Republic of Lebanon
Office of the Minister of State for Administrative Reform
Center for Public Sector Projects and Studies
(C.P.S.P.S.)

الجمهورية اللبنانية
مكتب وزير الدولة لشؤون التنمية الإدارية

Halons and Fire Fighting

Halons and Ozone Depletion

Alternatives in Fire Fighting

Halon Banking

Contents

SUN LIGHT SPECTRUM

Ultraviolet Radiation

Visible Light

Infrared Radiation

The Ozone Hole (II)

BER 1997

- 1985: detection of ozone hole over antarctis
- UV radiation in stratosphere splits chlorofluoro- and bromine-atoms from CFC/HCFC emissions
- deep temperatures & raising ClO-concentrations lead to ozone depletion

Important Ozone Depleting Substances (ODS) to be phased out:

- ➡ CFCs

- ➡ HCFCs

- ➡ Halons

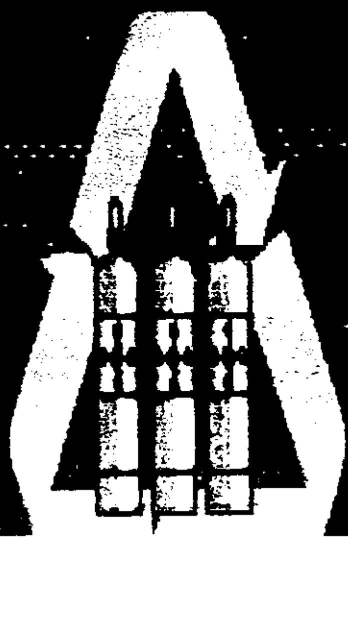
- ➡ Methyl Bromide

Benefits of ODS phase out

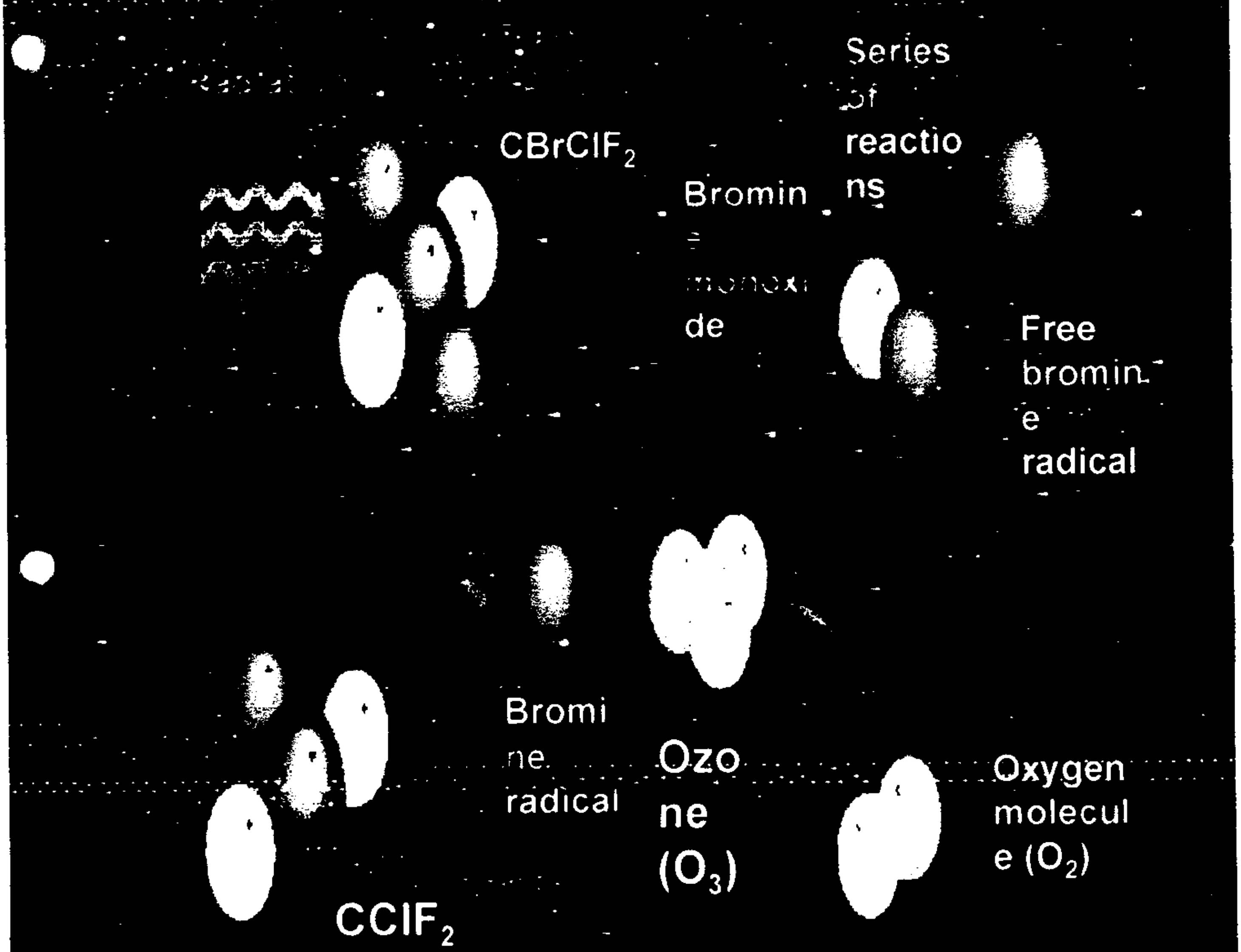
- Protection of the Ozone Layer
- Reduced Health Risks
- Energy Savings
- New Technologies
- Pollution Prevention

