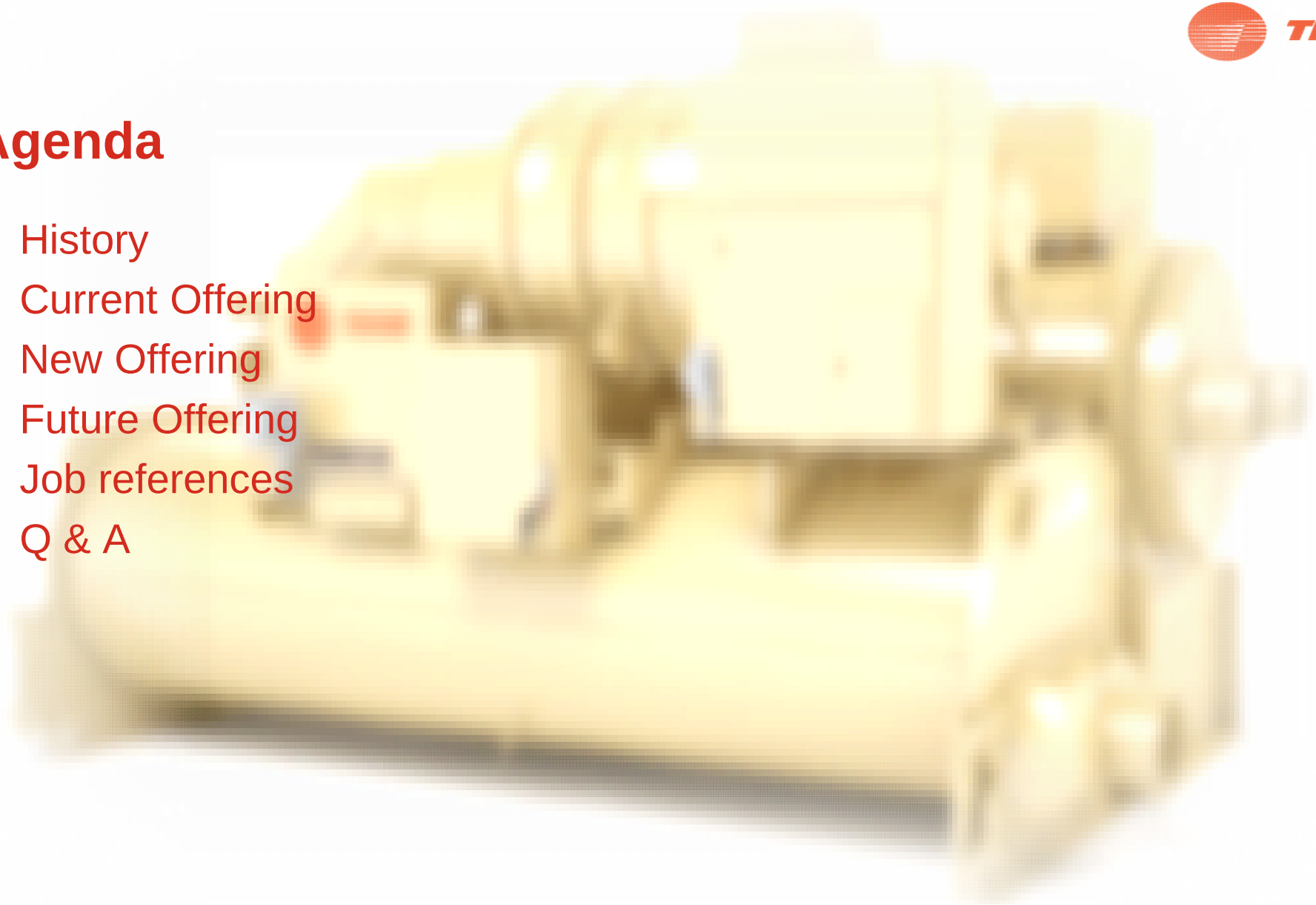
Low Global Warming Potential Alternatives
- Next Generation Refrigerant

August 2016

Agenda

- History
- Current Offering
- New Offering
- Future Offering
- Job references
- Q & A



History…..

