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**AIRAH Victoria**

**Refrigerants Update**

20<sup>th</sup> October 2014

# Agenda

## ➤ R22 Phase down

- ❖ Legislation and options
- ❖ Interim replacements and considerations

## ➤ New HFO refrigerants

- ❖ Legislation as a driver for change
- ❖ New HFO refrigerants, properties and blends
- ❖ HFO flammability

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# R22 – Legislation and Options

- R22 is subject to phase down (Ozone Protection and Synthetic Greenhouse Gas Management Act 1989) under the following schedule:

Year	Annual import limit (ODP tonnes)	R22 max import (tonnes)
2012, 2013	40	720
2014, 2015	10	180
2016 – 2029	2.5	45
2030	0	0

\*1 ODP tonne equates to 9 metric tonnes of HCFC-141b or 18 tonnes of HCFC-22 or 50 tonnes of HCFC-123

- R22 recycling schemes will mean extra R22 is available to the market
- R22 will still be available but future planning for systems on R22 is worthwhile:
  1. Remain on R22 and stockpile some gas
  2. Retrofit to an interim replacement product
  3. Decommission and replace systems
  4. Wait until new HFO products are available before retrofit/ replacement

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# R22 – Interim Replacement Products

- Many products have been marketed to replace R22
- Two main Manufactures:
  - ❖ DuPont – Isceon ‘9 series’
  - ❖ Refrigerant Solutions – RS range
- Drop-in replacements
- Mainstream HFCs
- From global experience, A-Gas would recommend:
  - ❖ R438A or R407C for air conditioning application
  - ❖ R407F for medium and low temperature application



# R22 – Replacement Considerations

Mass  
Flow

Glide

Pressure

Seals

Oil

Capacity

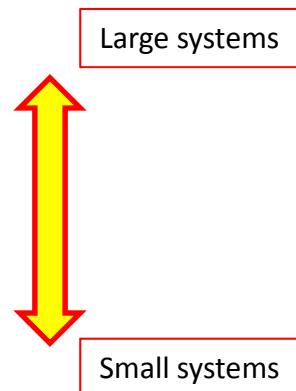
- Always consult the manufacturers Retrofit Guidelines before commencing a retrofit

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# Current Australian Market Position

- Moves towards use of low GWP fluids and better energy efficiency has been driven predominantly by legislation.
- The Carbon equivalent price mechanism affecting SGG's was repealed on Thursday 17<sup>th</sup> July 2014
- Europe and the USA are moving towards a fast phase down of HFCs
- With the demise of the Carbon Levy there is a legislative vacuum in Australia with nothing pushing the industry towards low GWP fluids – How long will this last?
- The future is likely to see a mixed bag of refrigerant options – legislation will drive change:

- R717
- HFOs
- R744
- Low GWP HFCs (R32)
- Hydrocarbons

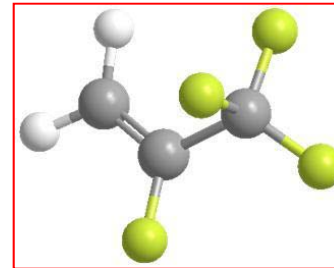


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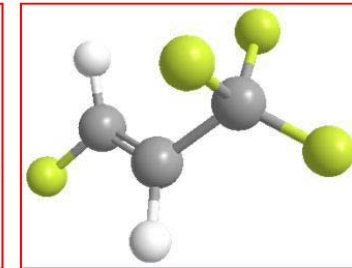
# Long Term Replacement Products – HFO Properties

- HFO stands from Hydrofluoroolefin – carbon to carbon double bond.
- HFOs are stable in a system but not in the atmosphere.
  - ❖ Atmospheric residency = 11 - 26 days
  - ❖ R134a = 20 – 100 years!
- yf and ze - ASHRAE A2L class
- yf and ze used to replace R134a in automotive and chiller application
- HFO 1233zd and 1336mzz are polyurethane foam blowing agents but are being trialled as R123 replacements
- zd and mzz – non flammable / not ASHRAE classified yet
- 1233zd is being used by Trane in new chillers