Halon Sector - Overview

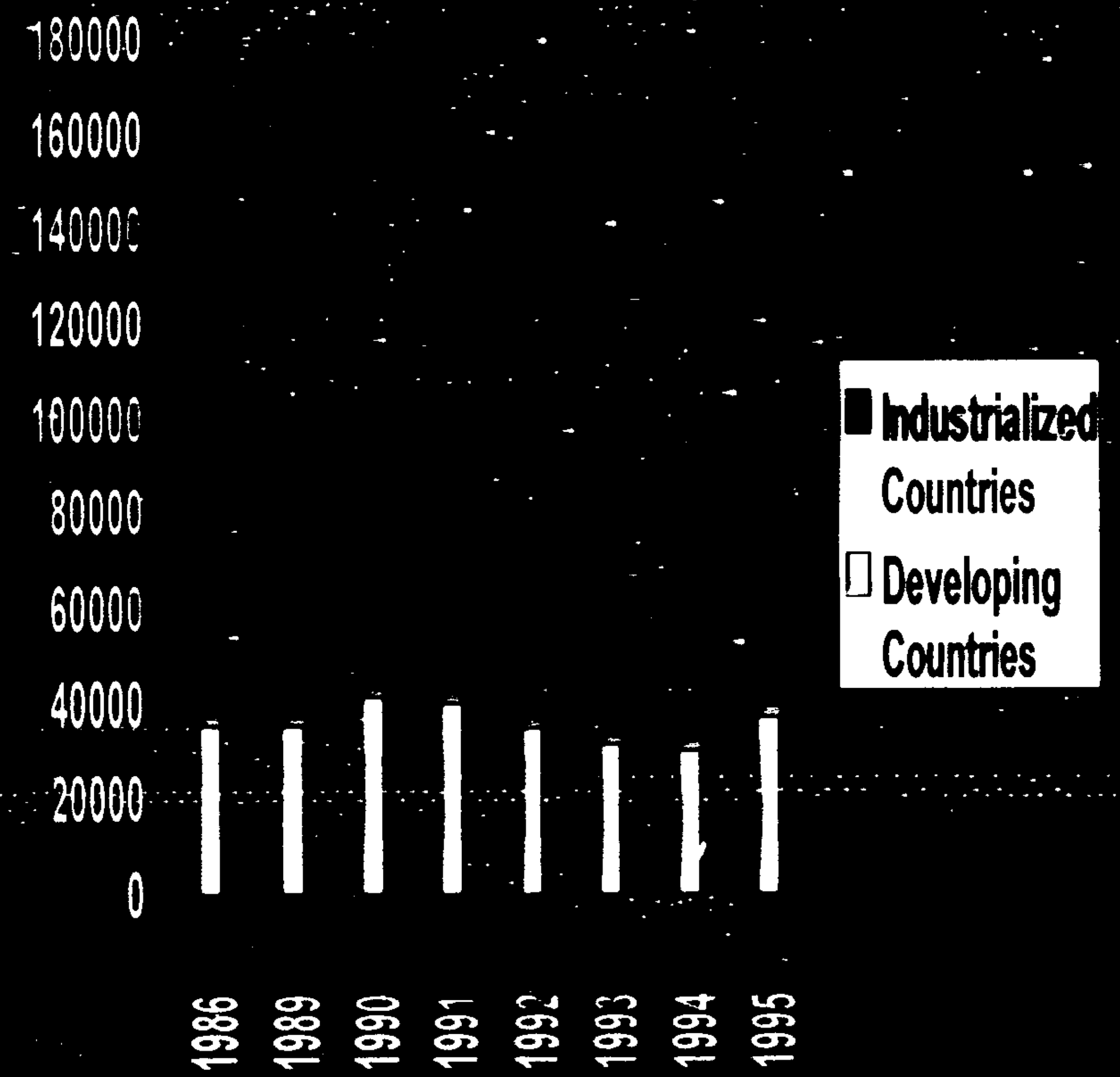
- Halons 1211, 1301, 2402:
  - fully halogenated chemicals
  - use in fire safety applications
  - long lifetimes in atmosphere
  - releasing reactive bromine in stratosphere
- ODP of halons 3 to 10 times higher than ODP of CFCs