3rd Generation (1991~2010)
Ozone Protection
HCFCs, HFCs

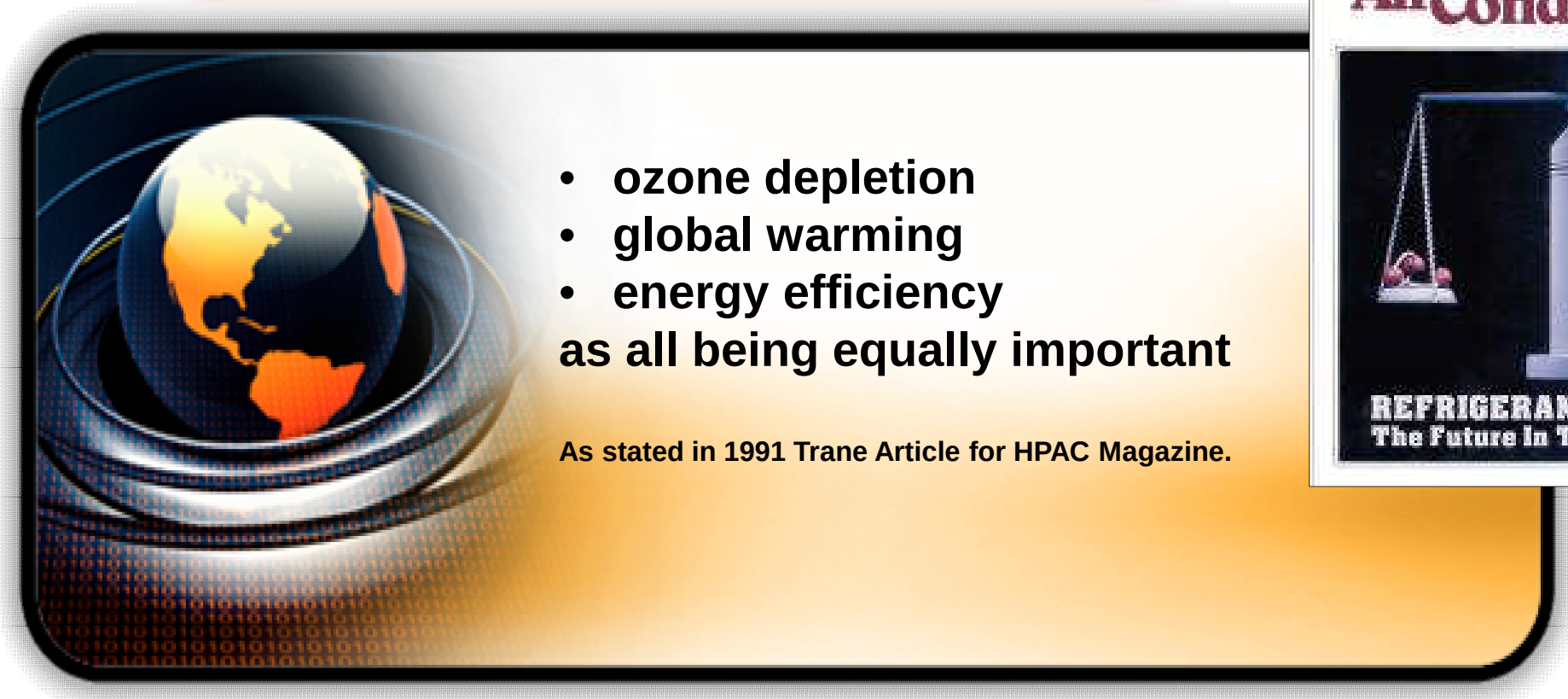
2nd Generation (1931~1990)
Safety & Durability
CFCs, HCFCs, HFCs, NH_3, H_2O

1st Generation (1830~1930)
Whatever that worked!
CO_2, NH_3, HCs, H_2O,etc

4th Generation (2010~)
Global Warming
HFOs
- Zero/low ODP
- Low GWP
- Short Atmospheric Life
- High efficiency

