

U-3ARC WEBINAR TRAINING #8

REFRIGERATION IMPACT ON THE ENVIRONMENT

Presented by Ms. Yamah Angeline Sumoku

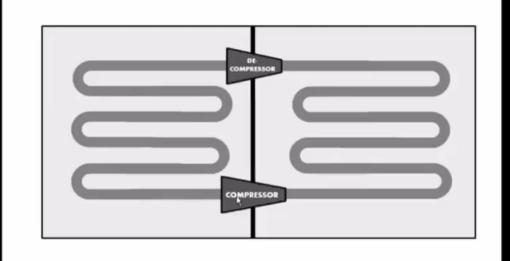
Date: April 23, 2022

LEARNING OUTCOME/OBJECTIVE

- What is Required for a substance to be a Refrigerant?
- Overview Of Refrigerant Classification- CFC, HCFC, HFC, HFO & NATURAL GASES
- Effect Of CFC, HCFC
- Ozone Depletion
- Global Warming Potential
- Green House Gases
- Environmental Concerns- Short Live Climate Pollutant
- Evolution of Refrigerant and Phase out Period
- Refrigerant Replacement and Application
- Safe Servicing Procedures in Handling Natural Refrigerant & it's Equipment
- Basic Approach For Working With Flammable Refrigerants
- Safe Workshop Layout

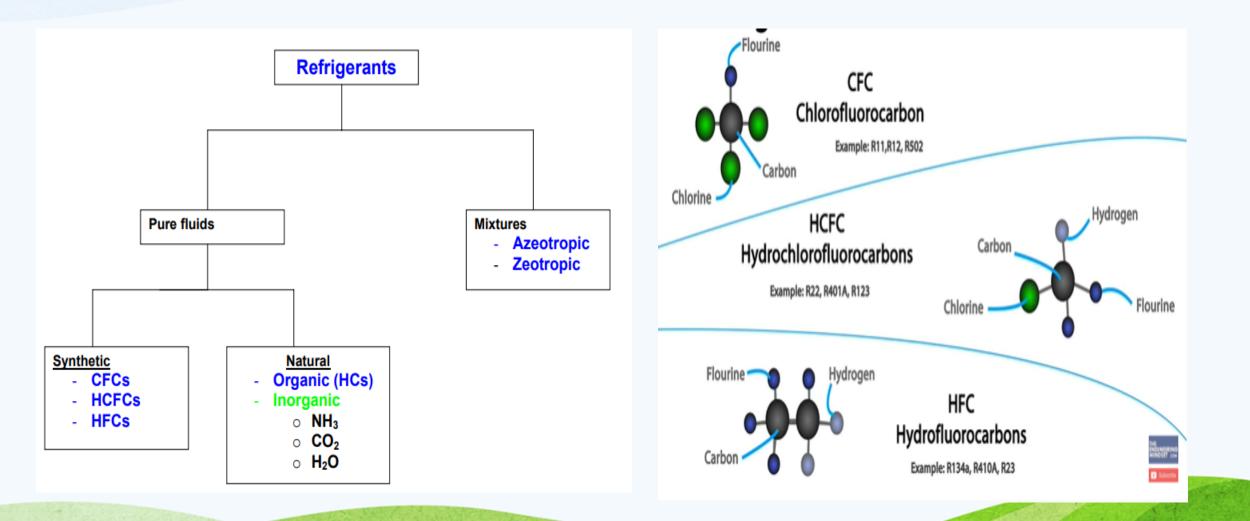
What Is Required For A Substance To Be A Refrigerant?

