



Foodservice
Carbon
Professional

Refrigeration Product Module

Course Scope

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Introduction

- **Aim:** to empower the confidence and knowledge to assess and address key energy, carbon and sustainability issues related to foodservice refrigeration products
- The Foodservice Equipment Association has brought its strength to providing a unique and comprehensive resource for the industry
- Developed and delivered by Dr Sam Mudie, of Hospitality Energy Saving and Sustainability and Head of Energy at University of Reading



Information Involvement Influence

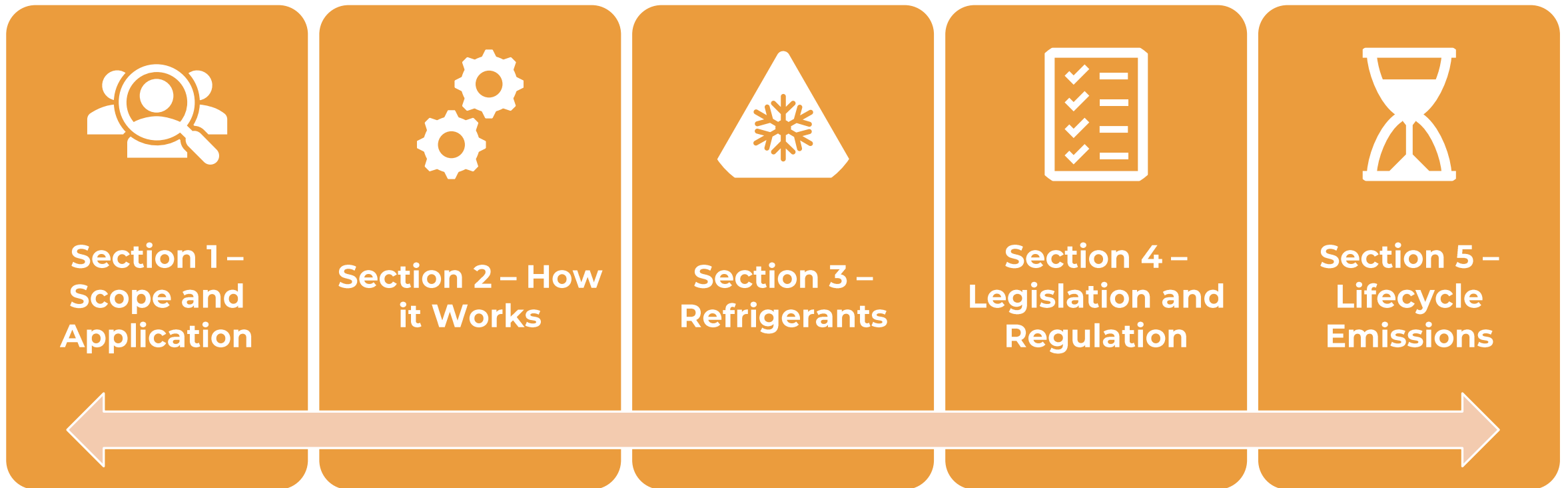


University of
Reading



Course Delivery and Overview

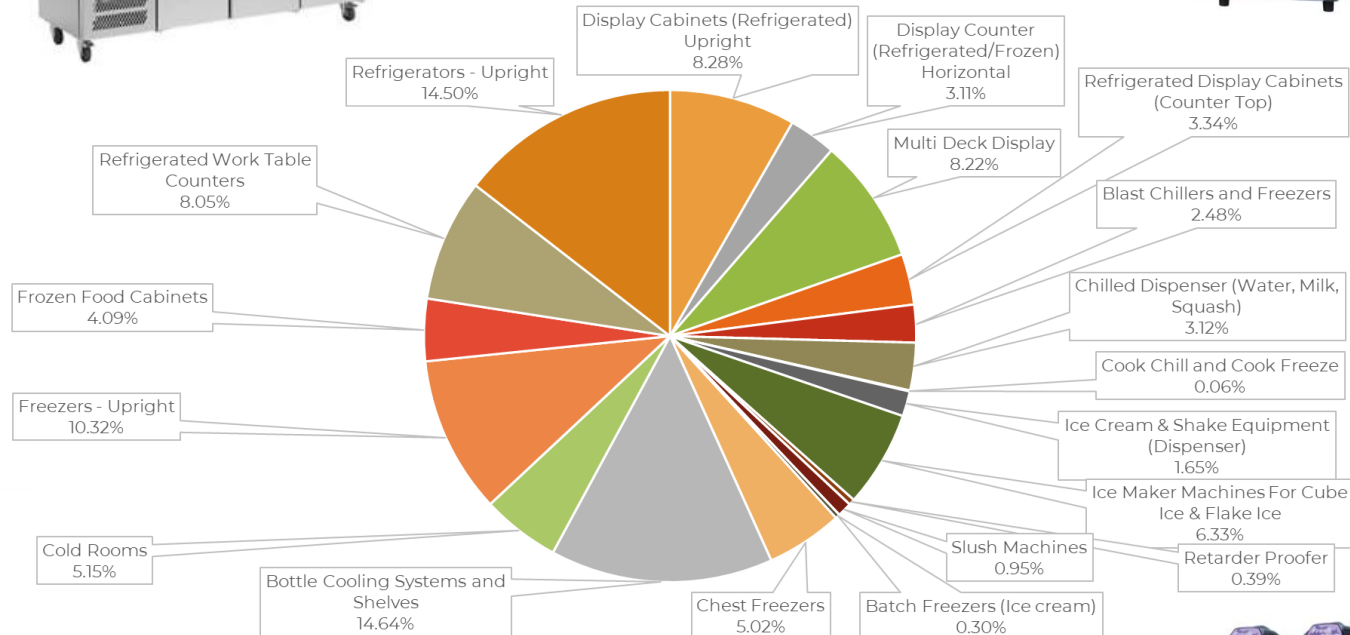
- Learn-at-your-own-pace recorded slides
- Multiple choice questions throughout
- Must complete core module assessment before commencing Refrigeration