## HFO Refrigerants

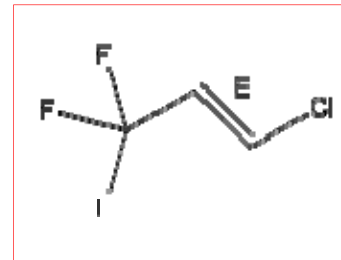


R1234yf – GWP = 4

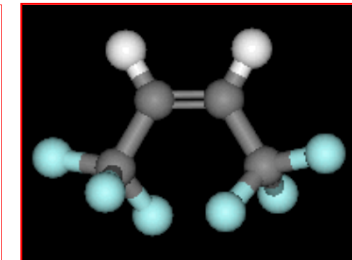


R1234ze – GWP = 6

## HFO Blowing Agents – likely R123 replacements



HFO 1233zd – GWP = 6  
ODP = 0.00024 – 0.00034

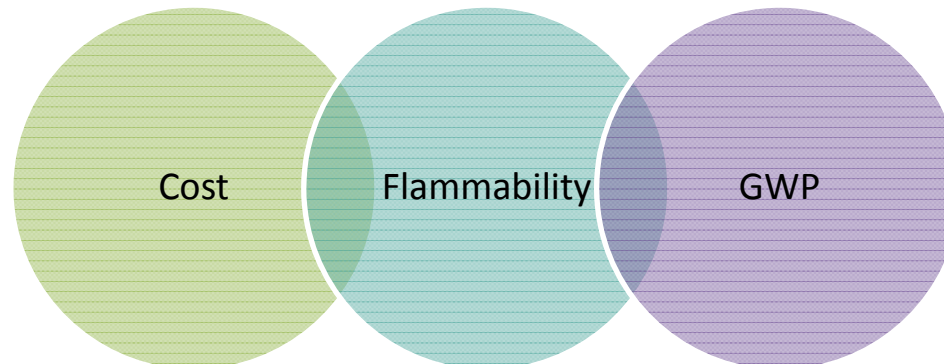


HFO1336mzz – GWP = 9.4

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# Long Term Replacement Products – HFO blends

- HFO 1234yf and HFO1234ze have similar capacity to R134a
- Blending with other products is required to replicate lower temperature application products
- Blending with low GWP HFC's such as R32 and R152a keep GWP low but are flammable
- R134a or R125 are used to reduce flammability (but increase GWP)
- Blends with higher HFO content will cost more
- Not all blends will be released....
- Once products are released most businesses will conduct trials before choosing their replacement



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# Long Term Replacement Products – HFO blends