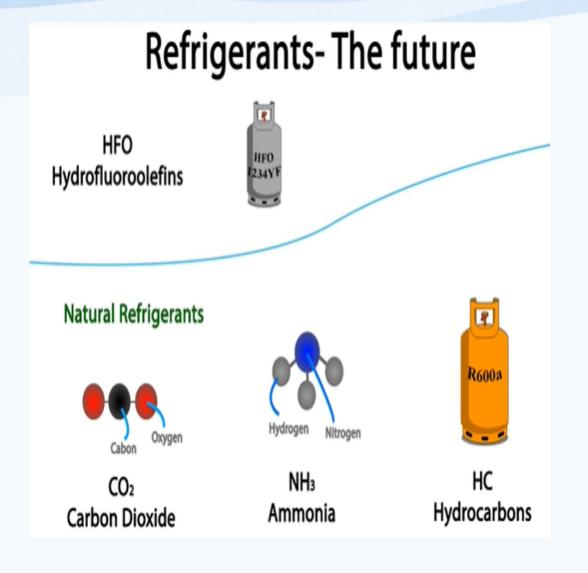
- Refrigerant A refrigerant is a fluidlike substance or mixture used in the refrigeration cycle to absorb and reject heat thus affecting the temperature within. In most cases they undergo a repeated phase transition from a liquid to a gas and back again.
- The chemical, physical and thermodynamic properties of the refrigerant must suit the system and the working



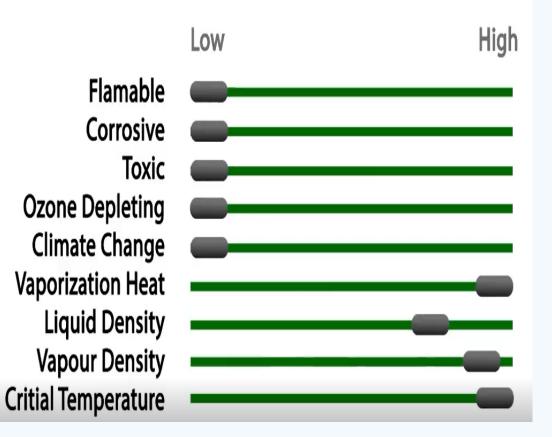
Chemical:	Stable and inert
Health, safety	Non-toxic
and environmental:	Non-flammable
	 Benign to the atmosphere, etc.
Thermal:	 Critical point and boiling point temperatures
	appropriate for the application
	 Low vapor heat capacity
	Low viscosity
	 High thermal conductivity
Other:	 Satisfactory oil solubility/miscibility
	 High dielectric strength of vapor
	Low freezing point
	 Reasonable containment materials
	Easy leak detection
	Low cost

Overview Of Refrigerant Classification-CFC, HCFC, HFC, HFO & NATURAL GASES





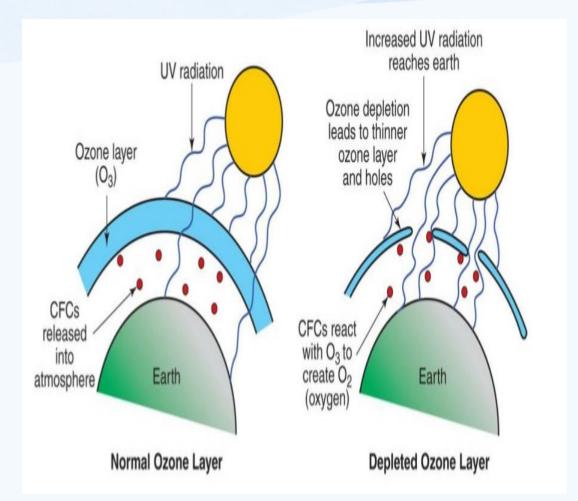
Ideal Refrigerant

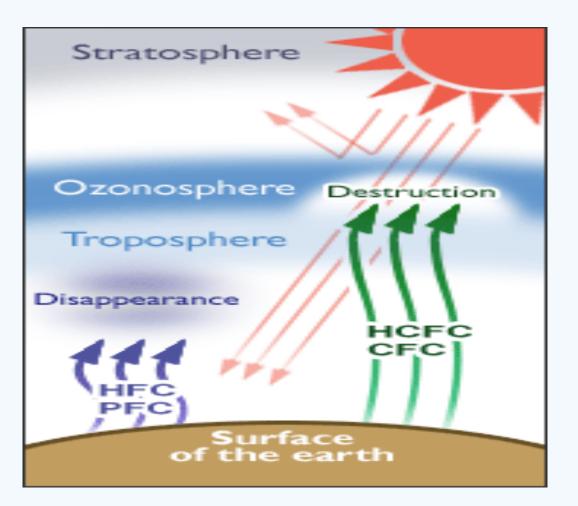


Ozone Depletion/Potential (ODP)