Section 1 - Scope and Application

Scope	Learning outcome	Benefits	Slides
Key professional food service refrigeration products, their applications and selection criteria.	Understand the various key professional food service refrigeration products, including their specifications, intended applications, and selection criteria, such as appropriate sizing, chilled versus frozen requirements, features, and climate class.	Participants will be equipped with the foundations to make sustainable and energy-efficient choices, alongside the broad pressures applying to the selection and application of refrigeration, as well as gain context for the rest of the course.	4-19

Section 1 - Scope and Application



Section 1 - Scope and Application

- Professional vs domestic
- Legislation and regulation
- Refrigerants
- Correct sizing and net volume
- Layout, space and ergonomics
- Food delivery frequency and delivery volume
- Menu Complexity
- Budget
- Chilled vs frozen
- Features and application
- Climate class, humidity and ambient temperature
- Energy usage and carbon

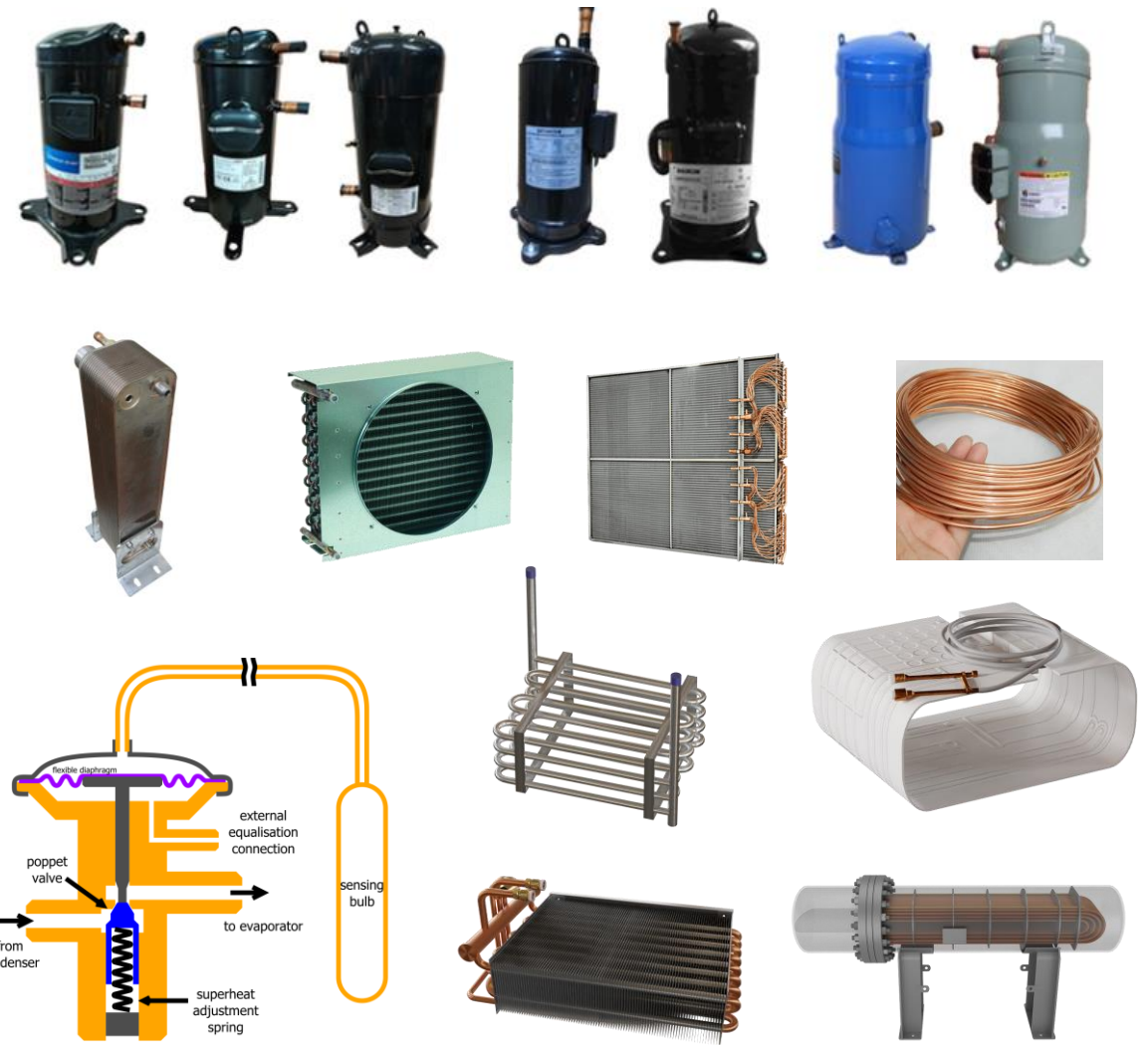
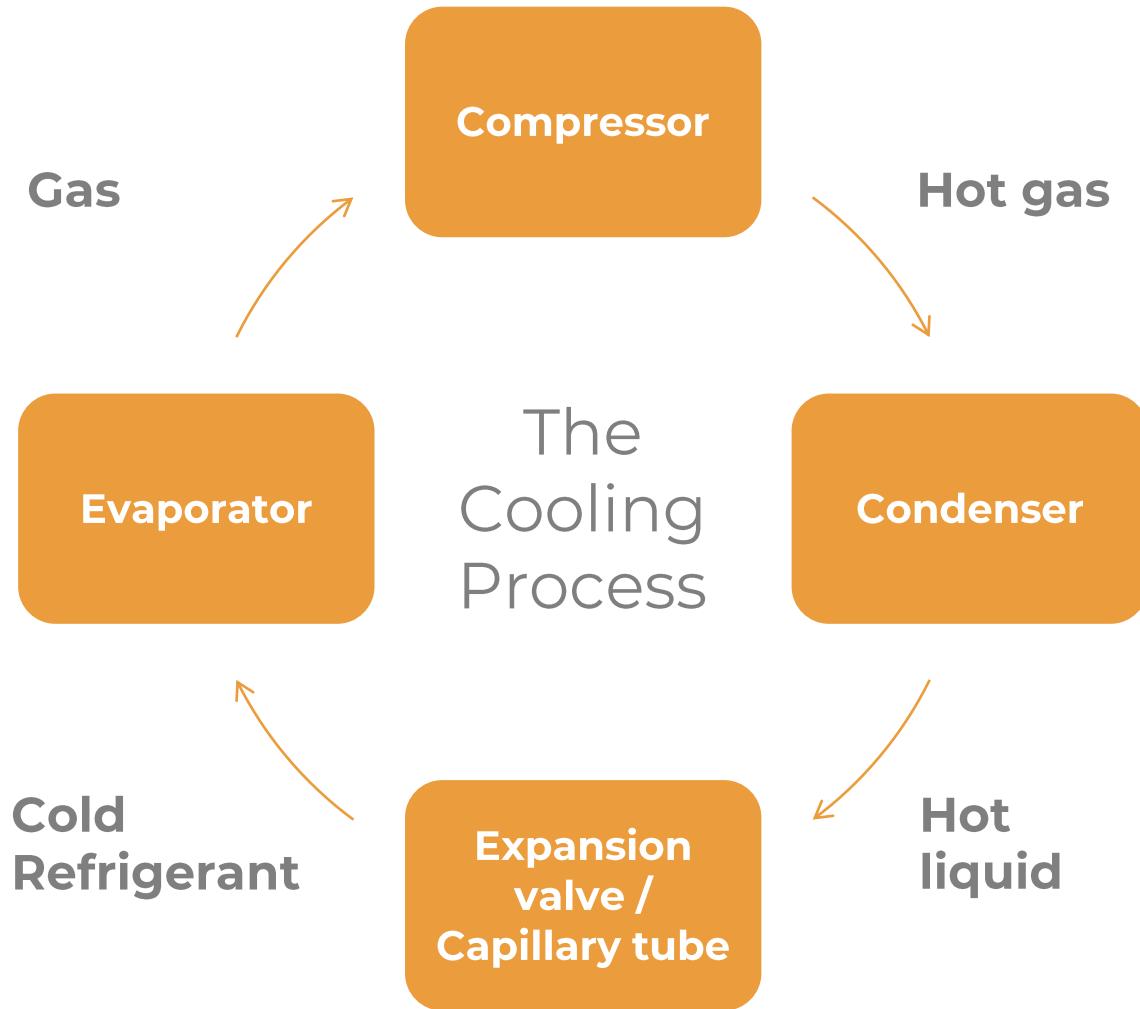