Refrigerant Progression

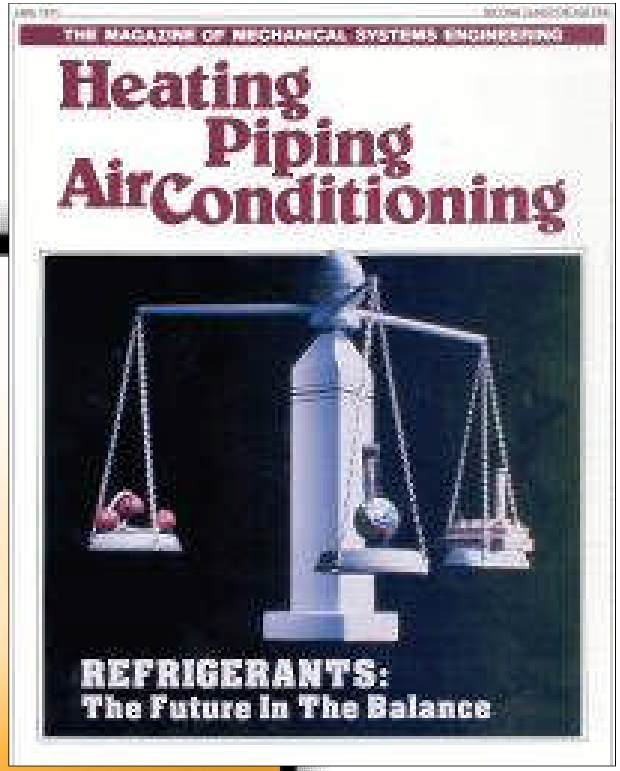
In 1991, amidst global phase out of ODS, Trane said……



- **ozone depletion**
- **global warming**
- **energy efficiency**

as all being equally important

As stated in 1991 Trane Article for HPAC Magazine.



Comparing existing refrigerants used for chillers

Criteria	HCFC123	HFC134a
Ozone Depletion Potential (relative to CFC11)	0.012	0
Global Warming Potential (relative to CO_2)	76	1320
Fluid Efficiency (COP)	9.4	8.5
Atmospheric Life (Years)	1.3	14
Operating Pressure (AHRI Conditions)	Below Atmospheric Pressure	Approx 1200kPa at condenser

No Perfect Solution!

Trane offers the right refrigerant for the right product at the right time.



Consistent message over time

Chiller Design Philosophy
- **Sustainability: Reliability & Serviceability**
- **System Integration & Control**
- **Balanced environmental approach**
  - **High efficiency**
  - **Low leakage**
  - **GWP**
  - **ODP**
  - **Short atmospheric life**

Convertible & Compatible Solutions: Continuing to help Customers Transition

TRANE

Today

Full line in 2018. Today, limited size & regional availability.



Next-Generation, Low-GWP



R-123 (+35 years)

R-11

CenTraVac

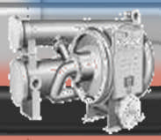






R-11 (50 years)

R-113



R-113 (40 years)

TURBOVAC

Montreal Protocol

1940 1950 1960 1970 1980 1990 2000 2010 2020 2030 2035

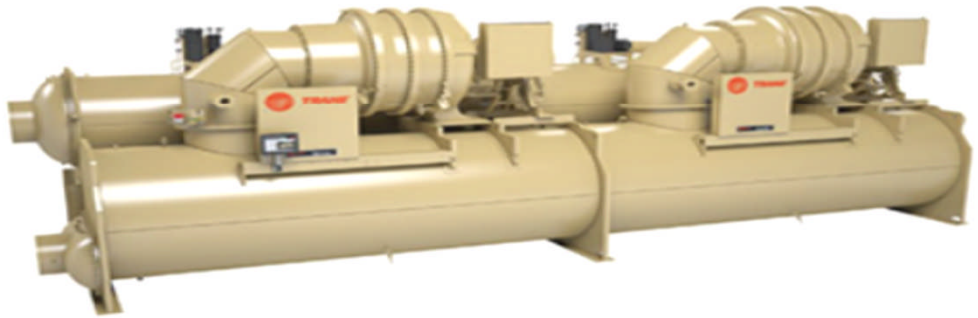
Regulations & new refrigerants push new technologies & transitions.
Trane was – and is – ready to deliver tomorrow's solutions today.

Trane adopts new low GWP refrigerant R514A

Posted on Wednesday, June 15, 2016 · Leave a Comment

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USA: Trane is expanding its range of CenTraVac centrifugal chillers in the US and Canada with models running on the lower GWP refrigerants R514A and R1233zd.

From next year, Trane will offer small tonnage CenTraVac chillers for markets like office and municipal buildings with a choice of the current refrigerant R123 or the low GWP HFO blend R514A. Starting now, Trane will also offer large tonnage CenTraVac chillers for applications such as industrial and large commercial buildings and data centres with the HFO R1233zd.