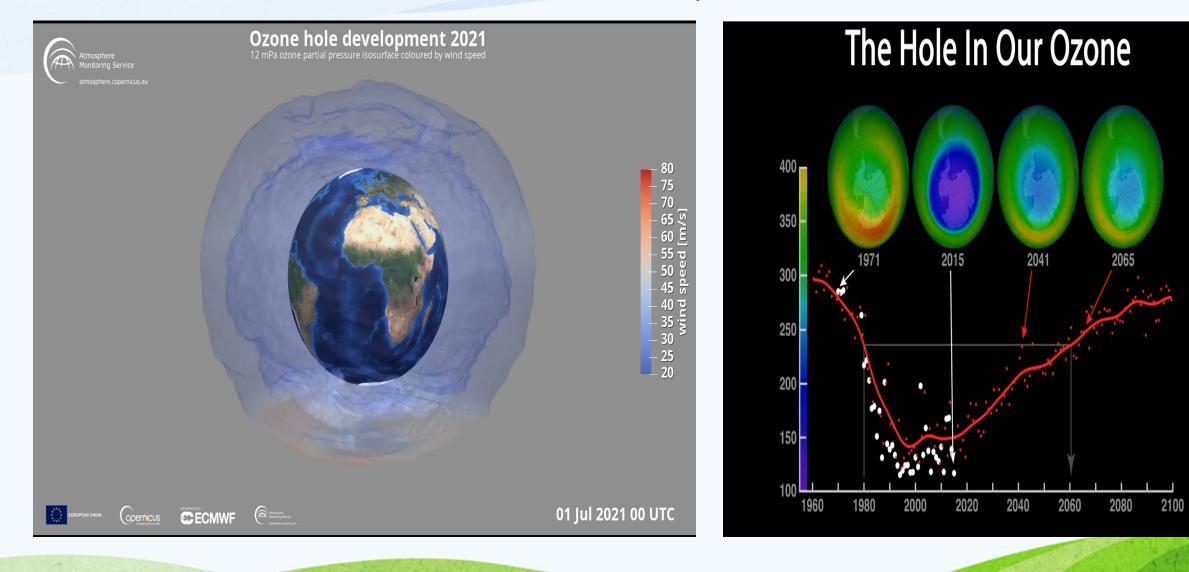












Source: Nasa

Ozone Depleting Effects on Human Life and the Environment

B HARMFUL EFFECTS OF OZONE LAYER DEPLETION



HUMAN HEALTH

Increased Ultraviolet Radiations reach the Earth Surface that are harmful for human health



PHYTOPLANKTON GROWTH

UV radiations inhibit the reproductive cycle of phytoplankton, single-celled organisms that make up the bottom of the food chain