Section 2 – How it Works

Scope	Learning outcome	Benefits	Slides
Key principles of refrigeration	Understand the essential principles of cooling	Participants will understand how commercial refrigeration works in order to design, apply, use and maintain equipment effectively, thereby keeping its energy consumption and emissions to a minimum.	4-20
Key components in refrigeration systems	Identify and describe the functions of the major components in a refrigeration system.	Participants will be able to discuss the importance of each component in maintaining the efficiency and performance of the system, while reducing carbon emissions.	4-20



Section 2 – How it Works

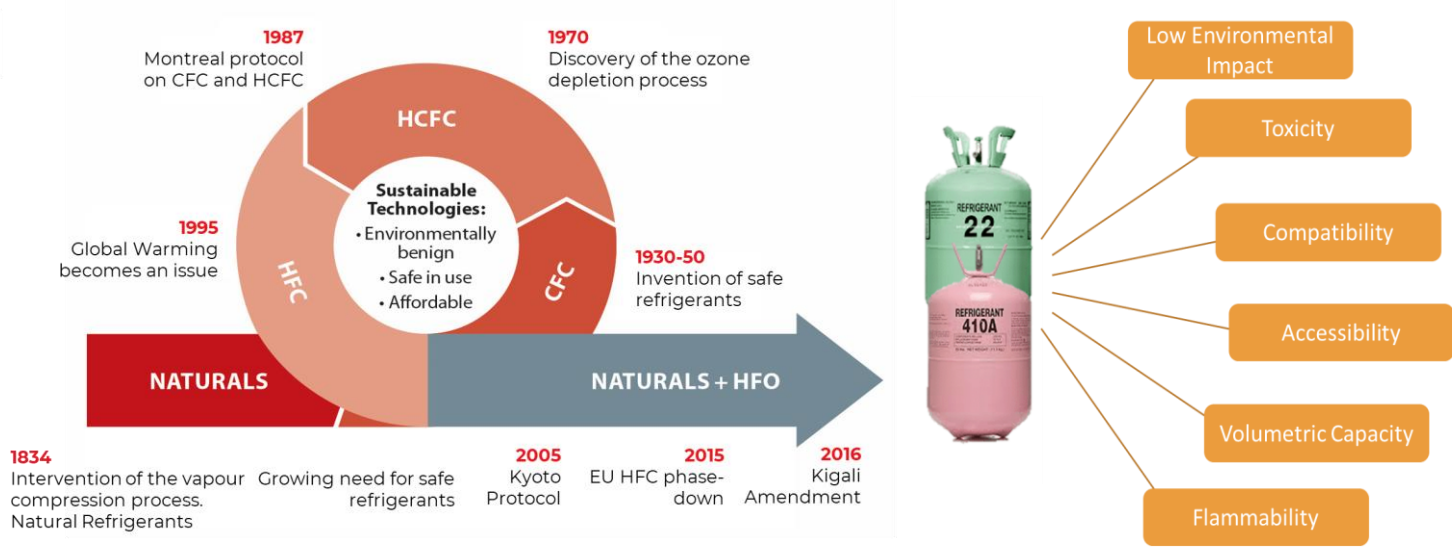
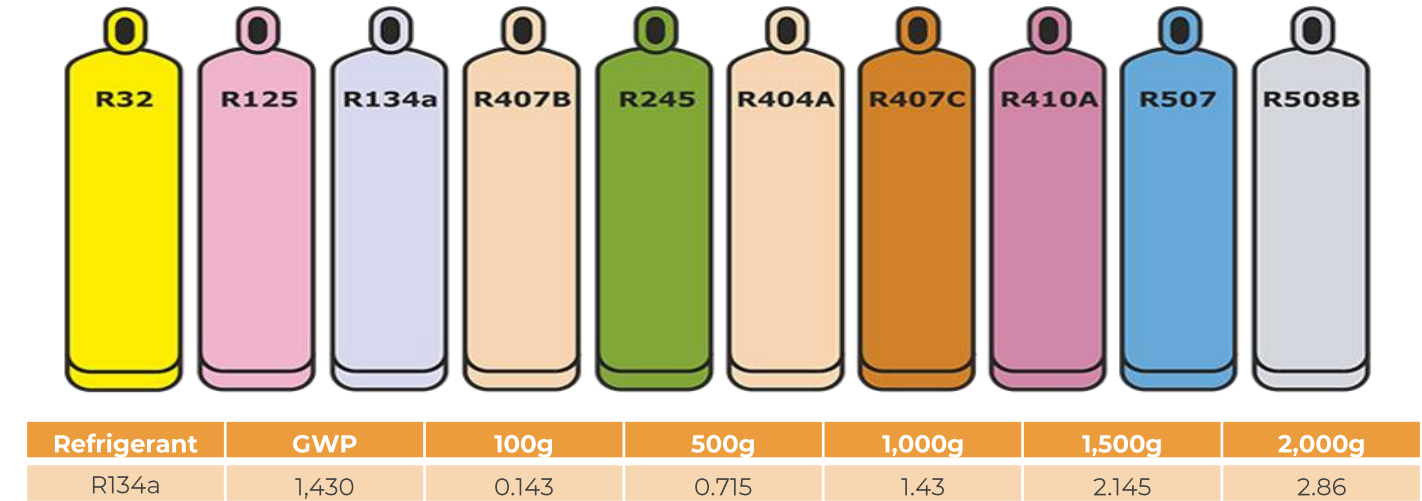
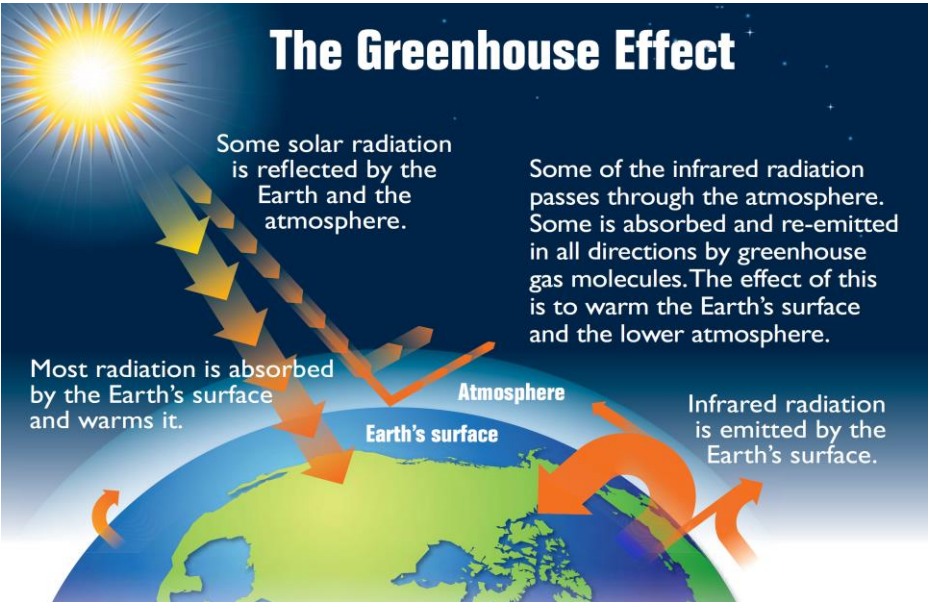
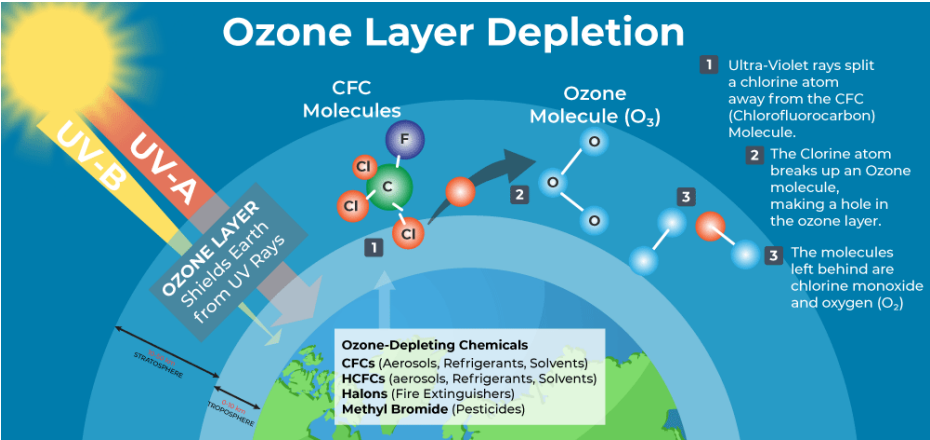


