



# Heavy Vehicle Fires – Causes and prevention

A recognised project under the NHVR's *Heavy Vehicle Safety Initiatives* program

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- A/C system overview
- History and the drivers for change
- Flammability
- Issues
- Case study
- Summary



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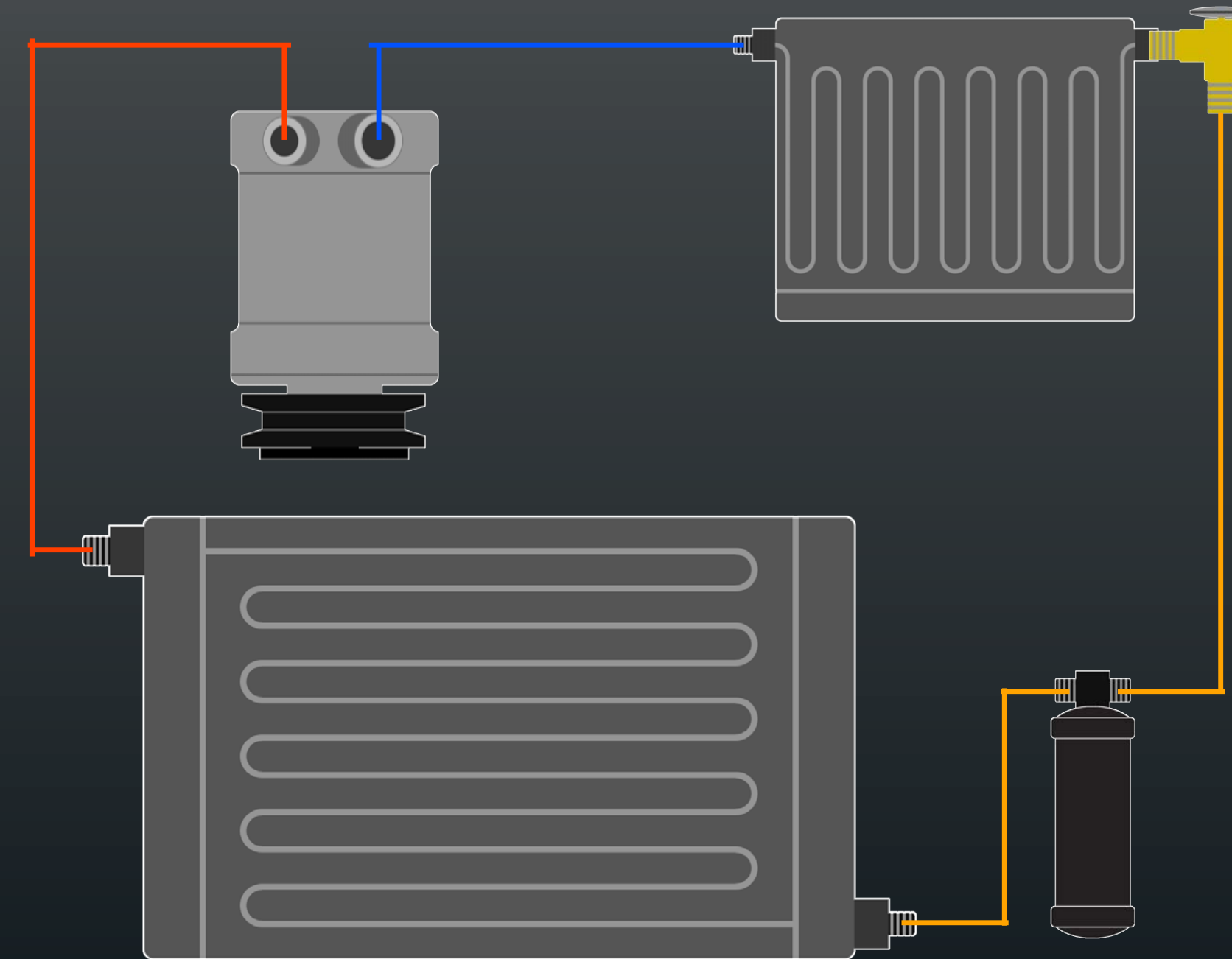
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## A/C system overview

- Compressor
- Evaporator
- Condenser
- TX-valve
- Filter Receiver Drier
- Hoses
- Pipes
- Switches
- Thermostat
- Fans