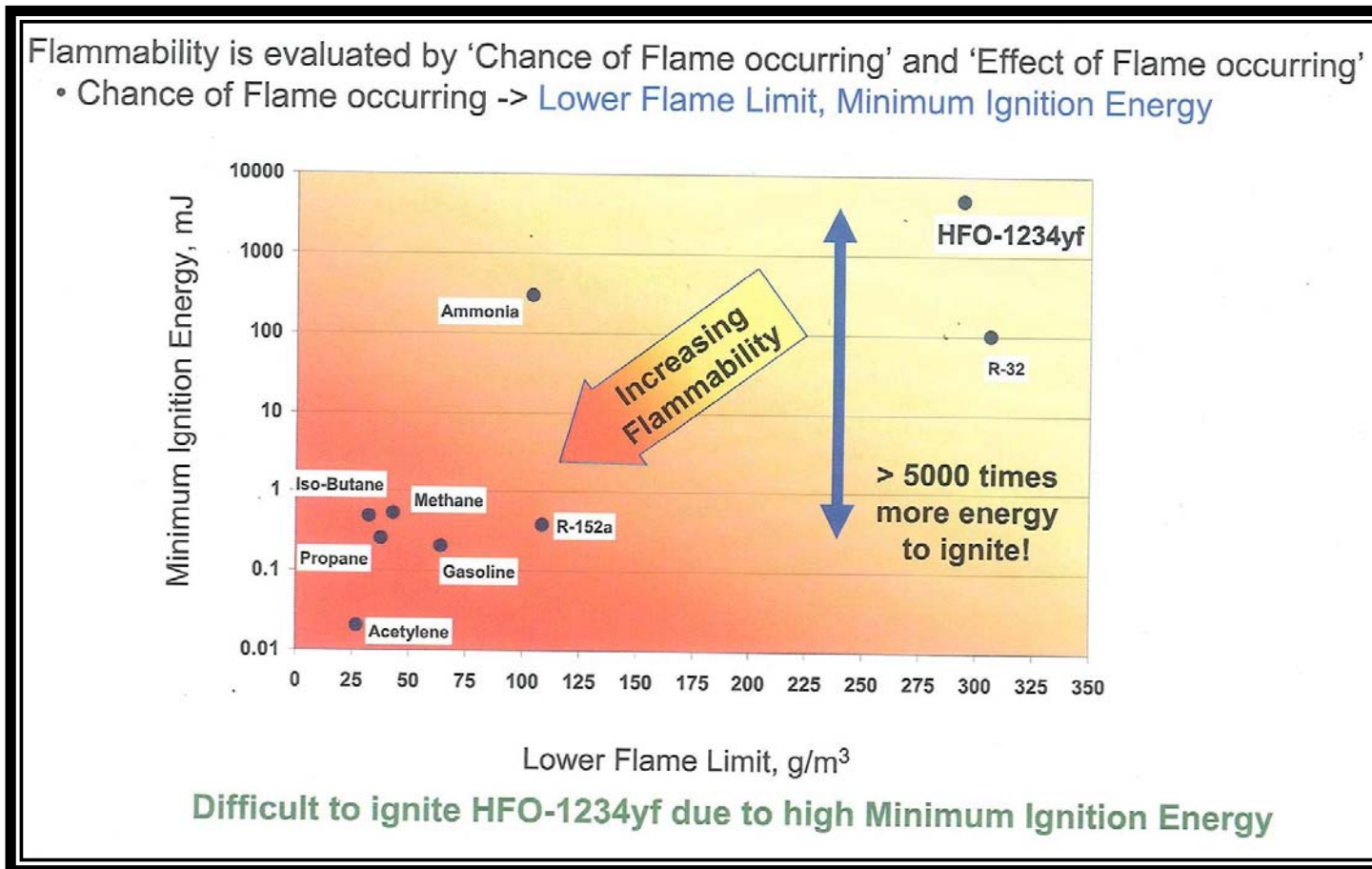
A selection of new blends being trialed for R22 replacement:

Product	Composition	% Composition (mass)	GWP	ASHRAE Class
ARM-32a	R32/R125/R134a/R1234yf	25%/30%/25%/20%	1577	A1
DR-7	R32/R1234yf	36%/64%	246	A2L
L-20 (R444B)	R32/R152a/R1234ze	41.5%/10%/48.5%	<350	A2L
N-20	R32/R125/R134a/R1234yf/R1234ze	12.5%/12.5%/31.5%/13.5%/30%	975	A1
LTR4X	R32/R125/R134a/R1234ze	28%/25%/16%/31%	1295	A1
LTR6A	R32/R744/R1234ze	30%/7%/63%	206	A2L
D52Y	R32/R125/R1234yf	15%/25%/60%	979	A2L