Section 3 – Refrigerants

Scope	Learning outcome	Benefits	Slides
Key properties of refrigerants	Understand key properties of refrigerants, including their ozone depletion and global warming potential	Develop an environmental stewardship mindset by understanding the impact of refrigerants on the environment, contributing to sustainable practices in the industry.	4-7, 23
Context of environmental legislation concerning refrigerants	Develop a solid background on why legislation mandates the continued investment in developing and implementing 5th generation refrigerants	Stay ahead in the industry by understanding regulatory trends and technological advancements, ensuring compliance and leveraging new opportunities for innovation.	8-9, 21
Types of refrigerants	Distinguish between different types of refrigerants	Gain the ability to make informed decisions when selecting refrigerants for various applications, enhancing system performance and compliance with regulations.	10-18
Calculating the carbon impact of refrigerants	Learn to calculate carbon dioxide equivalent emissions from typical refrigerant charges	Acquire practical skills to assess and quantify the environmental impact of refrigerant choices, enabling more accurate reporting and better environmental management.	19-20
The importance of energy efficiency	Appreciate the impact of refrigerant selection on the energy efficiency and consumption of refrigeration systems	Improve operational efficiency and reduce energy costs by selecting refrigerants that optimise the performance and energy consumption of refrigeration systems.	22-23