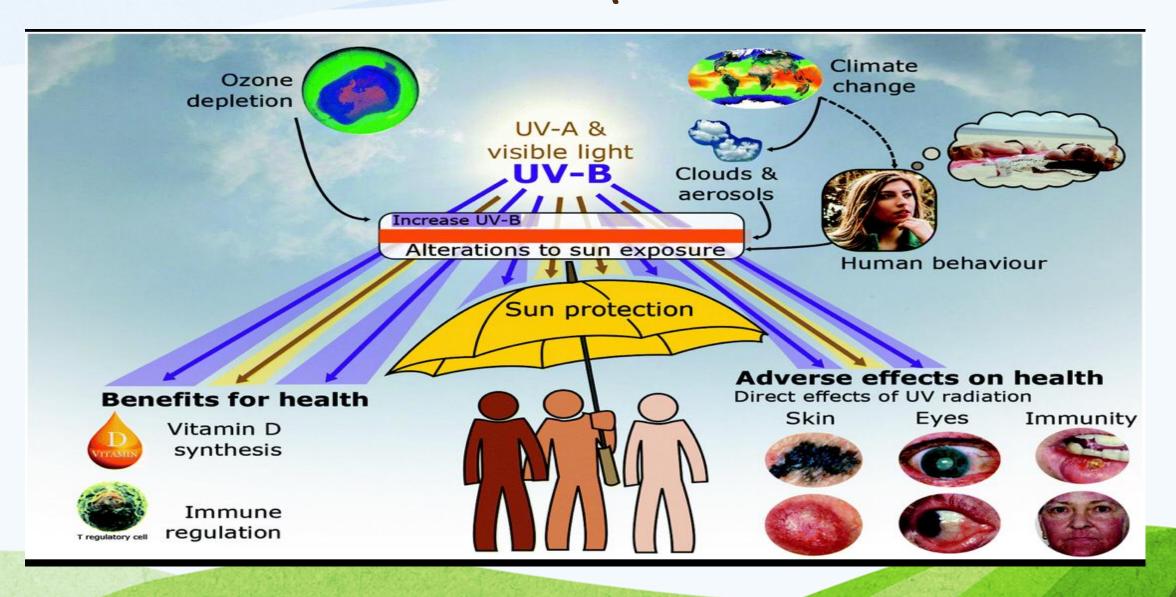
CROPS GROWTH

UV radiations also effect on the growth of crops, especially rice

INCREASED DISEASES

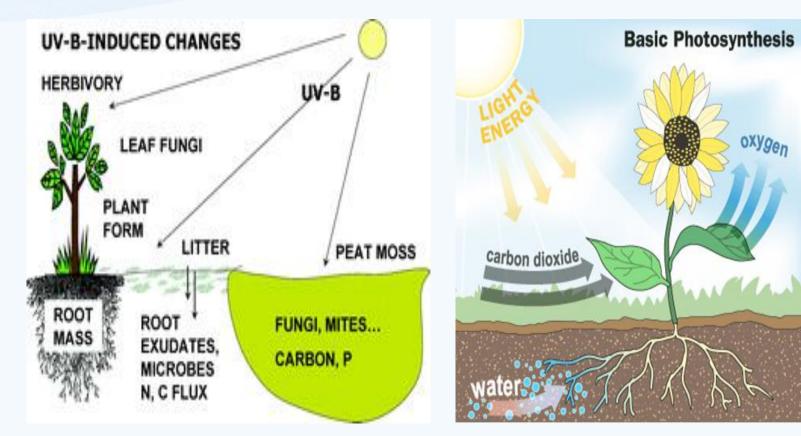
Increased risk of skin cancer, infectious diseases and eye related problems