Although a very efficient refrigerant with a GWP of just 77, R123 is an HCFC and will be banned from use in new equipment by 2020 due to its, albeit small, ozone depletion potential. In the US, it will still be allowed to be used to service existing equipment and for export until 2030.

R514A, developed by Chemours as Opteon XP30, is considered a drop-in replacement for R123. With a GWP of just 2 under AR5, R514A blends the HFO 1336mzz(Z) with trans-1,2-dichloroethene, a gas not previously used in refrigerants. Like R123, R514A has a B1 toxicity classification.

"We are pleased to bring our customers new choices for achieving their building, business and sustainability goals without compromising safety, performance or efficiency," said Dave Regnery, president of commercial HVAC North America, Europe, Middle East and Africa for Ingersoll Rand

Trane adopts new low GWP refrigerant R514A

- Trane offers R123 or R514A for low tonnage CenTraVac chiller
- Trane offers R1233zd for high tonnage CenTraVac chiller
- R514A (GWP of 2) and R1233zd (GWP of 1) are low GWP HFOs
- Existing Trane R123 chillers are generally convertible for the use of R514A
- R1233zd ECTV is available
- R514A CTV will be launched after Q3 2017

With a GWP of just 2 under AR5, R514A blends the HFO 1336mzz(Z) with trans-1,2-dichloroethene, a gas not previously used in refrigerants. Like R123, R514A has a B1 toxicity classification.

"We are pleased to bring our customers new choices for achieving their building, business and sustainability goals without compromising safety, performance or efficiency," said Dave Regnery,

Comparing HFCs, HCFCs & HFOs

	Low Pressure			Medium Pressure			
	R123 (HCFC)	R1233zd (HFO)	R514A (HFO)	R134a (HFC)	R513a (Blend)	R1234yf (HFO)	R1234ze (HFO)
Flammability	Non (1)	Non (1)	TBA	Non (1)	Non (1)	Slight (2L)	Slight (2L)
Toxicity	Higher (B)	Lower (A)	TBA	Lower (A)	Lower (A)	Lower (A)	Lower (A)
Fluid Efficiency	9.4 COP	9.3 COP	TBA	8.5 COP	8.3 COP	8.2 COP	8.5 COP
Capacity Change	1	+35%	TBA	1	0%	-5%	-25%
ODP	0.012	0	0	0	0	0	0
GWP	76	1	2	1320	572	<1	<1
Atm Life	1.3 years	26 days	TBA	14 years	14 years*	14 days	14 days
Product Availability	Current Trane Product Offering		Soon…..	Current Trane Product Offering		Under Evaluation for Trane Product	

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TRANE

Trane's R1233zd(E) chiller is enviro award winner !



Japan's economy, trade and Industry parliamentary secretary Seki Yoshihiro (left) presents the award to Matsumura Kazumi of Trane's development marketing strategy division



JAPAN: Trane's CenTraVac chiller using the new low GWP HFO refrigerant 1233zd(E) has won a major Japanese government environmental award.

Trane's chiller was one of a number of awards made at the 18th Ozone Layer Protection and Global Warming Prevention Technology Grand Prix at the end of August. The awards are organised by the daily business and technical newspaper *Nikkan Kogyo Shimbun*, co-hosted by the Japanese Refrigerants and Environment Conservation Organisation (JRECO), and supported by Japan's Ministry of Economy, Trade and Industry (METI) and Ministry of the Environment.

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Trane's R1233zd(E) chiller is enviro award winner !



Japan's economy, trade and Industry parliamentary secretary Seki Yoshihiro (left) presents the award to Matsumura Kazumi of Trane's development marketing strategy division



JAPAN: T… GWP HFO refrigera… ernment environn…

Trane's cl… at the 18th Ozone Layer Pro… nology Grand Prix at the enc… e daily business and techn… osted by the Japanese … Organisation (JRECO), a… y, Trade and Industry (M… ment.

