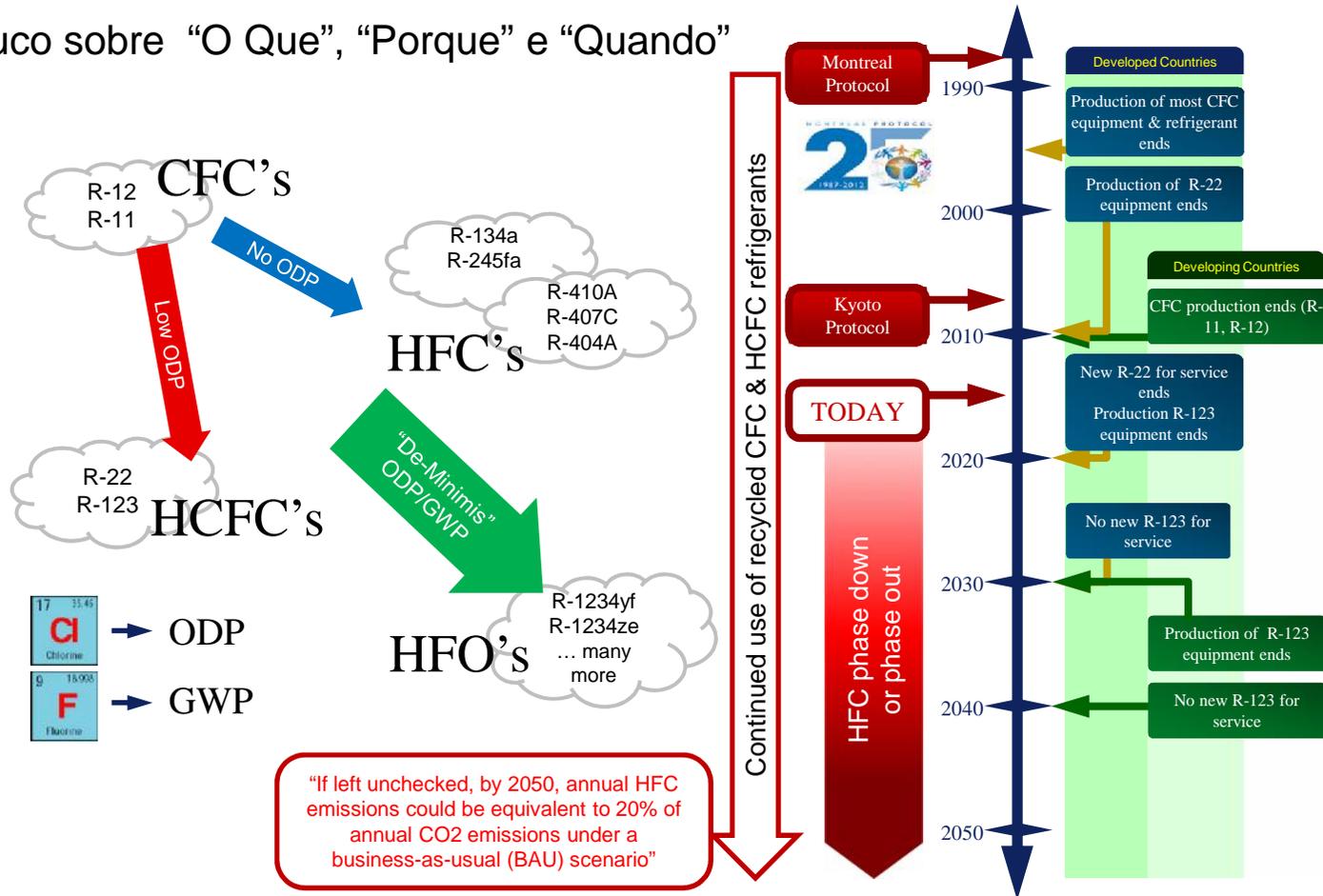
A number of chiller manufacturers, including Climaveneta with its TEC/2 range shown here, have already adopted lower GWP refrigerant R1234ze

Industry Alignment with NGO Supports USA Climate Commitment

# A Transição do Refrigerante



Um pouco sobre “O Que”, “Porque” e “Quando”



Refrigerant Transition Begins NOW... To the Next Gen Olefinated Refrigerant