Effect Of Ozone Depletion - Human



Effect Of Ozone Depletion - Plant

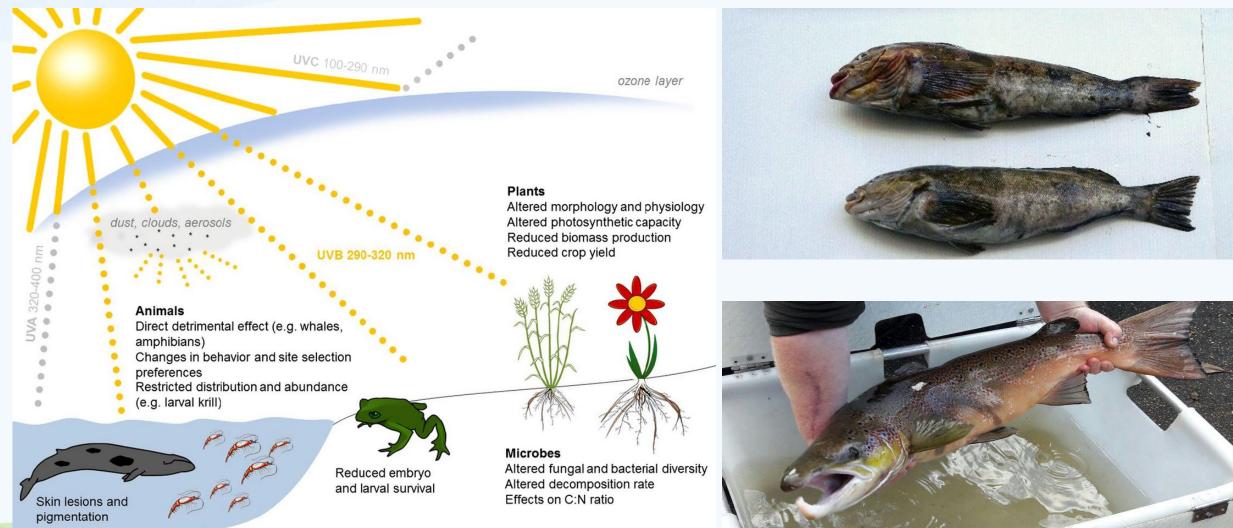
oxygen





This clover plant is showing dead tissue after 9 hours of exposure to ozone

Effect Of Ozone Depletion – Marime Life





Global Warming Potential (GWP)

9

- HCFC & HFC

Radiation from the sun and other forms of heat energy, are being prevented from being released from the atmosphere by carbon dioxide, CFC and HCFC refrigerants, causing an increase in temperature on the earth surface. The result of this is referred to as "Greenhouse Effect".

Global Warming Potential - Green House Gases

Green house Gas – gases that have the ability of retaining some of the earth energy that leads to increase in temperature within the atmosphere. For example:

- Carbon dioxide
- Methane
- Fluorinated Gases
- Chlorofluorocarbon



Environmental Concerns-Short Live Climate Pollutant



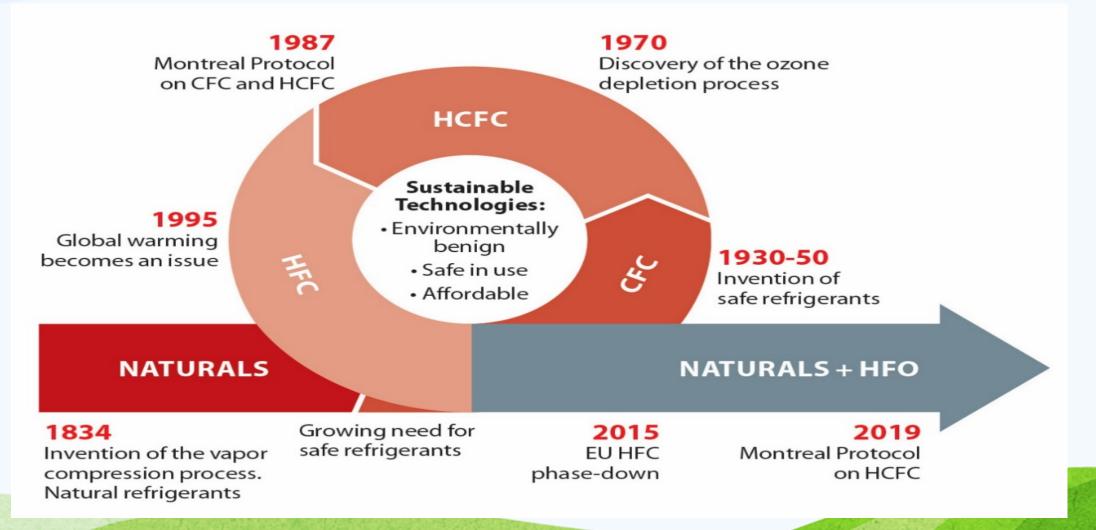


There are two main areas of environmental impact:

- 1. Direct: The leakage of refrigerant gases into the atmosphere which can cause ozone depletion and contribute to global warming.
- 2. Indirect: Refrigeration and air conditioning systems consume energy, which raises CO₂ emissions and contributes to global warming

