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Industry Division

REGIONAL SURVEY OF PRODUCTION AND CONSUMPTION OF SUBSTANCES HARMFUL TO THE OZONE LAYER IN THE ESCWA REGION

VOLUME II

- Issued without formal editing.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

EGYPT

Egypt was one of the first countries to sign the Montreal Protocol in March 1985, ratifying it in September, 1988. According to Paragraph A of Article 5 of the Protocol, Egypt is therefore eligible for assistance from the Interim Multilateral Fund (IMLF) to accomplish its ten-year phaseout of the use of ozone depleting substances.

With signature of the Protocol, awareness of the ozone depletion problem has increased in Egypt. However, awareness of the dimensions and implications of ozone depletion is still somewhat limited, and the coordination of efforts between the various governmental institutions is minimal. Egypt, which is not an ODS producer, imports the following for use in its industries:

1. Fully halogenated CFCs, which include F11, F12, F113, F114, and F115. These are used mainly in the refrigeration and plastic foam industries, and as aerosols and solvents for various purposes.

2. Partially halogenated CFCs, which include F22 and F31. These are used in the refrigeration industry.

3. Chlorinated hydrocarbons, which include F30, F160, F10, trichloroethene, and perchloroethene. These are used as solvents, for plastic foam production, and as degassing agents in metal industries.

4. Halons, which include 1301 and 1211, are used for fire extinguishing purposes.

A list of the ozone depleting substances imported by Egypt showing their full name, chemical formula, and use is presented in table 1.

AMOUNTS OF OZONE DEPLETING SUBSTANCES IMPORTED AND USED IN EGYPT

Ozone depleting substances are mainly brought into Egypt through two of its six ports of entry, Alexandria and Port Said. Table 2 shows the quantities which entered each of these two ports separately during the period from 1986 to 1991, while table 3 presents the total amount of ODSs imported by Egypt during the same period. Figure 1 shows the steady increase in the total quantity of ODSs imported between 1986 and 1991.

Examination of table 2 shows that halons are mainly imported through Port Said, while chlorinated hydrocarbons are mainly imported through Alexandria. This may be attributed to the existence of a Free Zone in Port Said. Halons are generally imported by distributors who prefer to store their stock in the Free Zone, releasing limited amounts according to demand by end-users, who in turn pay the required duty. Chlorinated hydrocarbons, on the other hand, are generally imported directly by end-users who need their stock released at once. The table shows that importation of fully halogenated CFCs is almost equally distributed between the two ports.

Figure 2 shows that the importation of CFCs was maintained at a steady level of approximately 1,200 tons per year between 1986 and 1989. A noticeable increase took place, however, between 1989 and 1991, despite a drop in the importation of fully

TABLE 1
OZONE DEPLETING SUBSTANCES IMPORTED BY EGYPT

ABBREV-IATION	SUBSTANCE	FORMULA	USES
		Fully halogenated CFCs	
F 11	Trichlorofluoromethane	CCl3F	Plastic foams
F 12	Dichlorodifluoromethane	CCl2F2	Refrigerants & aerosols
F 113	Trichlorotrifluoroethane	CClF2–CCl2F	Solvents
F 114	Dichlorotetrafluoroethane	CClF2–CClF2	Aerosols
F 115	Chloropentafluroethane	CClF2–CF3	Refrigerants
		Partially halogenated CFCs	
F 22	Chlorodifluoromethane	HCCLF2	Refrigerants (Airconditioners)
F 31	Chlorofluoromethane	CF2CL2	Refrigerants
		Chlorinated Hydrocarbons (CHCs)	
Tri	Trichloroethene	CHCl=CCl2	Solvents (Metal degreaser & cleaner)
Per	Perchloroethene	Cl2C=CCl	Solvents (dry cleaning & metal cleaning)
F 30	Dichloromethane	CH2Cl2	Plastic foams
1,1,1	Trichloroethane	Cl3C–CH3	Solvents
F 160	Chloroethane	CH3–CH2Cl	Plastic foams
F 10	Tetrachloromethane	CCl4	Solvents
	Hexachloroethane	CCL3–CCL3	Degassing in metal industry
		Halons	
1301	Bromium trifluoromethane (R 13B1)	CF3Br	Fire extinguishers
1211	Bromium chlorodifluoromethane (R12B1)	CF2ClBr	Fire extinguishers