Source: AHRI – Alternative Refrigerant Evaluation Program



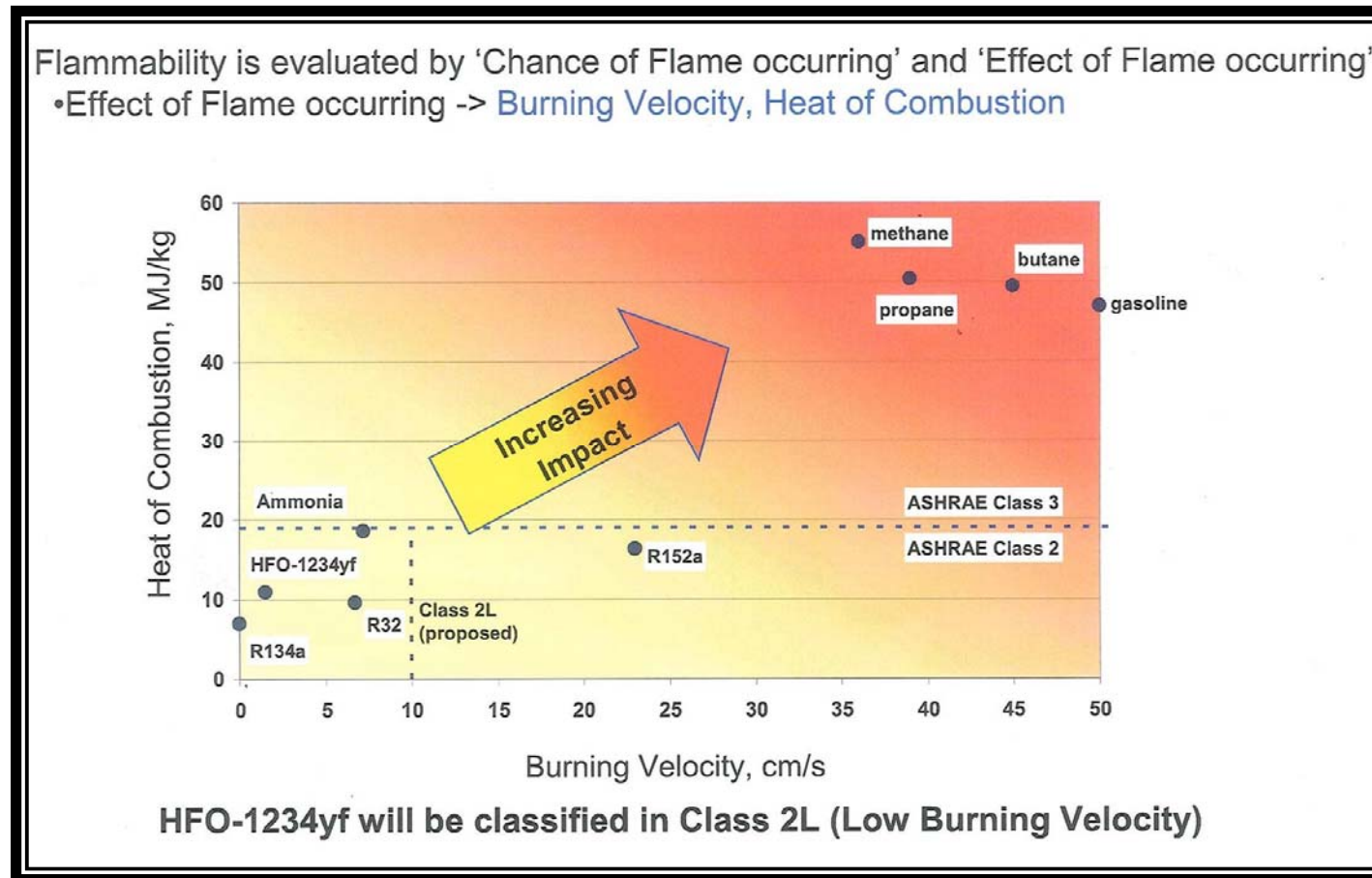
# HFO Refrigerants - Flammability



- R1234ze does not exhibit an LFL until it reaches a temperature of approx 29°C. It is therefore recognised as being non-flammable

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# HFO Refrigerants - Flammability



The low heat of combustion means burning velocity is very slow for R1234yf, as a result the flame struggles to propagate and tends to self extinguish.

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**Thank-You**