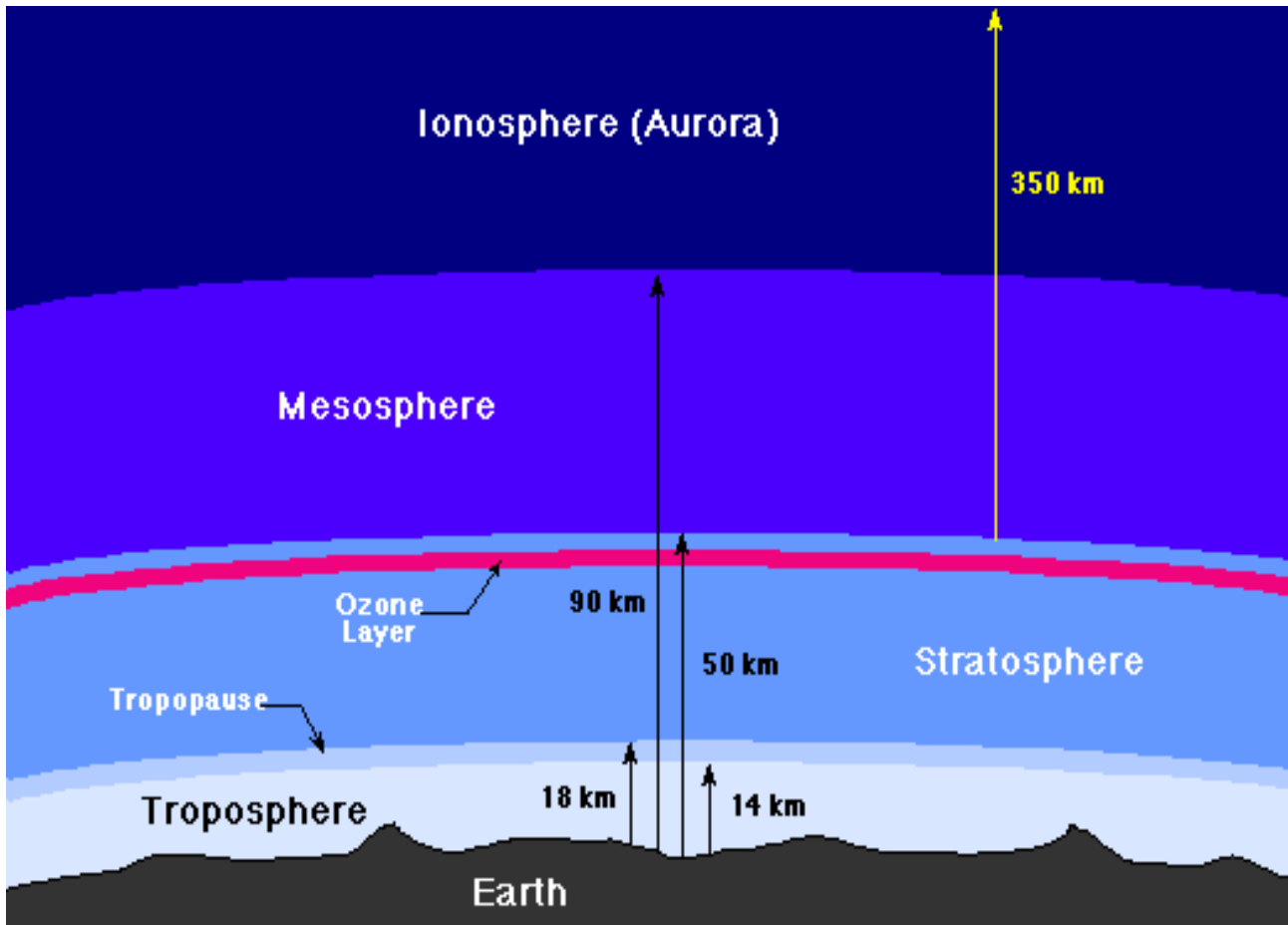


4- Ozone Layer Protection



4-1 Introduction:

Ozone (O₃) is a triatomic allotrope of oxygen, composed naturally through a process called photochemical analysis, where the sunlight has an impact on oxygen molecules, the ozone exists throughout the year over the equatorial belt, and moves toward the polar regions by the movements of air in the stratosphere that is filled by ozone on the altitudes ranging from 20 to 35 kilometers, Its thickness ranges between 2 to 8 kms.