Ozone depletion by halons



Consumption of halons 1986 - 1995 in ODP tons

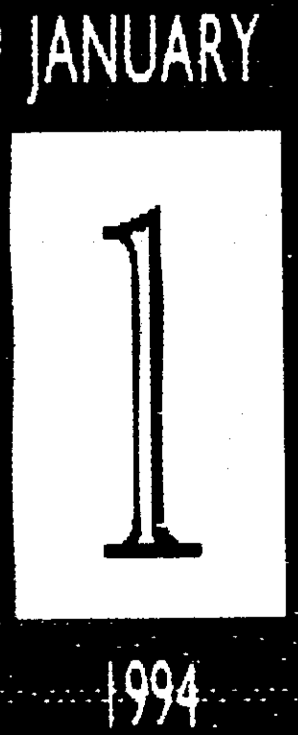


Steps of Halon production phase-out

- Build awareness of ozone depletion problem
- Commit to phase out of newly manufactured halons
- Reduce unnecessary emissions and uses of halons
- Switch to alternative fire protection methods
- Develop halon bank management and recycling
- Eliminate need for newly manufactured halons

Halon phase out background

- 1992 meeting of the parties in Copenhagen.
  - A2 countries complete phase by January 1, 1994
  - A 5 countries 10 years grace period:



- production & consumption for basic domestic needs
  - parties can ask for exemption for essential uses
  - unrestricted trade for recycled Halons allowed as far as data reporting under MP is respected

Fire protection and halons

Fire protection engineering = use of technology to reduce risk from fire in a cost-effective manner

- Halon 1301: applied in fixed protection systems
- Halon 1211 applied in portable fire extinguishers

Halon alternatives for fire protection

- Traditional fire protection methods
- New technologies – halocarbons
- New technologies – inert gas mixtures
- New technologies – Fine water mist
- Other new techno
  - Inert gas generat
  - Fine solid particu

Halocarbons - Composition

HCFC	HCFC Blend A HCFC 124
HFC	HFC-23, HFC-125, HFC-227ea, HFC-236fa
PFC	FC-3-10, FC-2-1-8
FIC	FIC-1311

Halocarbons – common characteristics (I)

- All are electrically non-conductive
- All are clean agents; vaporize readily and leave no residue
- All can be stored and discharged from typical halon 1301 hardware (with the possible exemption of HFC-23, which resembles 600 psig superpressurized halon systems)
- All are total flooding gases after discharge

(cont.)

Halocarbons – common characteristics (II)

- many require additional care relative to nozzle design and mixing
- all (except CF_3I) produce more decomposition products (primarily HF) than halon 1301 given similar fire type and size, and discharge time
- all are more expensive at present than halon 1301 on a weight (mass) basis

Halocarbons – environmental factors

Tradename	*Designation*	*ODP*	*GWP*	*Atmos.Lifetime*
[illegible]	[illegible]		[illegible]	65
[illegible]	FC-3-1-10	[illegible]	[illegible]	2600
[illegible]	HFC 227ea		3300	41
FE-[illegible]	HFC 23	0	12100	250
FE [illegible]	HFC [illegible]			250
FE 241	HFC 124	0.022	480	6
FE 25	HFC-125	0	3200	[illegible]
NAF S III	HCFC blend A	0.036	1450	12
[illegible]	FIC-13I1	0.0001	<5	< 1day