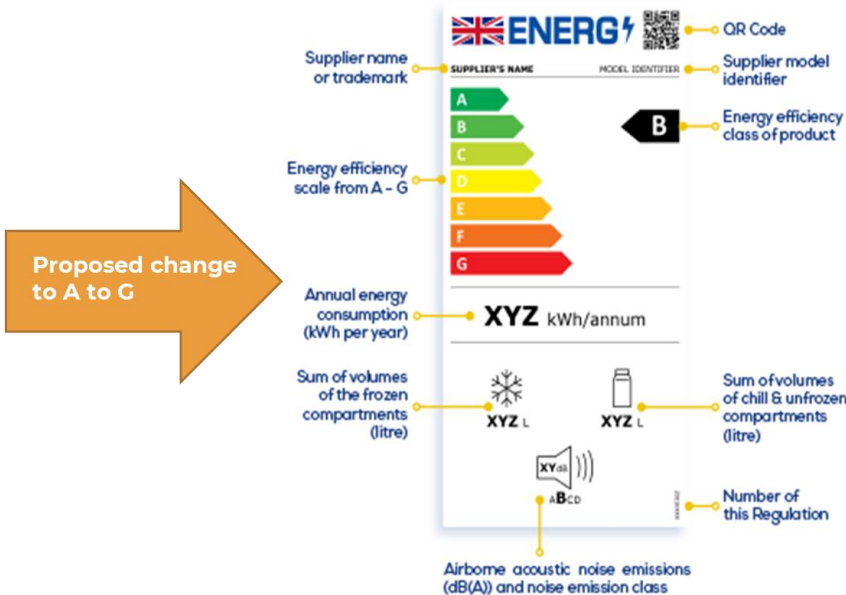
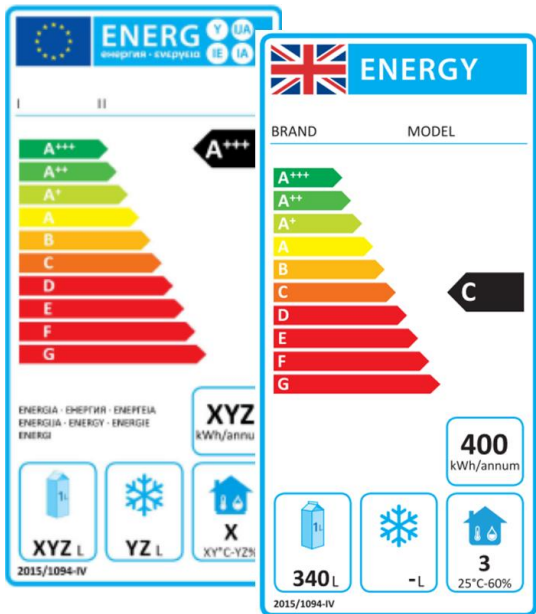
Section 3 – Refrigerants



Section 4 – Legislation and Regulation

Scope	Learning outcome	Benefits	Slides
Ecodesign for refrigeration	Understand how the Ecodesign directive applies to different refrigeration product groups.	Gain the ability to ensure compliance with energy efficiency standards, leading to reduced operational costs and enhanced environmental responsibility.	4-9
Energy labelling requirements	Be able to understand product group energy labels, and the explain the differences between them, and the EU and UK energy labels that have arisen in the wake of Brexit.	Develop the expertise to accurately interpret and utilise energy labels, enabling informed decision-making and improved sustainability performance.	10-22
F-gas regulations compliance	Understand the F-gas regulations, phase out dates and the practical actions that need to be taken to comply.	Acquire knowledge of critical compliance measures to avoid legal penalties and contribute to the reduction of greenhouse gas emissions.	23-29
Other environmental legislation affecting refrigeration	Understand other broad environmental regulation such as WEEE, UKREACH and other sustainability reporting,	Enhance your ability to navigate complex regulatory landscapes, ensuring comprehensive compliance and supporting your company's commitment to sustainability and corporate social responsibility. Provide authoritative advice to clients, partners and colleagues about the broad regulatory landscape of energy and carbon related regulations for refrigeration.	30-32

