R-454C / R-454B: Low GWP HFO refrigerant solutions for sustainable, energy efficient and safe Heat Pump applications
The Europe's, and Kigali amendment of the Montreal Protocol, started the phase down of R410A and other HFCs.

R32 is popular lower GWP alternative given its availability but still seen as an interim transition to lower-GWP alternatives.

R-454B and R-454C are positioned for sustainable longer term solution beyond 2030.
Charge Size Calculation in accordance with EN378 (2016)

- European Safety standard EN378 (supports flammable refrigerants)
- Safety standard EN60335-2-40 for Heat Pump supports flammable refrigerants A3 up to 0.15kg and A2L up to 1.8kg (LFL)
- National and Regional building codes prevails

- Prevent ignition and combustion (Baseline strategy)
- Risk assessment (e.g. control ignition sources and isolation from flammable refrigerants)
- Refrigerant Charge limits (m1, m2, m3)
- Minimum occupied area, Active mitigation
- Refrigerant Piping Design qualification and protection, detectors
- Training and Education
Heat Pump safety standards and requirements

Three ways A2L refrigerants can reduce the flammability risks compared to A3 alternatives such as propane:
• 4x A2L by volume is typically needed to form a flammable mix with air.
• 2000x more energy is typically needed to ignite A2L gases
• A2Ls develop about 5 times lower combustion energy in A2L leading to A2Ls being:
  • less likely to form flammable concentrations
  • harder to ignite making them safe to use with many electric components
  • less reactive and developing lower combustion energy
• Industry is moving to support larger sizes for A3 refrigerants BUT with strong limitation on area (m2) indoor
• A2L and A3 are on 2 different markets

Safety requirements to use A3 flammables are more stringent:
• Charge limits
• People skill to avoid hot surfaces / avoid ignition sources

PTAC: A2L vs A3 at m1 charge per UL-60335-2-40

![Test results comparing A2L and A3 refrigerants](image-url)
28 APR 2019
Stiebel Eltron announces heat pump on R454C

GERMANY Stiebel Eltron says it will introduce a series of heat pumps next year using lower GWP refrigerant R454C.

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18 APR 2019
MH1 plans Euro launch of small split using refrigerant R454C

JAPAN Mitsubishi Heavy Industries has announced what it claims is the first small residential air conditioning system using lower GWP refrigerant R454C.

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5 MAY 2019
MH1 develops heat pump for R454C

JAPAN Mitsubishi Heavy Industries has introduced a commercial heat pump using the R454C-known lower GWP refrigerant 454C.

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16 OCT 2010
Chennou’s XL-41 approved for York chiller

USA Chennoug, Opteon 411A (RX41) a lower GWP replacement for R410A, has been approved by York Controls for its York Y-KAA scroll chiller platform in Europe.

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3 JUN 2019
Carrier confirms an HFO refrigerant future

EUROPE Carrier’s European refrigeration equipment manufacturer has confirmed that HFO refrigerants will be the basis for new “green” refrigerant options.

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29 MAY 2019
Latest VZH scrolls bring seasonal efficiency gains

EUROPE Carrier has announced the third generation of its VZH variable speed compressors, boosting their part load performance and operating maps.

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27 MAY 2019
MEHTS offers lower GWP refrigerants on chillers

EUROPE MEHTS, Chennoug says that Infralloys Hydrokromos and IT Cooling Systems have agreed to offer its lower GWP refrigerants R454A and 410A on its chillers and heat pumps.

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11 NOV 2009
Sanhua adds TTVs for R455A and R444C

China The R444C series thermostatic expansion valves, now introduced by Sanhua, are available for the lower GWP alternatives alternate to R410A.

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19 OCT 2009
Digital scrolls for A2L refrigerants

EUROPE Carrier is introducing a new range of Copeland standard and digital scroll compressors for A2L refrigerants in medium temperature refrigeration applications.

Read More »

16 APR 2009
Danfoss approves lower GWP options for DSH scrolls

EUROPE Danfoss has approved its DSH scroll compressor range for use with hybrid and volatile refrigerants, the lower GWP alternatives to R410A.
Summary

• A2L solutions for R410A replacement features good performance: selection is based on GWP and performance
  • Opteon™ XL20 (R454C) has the Lowest GWP between all A2Ls, whilst enable the R410A replacement with some redesign (Internal HEX, EVI)

• The Step Forward and Adoption by STIEBEL ELTRON is good demonstration of the A2Ls benefit in Air Source HP.

Thank you!
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