Ozone layer is the natural filter and preventive shield surrounding Earth to protect all creatures against harmful UV-B rays. Which affects the global climate change; hence, threatening human health and environment safety.

Source of threat comes from the introduction of man-made chemicals that have led to increased use of ozone-depleting substances.

Ozone in the atmosphere is in the status of a natural dynamic balance, where exposed to continuous, balanced and equal construction and disintegration operations, to allow the stability of life on earth.

A group of chemicals has emerged, due to the development of industry that significantly changed this natural balance and led to Ozone Layer shrinking. Table (4-1) shows the most important of these chemicals as defined by international agreements (Montreal - Vienna) and others.

4-2 Chemicals depleting Ozone Layer:

Table (4-1): usage of Ozone-Depleting Substance, Ozone Depleting Potential and Global Warming Potential.

Substances	Usage	ODP	GWP
Chlorofluorocarbons CFC's	Refrigerators, cleaning solvents, aerosols, and foam products industry	0.6 - 1	4670 - 10720
Halon 1211 CF₂BrCl Halon 1301 CF₃Br	Fire fighting equipments and systems	3 - 10	1620 - 7030
Methyl chloroform C₂H₃Cl₃	Production of CFC's (inter-median substance) solvents, inhibitors, fire fighting equipments	1.1	1380
Carbon tetrachloride CCl₄	Cleaning solvents, ink, and corrector pen.	0.1	144
Methyl bromide CH₃Br	Fumigation spraying substance used for soil sterilization injected into the soil before a crop is planted and after harvest in storing grains. Fumigation spraying substance is a vaporizing broad spectrum pesticide that usually used in sterilization.	0.6	5
Hydrochlorofluorocarbons HCFC's	Transitional alternatives to CFC's, used in refrigerators, solvents and foam blowing agents & fire fighting equipments. HCFC's depleted stratospheric ozone but to a lesser degree than CFC's, but they are among the global warming gases.	0.1 – 0.5	76 - 2270

- Ozone Depleting Potential (ODP):

Is the ratio between the environmental effect of a substance on ozone compared to the effect of the same amount from CFC-11. Ozone Depleting Potential equal 1.0.

- Global warming potential (GWP):

Is the ratio between warming caused by a substance and warming caused by a similar mass of carbon dioxide. The global warming potential of carbon dioxide reaches 1.0.

4-3 Harmful impacts on health and environment caused by ozone depletion:

The Ultra Violet UV-B ray which comes from the sun reaching earth's surface has harmful effects such as; human skin cancer and eye cataract, immunodeficiency, effect on photosynthesis in green plants, reducing plant growth and affecting agricultural crops; in addition to its adverse impact on aquatic environment, all of which leads to an unbalanced general system of nature and life on earth, which in turn, affects the global climate change; hence, threatening human health and environment safety.

4-4 Environmental Indicators:

Environmental indicators of ozone unit adheres to provisions and decisions of Montreal Protocol concerning the gradual reduction of the consumption of ozone-depleting substances leading to total phase - out, according to schedules of the Protocol and various amendments made to it.

a) Halons Sector:

Preparation of a National Strategy for Halon Sector, aimed at phasing-out these ozone-depleting substances in fire fighting and the use of halon alternatives; Multilateral Ozone Fund has established the Halon Bank in Egypt, aimed to recover and recycle halons for necessary use in various vital sectors in the state. In 16th September, 2006, a cooperation protocol had been signed between Ministry of State for Environmental Affairs and Ministry of Military Production. Helwan Company for Engineering Industries (formerly Military 99 Factory) is selected to be responsible about management of the Halons Bank Project under UNDP and MSEA supervision. Full installation , operation and training employees on how to recover and recycle Halons has been completed. The Halon bank was inaugurated during the celebration of International Ozone Day in 2008, as clarified in figure (4-1).