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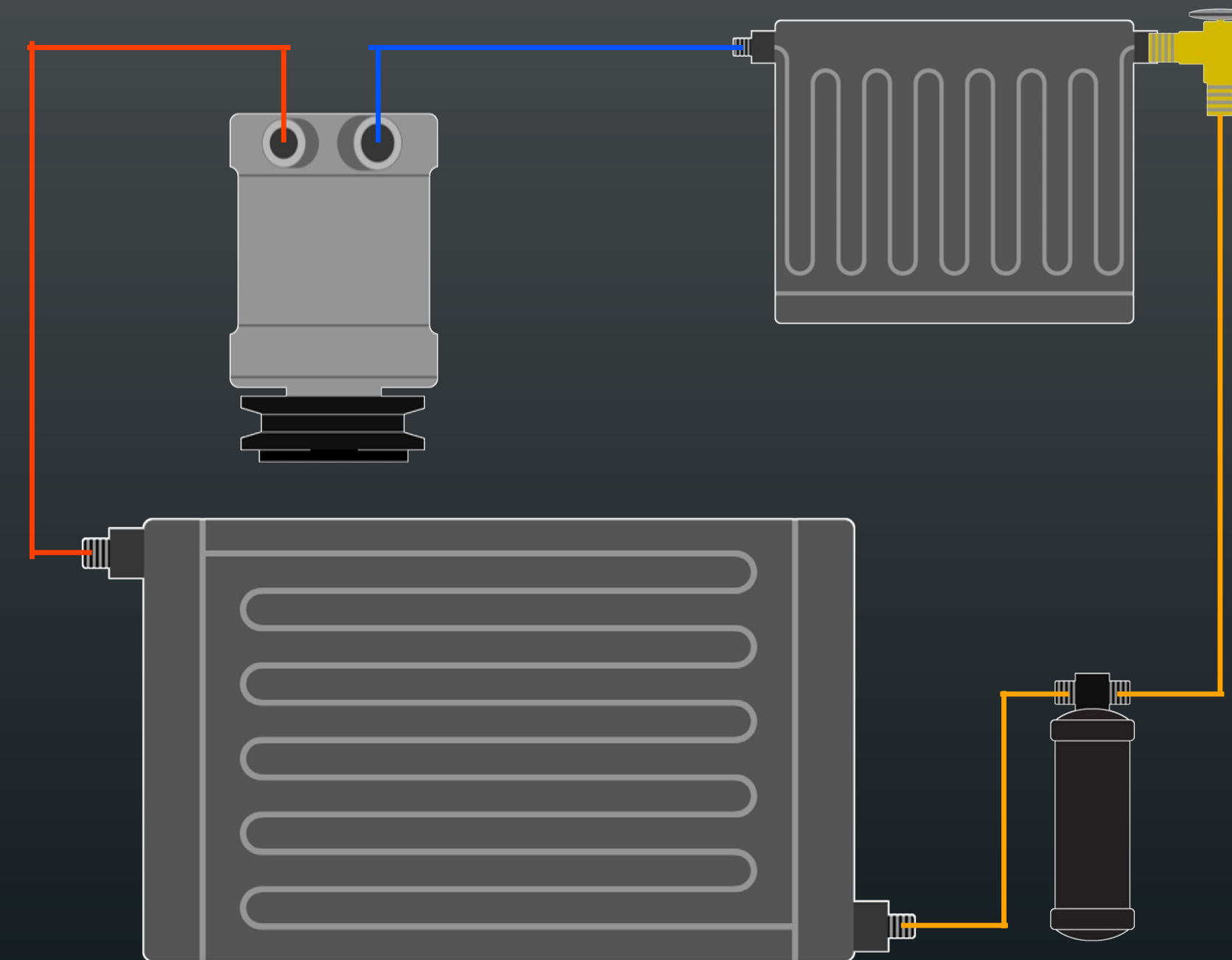
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A/C system overview

## Refrigerant

- Fluid
- Changes state
- Pressure/Temperature relationship
- Non-toxic
- Carry lubricant
- Large latent heat of vaporisation