Section 4 – Legislation and Regulation



CE

UK
NI

UK
CA

FGas Log & Direct CO ₂ Emission Calculator							
Institute of Refrigeration (IoR) REAL Zero Project							
Site Name:							
Site Address:							
Period Recorded	From:	01/01/2019		To:	01/07/2019		
Your Logo Here	Refrigerant Type	R134a	R404A	R22	R407C	R410A	
	Cost per kg	£ 55.00	£ 90.00	£ -	£ 40.00	£ 60.00	
	Global Warming Potential (EN378-1:2008)	1300	3780	1700	1650	1980	
System 1		104.00					0%
System 2					0.75		0%
System 3						2.75	0%
System 4							
System 5							
System 6							0%
System 7							
System 8							
System 9							
System 10							
Total Loss (by refrigerant type)		104.00	0.00	0.00	0.75	2.75	
CO ₂ Equivalent Tonnes (by refrigerant type)		135.20	0.00	0.00	1.24	5.45	Ver: 2.50
Cost of Refrigerant (by refrigerant type)		£5,720	£0	£0	£30	£165	
No of Days Report Covers	181d	<div>Note: The accuracy of the totals displayed on this page rely on the correct linking of the spreadsheet as per the instructions.</div> <div>The total refrigerant used, cost, carbon emissions and % lost are over the period of days covered by the report and are not annualized</div> <div>Cell errors will be visible on this sheet until it is linked to 'System' sheets</div> <div>Disclaimer: The IOR can accept no liability for any errors or omissions</div>					
Total Carbon Emissions Tonnes (all systems)	142						
Total Cost of Refrigerant (all systems)	£5,915						
Total Refrigerant Used kg (all systems)	107.50						
Total Entrained Volume kg (all systems)	112.50						
Total % of Refrigerant Lost (all systems)	96%						
The refrigerant leakage recorded on this log is equivalent to driving a typical van		567,530		miles			

Welcome to the REAL Zero FGas logging sheet. Please follow the below instructions carefully and check your data is linked correctly by trying some test data. Good luck with leakage reduction!

Instructions

Enter date span of the report dd/mm/yyyy

Enter your refrigerant type here

Enter the cost per kg of refrigerant

If the refrigerant and GWP is not on the summary sheet get the data from the 'Information' sheet and over write it.

To link the individual system pages (tabs) to the summary page please follow the below instructions:

1. Single 'click' on the system number cell under the corresponding refrigerant type to be totalled
2. Enter = into the cell and go to the relevant system tab at the bottom of the page
3. Single click on the 'Actual Loss' refrigerant used total cell and enter (return Key) on that cell - Red Cell

The refrigerant usage total for that system will then populate the corresponding total box on the summary sheet



Section 5 – Lifetime Emissions of Refrigeration (Part 1)



Lifetime emissions of
foodservice
refrigeration



Embodied carbon of
refrigerators



Design for low
carbon



Transport and
distribution



Reduction of energy
and carbon in the use
of refrigeration
systems



Food safety and
waste reduction



The importance of
staff training



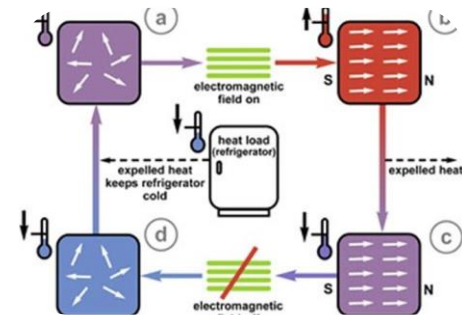
Section 5 – Lifetime Emissions of Refrigeration (Part 2)



Appropriate maintenance of refrigeration systems



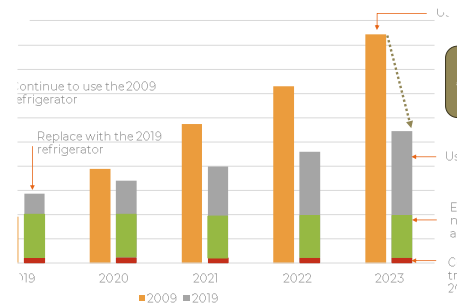
Fugitive emissions from refrigeration



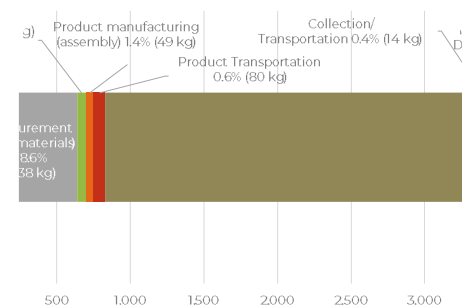
Innovation and development in refrigeration technology