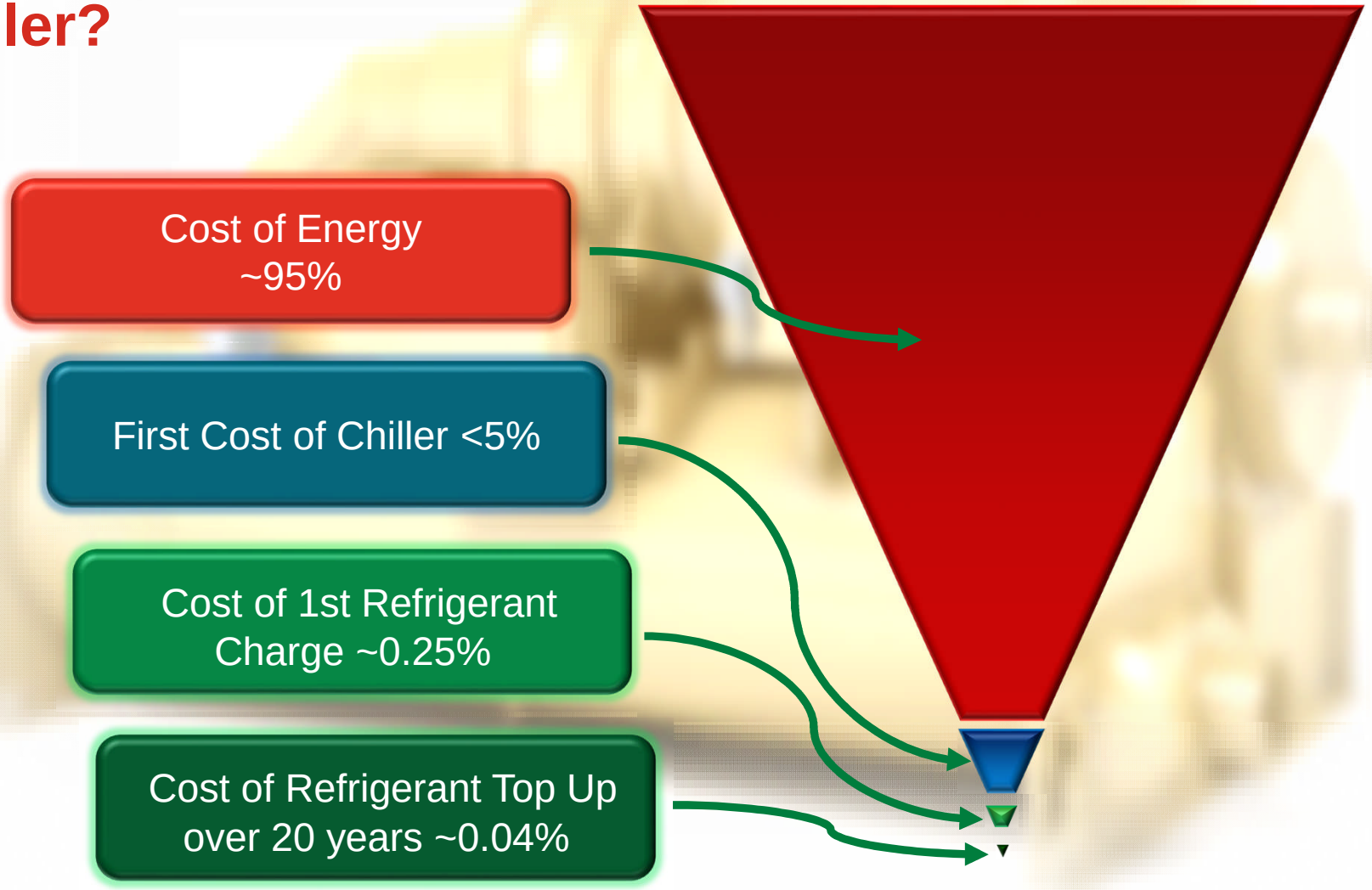
The Series E CenTraVac, the first chiller in the world to use the new HFO, won the Minister of Economy, Trade and Industry Prize in this year's awards. Its introduction was first announced in the *Cooling Post* in June 2015

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Job References (R1233zd)

Asia	Europe/USA/MEA
Japan • Automobile (835RT x 1) • Electronics (2500RT x 3) • Electronics (2500RT x 3) • Electronics (2500RT x 2)	Europe • 17 shipped • 5 on order
Taiwan • Electronics (2000RT x 2 + 1750RT x 1) • Electronics (2000RT x 2)	USA • 9 shipped • 9 on order
Singapore • **Data Centre (1500RT x 2)**	MEA • 18 shipped
Australia • Commercial (1137RT x 1)	

Where does the money go over the life of chiller?





Question & Answer