Figure (4-1) Egyptian Halon Bank

The EEAA compiled all Halons, from all parties that possess stagnant stockpile to transform into alternatives for fire-fighting systems; all quantities are collected and delivered to the Halon bank. Allowing use of halons in some fire fighting systems only to secure critical expensive equipments , maintain the functional viability of aircrafts, ships , tanks ,communications systems, computers , other sophisticated and critical electronic equipments from a strategic point until their replacing with non-depleting Ozone Layer alternatives during the coming years.

b) Medical Aerosol Sector (MDI):

The Egyptian Strategy for Pharmaceutical Sector has been completed which aims to transform the manufacturer's production lines of medical aerosols using ozone-depleting substances CFC's in Metered Dose Inhalers (MDI's) for the treatment of asthma and allergic respiratory diseases as clarified in figure (4-2).

Multilateral Ozone Fund has approved funding such strategy in collaboration with Ministry of Health and Population to phase out use of such substances, as this sector consumes 163 tons of ozone-depleting CFC's. Full transformation of pharmaceutical production lines is expected by the end of year 2010.

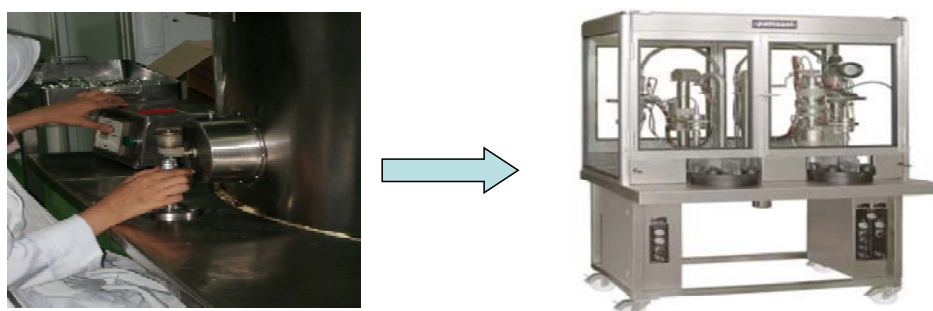


Figure (4-2): Transform the manufacturer's production lines of medical aerosols using ozone-depleting substances

c) Refrigeration and Air Conditioning Maintenance sector:

The Egyptian Strategy aims to final phase-out use of 822 tons of CFC's used in refrigeration and air-conditioning in accordance with Table (4-2). Accomplishment of first & second phases of this strategy had been completed. All planned objectives have been achieved without affecting the national economy.

(1) The most important achievements during the first phase from 2005 – 2006:

- Selecting and distributing best recovery and recycling devices for refrigeration and mobile air conditioning (MAC) to auto service centers in order to freeze and reduce consumption of CFC's, figure (4-3).
- Organize a national training program for training and rehabilitating 1240 trainees to be trained on modern technologies for maintenance and repair services in refrigeration and air-conditioning sector.
- Increase awareness & information among refrigeration maintenance sector about using modern technology for maintenance and repair of refrigeration and air conditioning devices (use of alternatives, recovery and recycling, retrofit old refrigeration equipment to use environmental-friendly alternatives).

(2)The most important achievements during the second phase from 2007 – 2008:

- An experimental project has been implemented for (15) air-conditioned railway cars, by retrofitting the mechanical systems for cooling (compressor - condenser - evaporator – expansion valve), and will be completed to retrofit (100) railway cars during the third phase.
- An experimental project has been implemented for (3) air-conditioned Public transport buses, by replacing full air-conditioning systems inside the cabin with the same cooling efficiency, and will be completed to amend (22) buses during the third phase.
- It is expected to fully complete the remaining stages of the strategy to phase – out (CFC's) depleting the ozone layer used in refrigeration and air conditioning systems by the end of 2009.



Figure (4-3): Recovery & Recycling equipment for vehicles air conditioning

Table (4-2): Gradual reduction for using of chlorofluorocarbons (CFC's) that deplete Ozone Layer