Inert gases - composition

Nitogen:	IG-10
Argon:	
Nitrogen/argon blend:	IG-55
Nitrogen/argon/CO 2-blend:	IG-541

Inert gas mixtures – common charcteristics

- Not liquefied gases but high pressure gases
  - Requiring high pressure storage
  - Resemble CO_2 systems
  - Use pressure reducing devices at or near discharge manifold
- This reduces pipe thickness requirements
  - Alleviates concerns regarding high pressure charges

Inert gases – common characteristics (II)

- quantity of agent release is large, discharge times are about 1-2 minutes. This limits some applications involving very rapidly developing fires
- Inert gases agents not subject to thermal decomposition, hence no by-products
- Use of gases with long discharge times and resultant long time durations of contaminated reduced oxygen atmospheres results in increased CO-production in some cases

Inert gas mixture – environmental factors

Trade Name	*Designation*	*ODP*	*GWP (100 yr) vs CO_2*	***Atmos Life-Time***
Halon 1301	Halon 1301	[illegible]	[illegible]	[illegible]
Inergen	IG 541	[illegible]	---	---
Argonite	IG 55	---	---	---
Argon	IG 01	[illegible]	---	---

New technologies - Fine Water Mist

- relies on relatively small (less than 200 μm) droplet sprays to extinguish fires.
- Mechanisms of extinguishment include:
  - Gas phase cooling (like total flooding inert)
  - Oxygen dilution by steam expansion
  - wetting of surfaces, and
  - flame blow-off

Fine water mist – technology (I)

- Water mist systems attracted attention due to:
  - Low environmental impact
  - Ability to suppress three-dimensional flammable liquid fires
- Reduced water application rates relative to automatic sprinklers

Other new technologies – Inert gas generator

- Use solid material that oxidizes rapidly
- Agents produce large quantities of CO_2
- Applications to date have included only non-occupied areas such as aviation engine nacelles and dry bays on military aircraft
- technology with excellent performance in these applications with space and weight requirements equivalent to those of halon 1301

Halon bank mangement and recycling

Halon banks will:

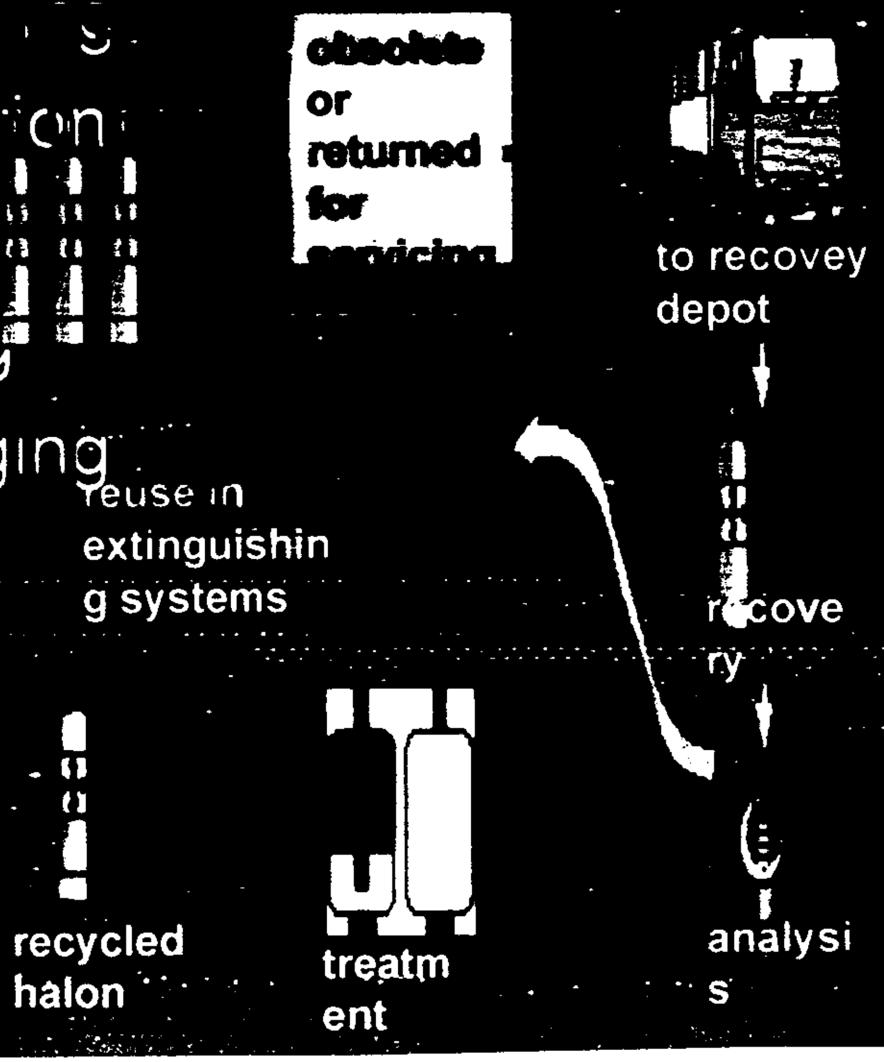
- promote use of recycled halons to prevent new production in A5 countries
- promote use of existing halons from non-essential & closed-down systems
- facilitate transfer of available halon from one user to another
- discourage emissions into atmosphere
- mitigate need for consumption & production exemptions for essential users