End of (first) life of refrigeration systems



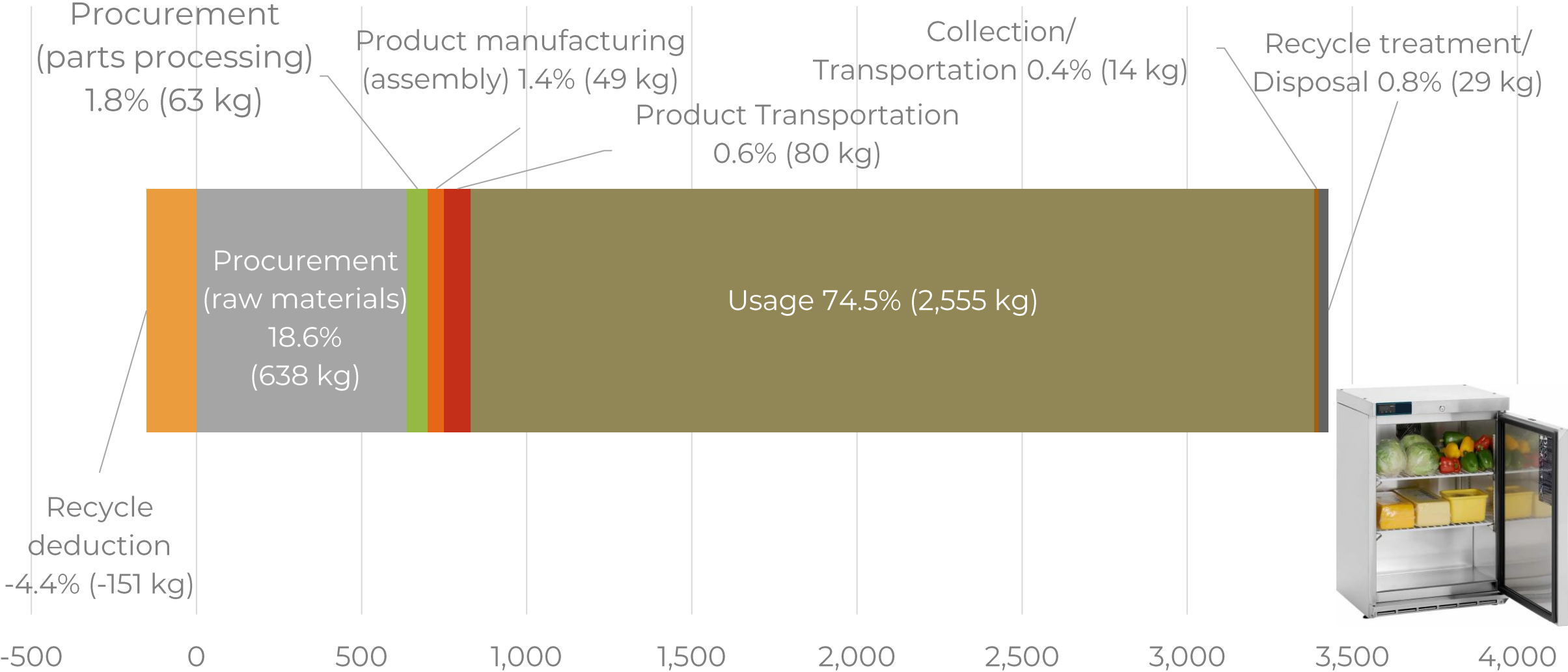
Lifecycle costs



Case studies of whole lifetime emissions




Lifetime Emissions – Small Display Fridge 3,480 kgCO₂e



Assessment


- This module should take you 10-16 hours of study
- You should be aiming to be prepared to take the assessment in 2-3 months' time
- Assessing your knowledge
 - In-lecture interactive questions
 - End of course quiz questions
 - End of course long-answer questions



In 2015 the Eco design directive was established for "Professional Refrigerated Storage Cabinets". What does this category of appliance mean in practice?

- ☐ Most solid door, fan assisted refrigerated cabinets used for storage in non-household environments
- ☐ Refrigeration used to display products
- ☐ All refrigerated storage used for commercial purposes
- ☐ Professional refrigerated storage cabinets operating with a remote condensing unit

☒ Check



What energy efficiency measures can operators take in running refrigeration units? Tick all that apply.

- ☐ Defrost regularly.
- ☐ Set temperature controls to the lowest possible level for faster cooling.
- ☐ Ensure proper ventilation and clearance around refrigeration units.
- ☐ Keep refrigerator doors open for easy access to items.

☒ Check

Drag and drop the main components of the vapour-compression refrigeration cycle into the correct place.


Vent fins

Compressor

Evaporator Coils

Condenser Coils

Expansion Device



Refrigeration Product Module Overview



Section 1 – Scope and Application

- Types of equipment, specification and intended use
 - Cooling Display Units
 - Cooling Equipment
 - Freezers
 - Refrigerated Storage
- Considerations for the specification and application of refrigeration



Section 2 – How it Works

- How a basic refrigerator works
- The principles of cooling
- The main components of professional foodservice refrigeration
- Foundations of making environmentally conscious decisions regarding reduced energy consumption and emissions



Section 3 – Refrigerants

- Types of refrigerants
- Key properties
- Ozone depletion
- Global warming potential
- Emissions from typical refrigerant charges
- Refrigerants and energy efficiency
- The role of legislation in developing and implementing 5th generation refrigerants



Section 4 – Legislation and Regulation

- Legislation and regulation relating to energy and carbon in foodservice refrigeration equipment
 - Ecodesign
 - Energy labelling
 - F-gas restrictions
 - Other sustainability reporting and compliance



Section 5 – Lifecycle Emissions

- 5a (Part 1)
 - Manufacturing
 - Design and selection
 - Specification of energy saving features
 - Use phase and practical action
- 5b (Part 2)
 - Maintenance
 - Fugitive emissions
 - Research and Innovation
 - End of Life
 - Reduction of carbon equivalent emissions





Thank you, and enjoy

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