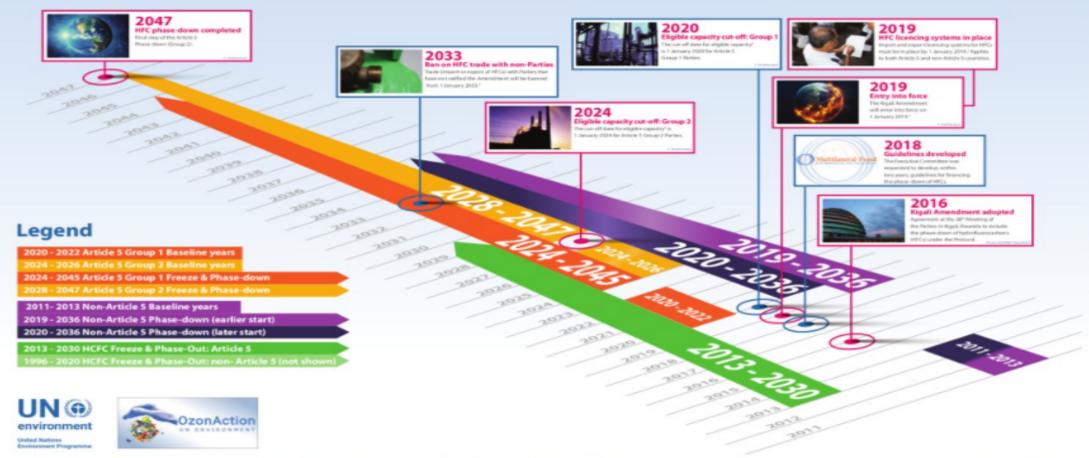
Evolution of Refrigerant and Phase out Period

Montreal Protocol



Kigali Amendment

The Path from Kigali: HFC Phase-Down Timeline



.is an Implementing Agency of the Montreal Protocol's Multilateral Fund. OzonAction is working with 147 developing countries providing interconnected and mutually supporting Compliance Assistance Services and project support to assist them meeting their current commitments under the Potocol. OzonAction is now working with these countires to jointly attain the ambitious achievements in climate protection promised by the Kigali Amendment. To find out more about OzonAction and to access our materials, tools and publications, including those on the Kigali Amendment and related issues, please visit our website: www.unep.org/ozonaction or contact us at egonaction/junep.org

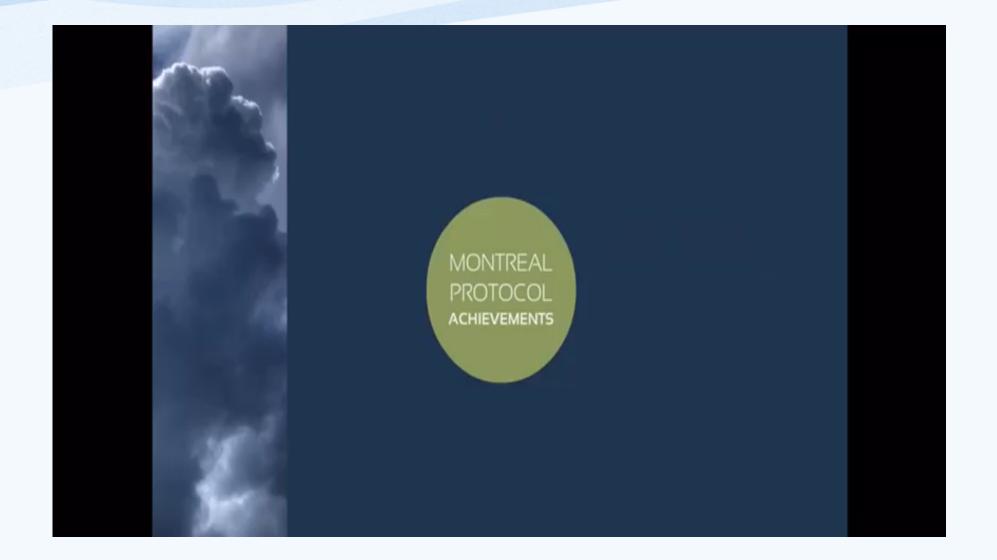
Kigali Amendment

non that Depinte the Ozone Laye d agreement at their 28° og of the Parties in October 2014 B. Rwanda to include the Aron of Indepint Americatem

Hydrofluorocarbons (HFCs) **Country Groups**

one depleting substances (ODS). Wh t ozone depleting, HFCs are eenhouse gases which can have high very high global warming potential

PC based in calculation



African Countries - Roles and contribution

•Africa have been signatories to these protocol and amendment though we contribute less than 2-3% of causes depleting the ozone and alarming global warming potential we are yet to be the most vulnerable.

