# THE TRANSITION TO LOW GWP REFRIGERANTS



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## The transition to low GWP refrigerants

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## An Ever Changing Picture



## F-gas Phase Down Timeline



## F-gas Pricing

R

REFRIGERATION



## Brexit

- UK currently following existing EU phase down programme
- No plans to change
- Also following existing EN378 regulation
- Business as usual!





- Follows F-gas regulation
- Move toward lower GWP leading to change in refrigerant
  - R452A replacing R404A but still has a GWP of 2,141
  - R410A systems replaced with R32 but beware of flammability!
- Trailer systems often not subject to service ban if less than 10kg charge
- Refrigerant subject to reduced availability and increased cost
- Beware of increases running costs
- Development work on other refrigerants such as CO<sub>2</sub>
- Other regulations still in place such as mandatory leak testing



High Risk	Medium Risk	Low/No Risk	
R404A	R134a	HFO/HFC blends	
R507	R407F	Ammonia CO <sub>2</sub>	
R422D	R448A		
	R449A	HC	

- High 'risk' refrigerants are subject to:
  - Existing service ban on virgin refrigerant
  - Only available as reclaimed/recycled refrigerant
  - Higher in price than lower GWP alternatives
- Medium 'risk' refrigerants may be subject to:
  - Increase in pricing post 2021
  - Reduced availability



## GWP and Flammability

Refrigerant	GWP	Safety Class	
R22	1780	A1	
R32	704	A2L	
R134a	1360	A1	
R290	5	A3	
R404A	3922	A1	
R407F	1824	A1	
R454A	239	A2L	
R513A	631	A1	
R717	0	B2L	
R744	1	A1	
R1234yf	<1	A2L	
R1234ze	<1	A2L	



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## New Challenges with Lower GWP Refrigerants

Many new 'lower' GWP refrigerants typically classified as 2L in terms of flammability

This brings in new requirements for sites previously using A1 refrigerants

Need to meet requirements of DSEAR

'Mildly' flammable = Flammable

Additional guidance under EN378 guidance





The user/owner is responsible for carrying out the risk assessment

The user may ask the designer/ installer for:

- Classification of area assessment/ calculations this would often be checked by an outside DSEAR expert
- Provide cause and effect of safety systems
- Calibration certificate for gas detection system
- Documentation for testing safety systems
- Provide UKCA mark and PED conformity certificate
- Training documentation to demonstrate competence
- Standard working procedures for flammable refrigerants
- Quantity of refrigerant & refrigerant data sheets





The installer must not charge the refrigeration system with refrigerant until a risk assessment has been carried out and it deems the refrigeration system safe to operate

This risk assessment must include :

- Places where explosive atmospheres may occur Classification of areas
- Arrangement to deal with accidents, incidents and emergencies
- People in the area have adequate information, instruction and training
- The design and installation of the safety systems are adequate
- Documented evidence of testing of the safety systems



#### Users can:

- Select an A1 refrigerant such as R513A or CO<sub>2</sub>
- Design to reduce the quantity of refrigerant in the system
- Keep refrigerant to the machinery room only
- Keep refrigerant to external equipment only
- Remove ignition sources





An Emergency Response Plan should include:

- General information about the refrigerant
- Emergency contact numbers
- A management structure and framework for when the emergency services and refrigeration contractor are called
- Methods used to inform staff to evacuate to a safe area
- The response plan to include for leaks in all areas where the refrigerant is present
- This should include the refrigeration space and give detail of the refrigeration systems automatic responses along with those required by personnel
- A package of information to be handed to the emergency services. This should include site layout drawing, P&ID's of the refrigeration systems, refrigeration system charge and COSHH sheets
- Detail how management will periodically test and review the emergency procedure
- Regularly testing



This should include:

- Emergency Response Plan available for all on site to read
- Induction to include details of where flammable refrigerants are present for staff and contractors working on the site
- A Permit to Work (PTW) system in place for refrigeration contractors and those working in the area of the refrigeration system
- Management to receive training to understand the risks.
- Those working on the refrigeration system, their competence to be assess by the PTW issuer. This would include reviewing their experience and training record



#### Machinery rooms must have:

- Normal continuous ventilation as per EN60079-10-1
- Occupancy ventilation (4 air changes per hour)
- Emergency ventilation
- Independent gas detection system. Independent from the refrigeration system
- All electrics (non ATEX) shut down if 25% of the LFL is exceeded
- Seal (air tight) from other areas





In an occupied space:

- Use quantities below the EN378 allowable charge
- Normal continuous ventilation as per EN60079-10-1

Areas not classified as occupied spaces:

- Hoods over non welded/ brazed joints as per EN378-3
- Hoods to include normal continuous ventilation as per EN60079-10-1

Open Air:

• Beware A2L's are heavier than air and can stagnate, therefore assess as per EN60079-10-1



## Refrigerant Replacement Options





Criteria	HFC/HFO blends	CO2	R717
Low GWP			
Flammability			
Toxicity			
Materials of Construction			
Refrigerant Cost			
Retrofit Cost		N/A	N/A
New Installation Cost			
Longevity			



## Summary

- High GWP HFCs are being phased down
- A plan should be in place to remove high 'risk' refrigerants
- Prices are likely to increase for medium 'risk' refrigerants
- Availability also likely to reduce
- Medium term plan needed
- No single solution fits all applications
- Flammability and toxicity awareness needed
- Possible energy benefits
- Growth in use of CO<sub>2</sub> and ammonia



## Thank You!

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## **THANK YOU!**