No	Year	Allowable consumption Value (Ton)	Reduction target (Ton)
1	2005	822	227
2	2006	595	355
3	2007	240	127
4	2008	113	64
5	2009	49	49
6	2010	--	--

a) **Methyl Bromide Sector:**

- During 2005, the Egyptian strategy has been implemented, in cooperation with the Ministry of Agriculture; this strategy aims at the implementation of the gradual reduction of methyl bromide usages in soil treatment, grain fumigation and storage of agricultural crops and commodities.
- This strategy has been implemented in two phases; the first phase started in 2006 till June 2009, followed by the second phase and it is expected to achieve its optimum target which is the final phase-out of methyl bromide consumption that deplete the Ozone Layer (317 tons /annually) ,using the appropriate environment- friendly alternatives by 2013.
- During the first phase of the project, using of bio-chemical alternatives have been applied to the users of methyl bromide and exported companies of agricultural commodities , and it was all recorded in Egypt (at strawberry crops, cucumber, peppers, tomatoes, Sherry, tomato, herbs, cantaloupe, lettuce), at 442 acres including 154 acres in 2008.
- During 2008 three modern greenhouses have been established for vegetables grafting on agricultural pests resistance basis, as an

alternative to methyl bromide, The capacity of each greenhouse estimated by 5 million seedlings annually (tomatoes Sherry, peppers, cucumbers and watermelons, cantaloupe), it is worthy to mention that this experiment has been implemented by Spanish technology, in Cooperation with the University of Almeria, one of the leading countries in this filed.

- The project has also developed a local alternative to methyl bromide, which is cultivation on the rice straw to produce Strawberry crops, to be exported, and the results were excellent that confirmed the necessity to expand in this project at the second phase to solve the environmental problems resulting from rice straw burning.
- Full implementation of the remaining phases of the strategy is expected to be completed to achieve the final phase-out of 317 tons of methyl bromide consumption that deplete the ozone layer by 2013.



Figure (4-4): Strawberry cultivation on bales of rice straw

b) Egyptian Strategy to phase- out the use of Hydrochlorofluorocarbons HCFC's:

Egyptian Strategy aims to phase - out the use of HCFC's that deplete the Ozone Layer in various sectors and replace with environment-friendly alternatives to reduce damages that affect Egyptian economy & industry by phasing - out the use of HCFC's. The first phase of this strategy includes; review of ministerial decrees and regulations, update data for each sector concerning consumed quantities.

The HCFC's are important substances used in many sectors; such as foam, thermal insulation, refrigeration, air conditioning & solvent sector. Although HCFC's have low level of Ozone Depleting Potential (ODP), but they have high level of Global warming Potential (GWP) which contribute to the global warming phenomena.

Table (4-3) illustrates the Schedule program to phase - out the use of HCFC's that deplete Ozone Layer for Article 5 countries (including Egypt) according to Montreal Protocol on Ozone Layer Protection.

Table (4-3): Phase-out schedule of HCFC's Depleting Ozone Layer:

Substance	Base level	Regulatory standards
Annex (c) , group I HCFC's substances	average consumption of 2009 - 2010	Freezing production and consumption levels (1 Jan 2013)
		Reduction by 10% (1 Jan 2015)
		Reduction by 35% (1 Jan 2020)
		Reduction by 67.5% (1 Jan 2025)
		Reduction by 100% (1 Jan 2030) with possibility of exemptions for essential uses.

4-5 Future Vision:

- ◆ Egyptian environmental policy seeks facilitating compliance with Montreal Protocol on Ozone Protection without prejudice to development programs or impacting priorities set by the State for sustainable development.
- ◆ Egypt has succeeded in fulfilling its obligations towards reducing consumption of ozone-depleting substances under the Protocol through phasing out use of great deal from ozone-depleting substances and replacing them with environment-friendly alternatives in many industrial sectors. However these achievements do not mean that a course of action was complete or all commitments to the Montreal Protocol had been implemented, efforts are being made to completely phase-out use of ozone-depleting substances in all sectors and the Ministry is relying on the following along next phase:
- ◆ Gradual progress in the use of alternatives to ozone-depleting substances and providing competitive prices to guarantee stability of the product in the Egyptian markets.
- ◆ Continuing the implementation of ozone-depleting substance recovery and recycling, and providing equipment for maintenance workshops and service centers for free, as well as training technicians on such equipment.
- ◆ Intensifying awareness campaigns on environment-friendly alternatives and orienting them to all community segments.
- ◆ Cooperate with all monitoring entities in the State and provide them with needed equipments for analyzing refrigerants. Organize training courses on the use of these equipments in order to prevent illegal trade of refrigerants and tightly controlling markets.

- ◆ Prepare a national strategy aimed at phasing out the use of HCFC's depleting Ozone Layer in various sectors according to Egyptian obligations with Montreal Protocol provisions for the Protection of Ozone Layer.