Why recycle halon?

- For several critical halon uses alternatives are not yet proven. These include
  - Aviation use
  - Military tactical vehicles
  - Explosion prevention
  - Fire extinguishing for flammable liquid hazards
- Halon recycling extends capital investment expended on purchase of halon based fire equipment
- From practical point, there are no adequate facilities to destroy halon yet

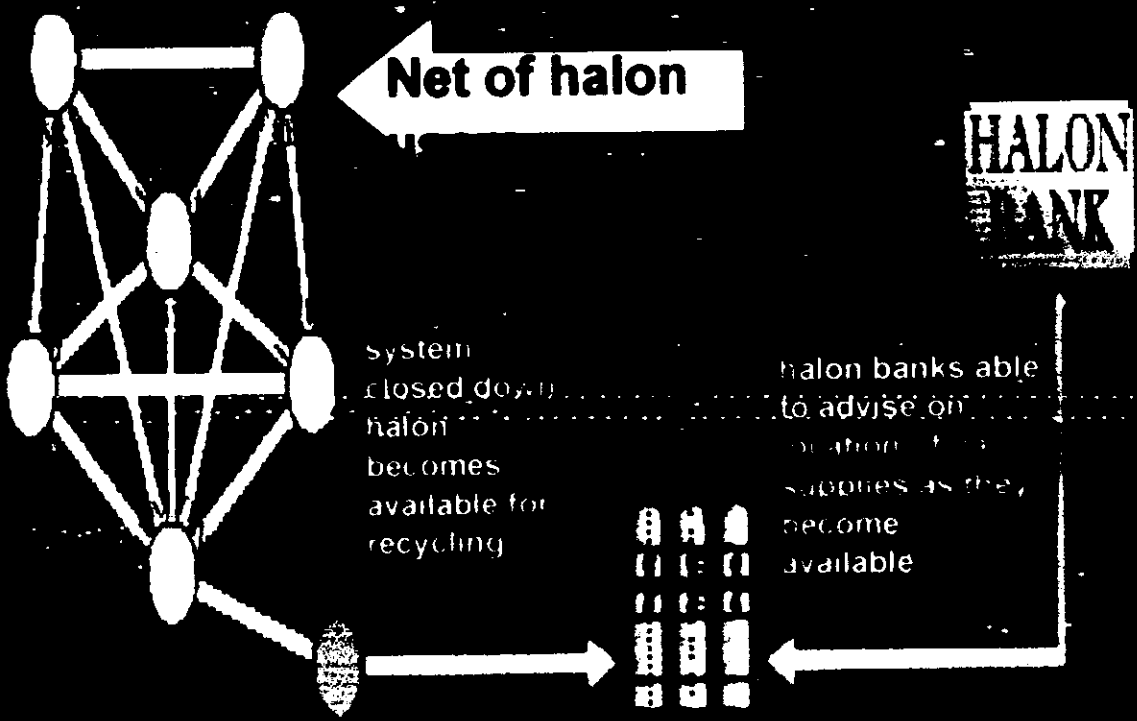
Halon Bank Management (HBM)

- keep track on halon quantities on each stage:
  - initial filling
  - installation
  - recovery
  - recyling
  - recharging



Halon banking on a national level

- a network of users keeps track of halon supplies available for recyling or
- a halon bank directs a user to location of supplies



Objectives of HBM

- concerned countries will meet their obligations of MP
- regional approach will allow coordinated effort to manage halons ensuring
  - higher cost-efficiency
  - synchronization of implementation
  - limitation of illegal trade between countries
  - reduction of halon use & emissions