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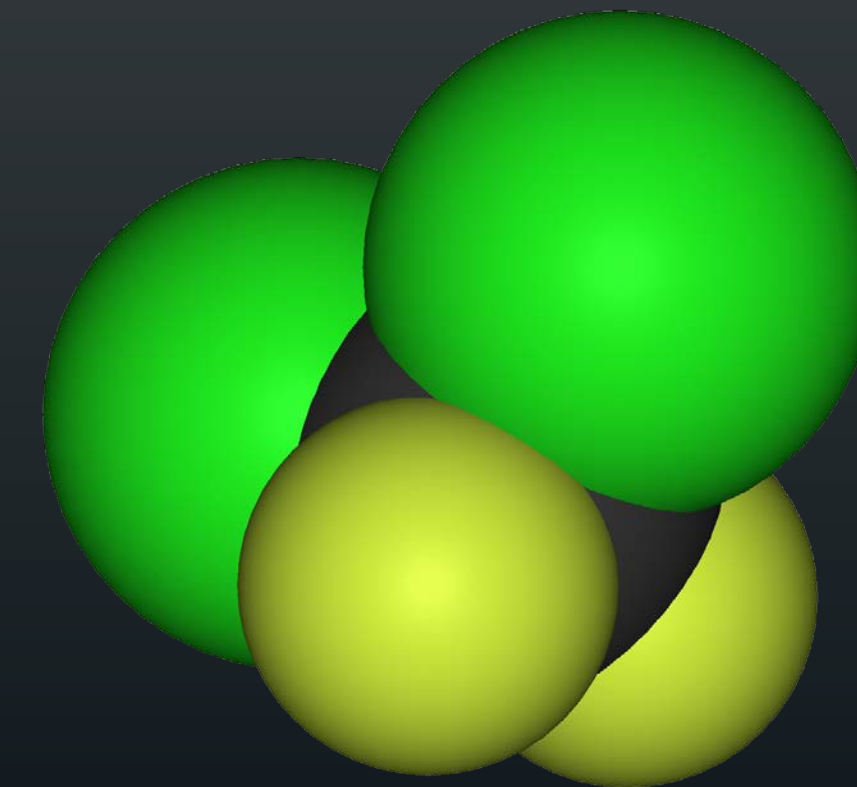
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## Refrigerant R-12

- Great refrigerant
- High ozone depleting potential
- High global warming potential
- Non-flammable

## CFC-12 or R-12 Dichlorodifluoromethane



History

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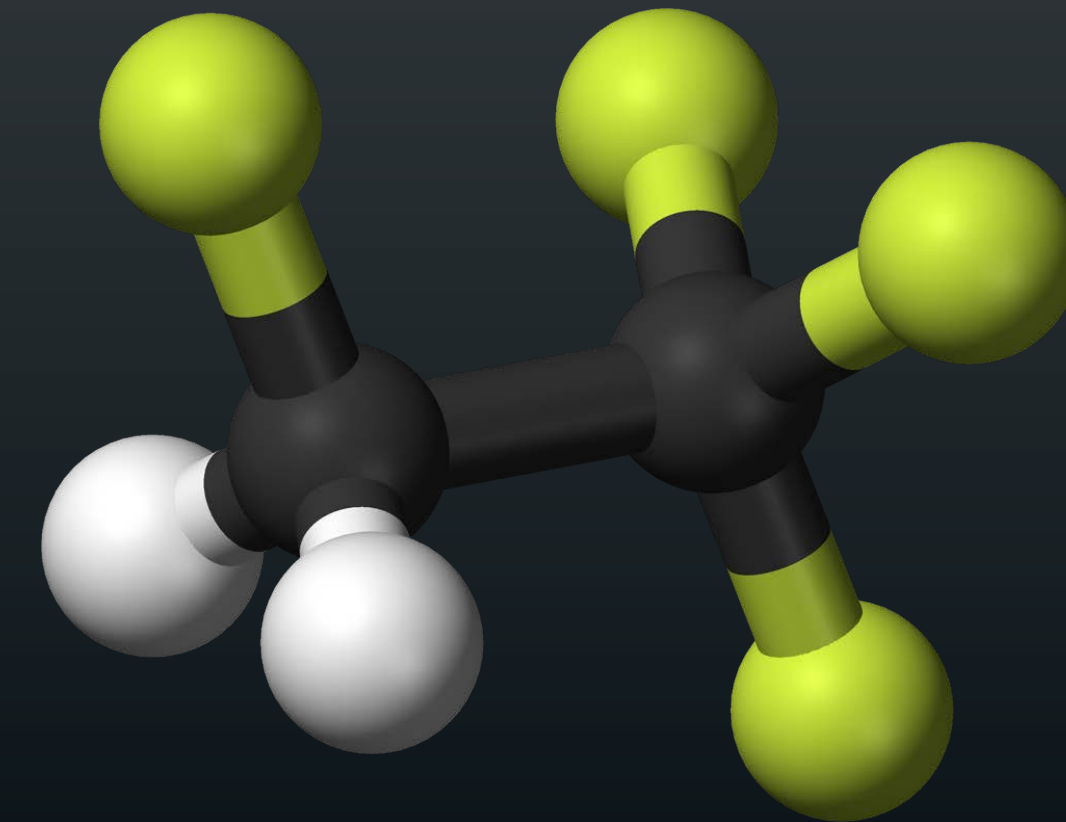
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## Refrigerant R-134A