•Quoting from UN climate change conference report held 2006 " the frequency and intensity of drought seems to have already worsened in parts of African; total available water in large basin of Niger, Lake Chad and Senegal has decreased by 40-60%."

•Between 13.1 and 14.1 million people are waking each day to face high level of acute food insecurity and severe water shortages across Ethopia, Kenya and Somalia due to drought in the first quarter of 2022.

Mitigation Procedure To Environmental Impact

Reduce Direct Impact

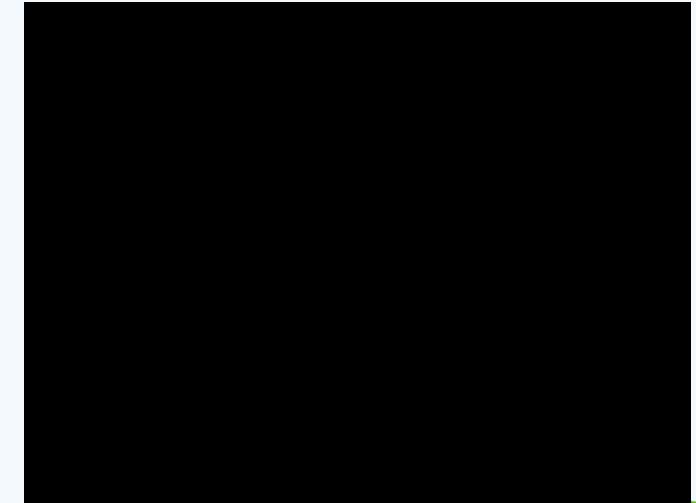
- Use a refrigerant gas with lower environmental impact: Look to use a refrigerant gas with zero ozone depletion potential (ODP) and low global warming potential (GWP).
- Lower the leak rates of your system: Refrigerants only create direct emissions when they leak to atmosphere. It is recommended that you ensure your system is leak-tight, considering every fitting, seals, O-ring within the systems and follow a regular maintenance schedule.
- Ensure correct end-of-life treatment of refrigerant gases: Ensure that you recover and dispose of refrigerant correctly when maintaining, upgrading or decommissioning a system.

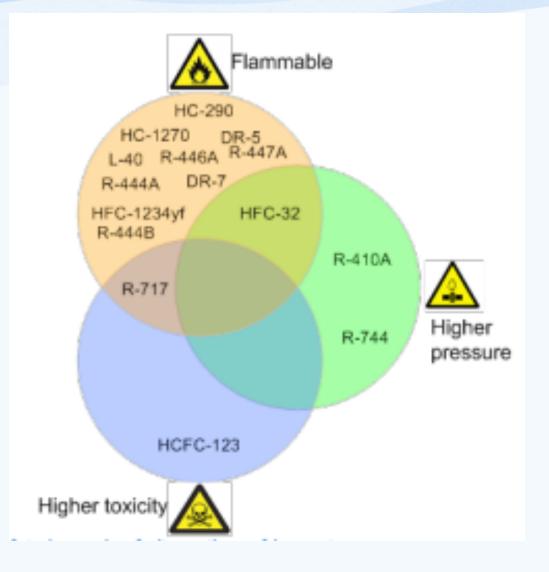
Reduce Indirect Emissions

- Minimize the power consumption of your refrigeration or air conditioning system: For existing systems, ensure that you are regularly maintaining the system and using the correct refrigerant gas. Installing new systems may offer substantial energy savings, via modern technology using next generation refrigerants, including HC, HFOs, and Natural Refrigerant.
- Use your refrigeration or air conditioning system less often: Improve insulation, install doors on commercial refrigerators, freezers and display cases, and change the temperature set-points for air conditioning.

RECAP OF MAIN POINTS

- Ozone Depleting Substances CFC RI2 (100%), halon, HCFC – R22 (50%)
- Global Warming Potential HCFC (50%), HFC (100%)
- Green house Gases Carbon dioxide, Methane, Fluorinated Gases, Chlorofluorocarbon
- Phase out period -
- 1. CFC RI2 2010
- 2. HCFC R22-2030
- 3. HFC RI34a, 410 2047





The Future

Convergence and uncertainties

THANKS FOR LISTENING

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Questions & Answers