- Great refrigerant
- Insignificant ozone depleting potential
- High global warming potential
- Non-flammable

## HFC-134a or R-134a Tetrafluoroethane



History

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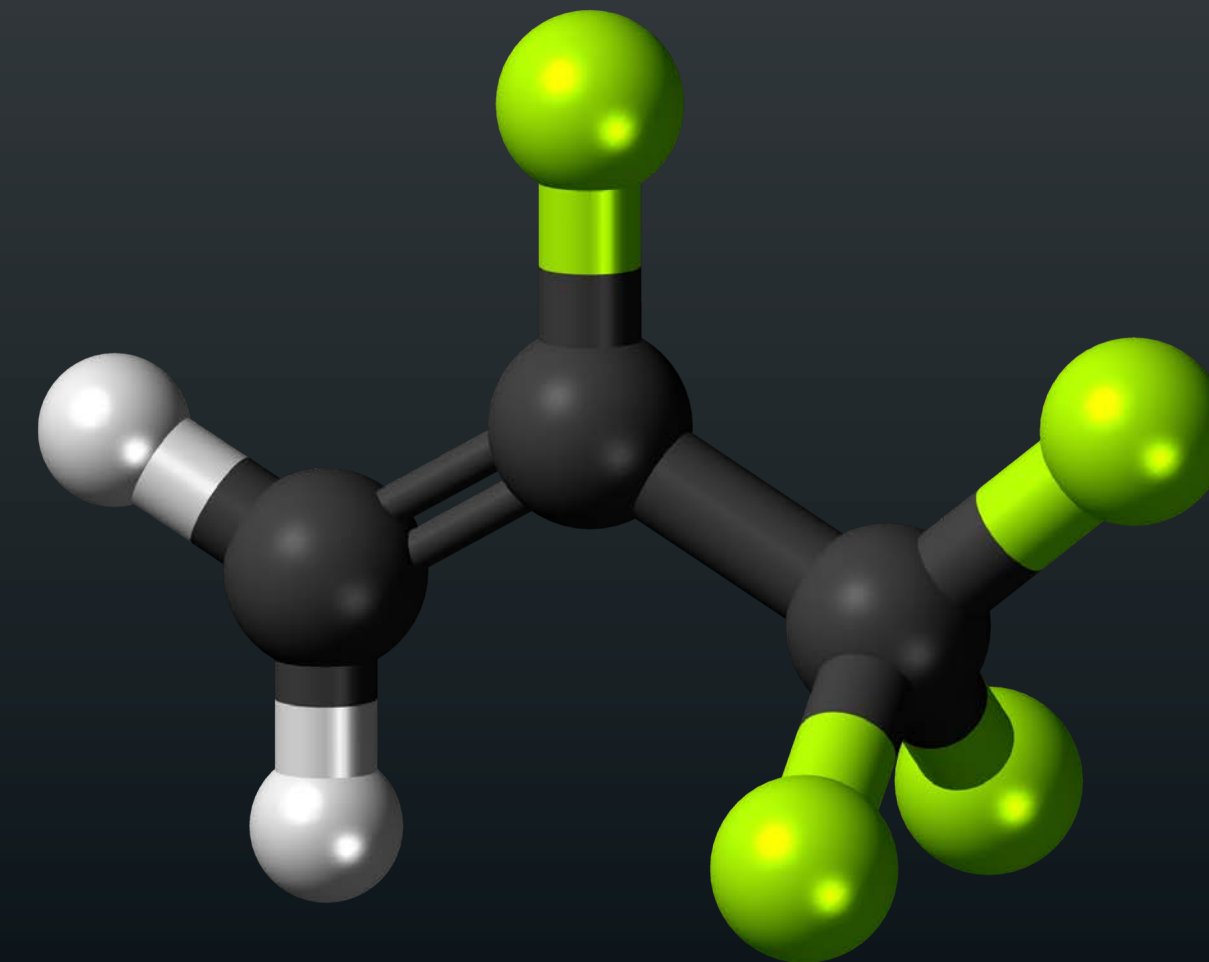
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## Refrigerant R-1234yf

- Great refrigerant
- Zero ozone depleting potential
- Very low global warming potential
- Mildly flammable

## HFO-1234yf or R-1234yf Tetrafluoropropene

$C_3H_2F_4$



History



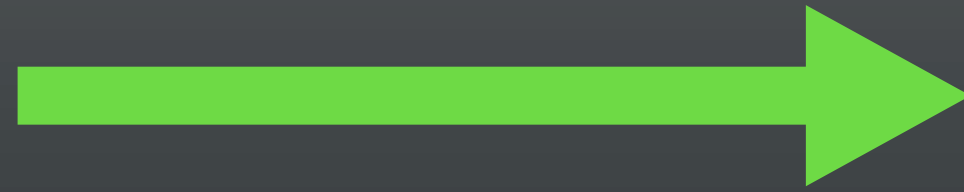
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History

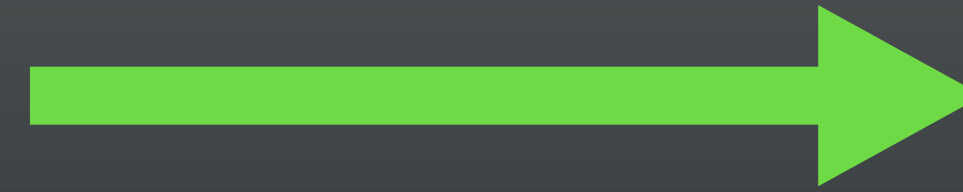
R-12



Environmental Drivers

Lower ODP

R-134a



Environmental Drivers

Lower GWP

R-1234yf

Mac Directive 2006/40/EC

Ban GWP > 150

1 January 2017



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Flammability

R-12

A1

R-134a

A1

R-1234yf

A2L



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Flammability

R-12

A1

R-134a

A1

R-1234yf

A2L

A1 - No flame propagation

A2L - Lower flammability

A2 - Flammable

A3 - Higher flammability



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## Issues

- Multi-refrigerant fleet
- Owner / Operator awareness
- Service personnel awareness / expertise
- Mixed / contaminated refrigerant pool
- Increase in costs
- Non “best practice” service/repair methods



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- The use of a refrigerant in a system for which it is not designed

Issues



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28 April 2014

Case Study

- AC Condenser fan failed on a Mitsubishi Truck
- The pressure cut-out switch was of the wrong type
- The high pressure caused the tx-valve to rupture
- High pressure liquid refrigerant entered the cabin

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Case Study

- A3 refrigerant (Hydrocarbon) had been used
- The refrigerant ignited
- Flames entered the cabin via the dash vents
- Both occupants suffered serious burns

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Case Study

- The owner of the truck was unaware an A3 was used
- The truck operator was unaware an A3 was used
- An A1 refrigerant would have posed no fire risk
- The technical investigation is a 118 page document



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Summary

- Refrigerants have evolved to provide better environmental outcomes
- System advancements include refrigerant specific technologies
- A1 refrigerants are approved for use in A1 systems
- A2L refrigerants are approved for use in A2L systems
- **No mainstream manufacturer approves the use of an A3 refrigerant in mobile applications - and yet this practice still occurs**



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Summary

Important:

- Ensure the correct refrigerant is being used
- Service the system regularly
- Use licensed, competent service providers

Thank you



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CONFERENCE - 15TH AUGUST, ROYAL RANDWICK, SYDNEY



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