TABLE 2
OZONE DEPLETING SUBSTANCES IMPORTED BY EGYPT
SHOWING QUANTITIES IN TONS, AND PORT OF ENTRY
1986 - 1991

MATERIAL	ALEXANDRIA						PORT-SAID						USES
	1986	1987	1988	1989	1990	1991	1986	1987	1988	1989	1990	1991	
FULLY HALOGENATED													
F 11	201.00	198.00	187.00	145.00	114.00	65.00	134.00	142.00	115.00	61.00	66.00	35.00	Plastic foams
F 12	210.00	240.00	209.00	190.00	211.00	284.00	100.00	80.00	99.00	63.00	82.00	145.00	Refrigerants & aerosols
F 113	0.00	0.00	0.00	0.00	0.00	0.00	2.00	3.00	3.00	2.00	3.00	1.00	Solvents
F 114	0.00	0.00	0.00	0.00	0.00	0.00	14.00	24.00	25.00	23.00	27.00	18.00	Aerosols
F 115	55.00	37.00	21.00	39.00	15.00	0.00	22.00	44.00	71.00	50.00	80.00	95.00	Refrigerants
TOTAL	**466.00**	**475.00**	**417.00**	**374.00**	**340.00**	**349.00**	**272.00**	**293.00**	**313.00**	**199.00**	**258.00**	**294.00**	
PARTIALLY HALOGENATED													
F 22	135.00	171.00	315.00	349.00	504.00	588.00	65.00	49.00	163.00	196.00	413.00	377.00	Refrigerants (Airconditioners)
CHLOROFLUOROMETHANE	50.00	186.76	0.05	2.00	17.76	123.00	0.00	0.00	0.00	0.00	0.00	0.00	Refrigerants
TOTAL	**185.00**	**357.76**	**315.05**	**351.00**	**521.76**	**711.00**	**65.00**	**49.00**	**163.00**	**196.00**	**413.00**	**377.00**	
CHLORINATED HYDROCARBONS													
TRICHLOROETHENE	0.00	629.37	710.50	3068.00	236.37	810.77	0.00	0.00	500.00	0.00	0.00	0.00	Solvents (Metal degreaser & cleaner)
TETRACHLOROETHYLENE (Per.)	550.00	1087.00	1085.00	542.00	2545.00	1234.00	0.00	0.00	40.05	45.99	90.01	0.00	Solvents (dry cleaning & metal cleaning)
DICHLOROMETHANE (METHYLENECHLORIDE)	52.00	93.00	207.00	371.00	660.00	1473.00	0.00	0.00	0.00	0.00	0.00	0.00	Plastic foams
TETRACHLOROMETHANE	187.00	200.00	202.00	75.00	597.00	100.00	0.00	0.00	0.00	0.00	0.00	0.00	Solvents
TRICHLOROETHANE	0.00	0.00	45.00	50.00	65.00	100.00	0.00	0.00	0.00	0.00	0.00	0.00	Solvents (Metal degreaser & cleaner)
CHLOROETHANE (Ethylchloride)	0.00	0.00	0.00	0.00	0.00	90.00	0.00	0.00	0.00	0.00	0.00	0.00	Plastic foams
HEXACHLOROETHANE *	55.00	60.00	30.00	45.00	60.00	80.00	--	--	540.00	--	--	--	Degassing
TOTAL	**844.00**	**2069.37**	**2279.50**	**4151.00**	**4163.37**	**3887.77**	**0.00**	**0.00**	**1080.05**	**45.99**	**90.01**	**0.00**	
HALONS													
1211	N/A	N/A	1.50	8.00	3.00	8.20	N/A	N/A	125.00	120.00	125.00	130.00	Fire extinguishers
1301	N/A	N/A	0.00	3.15	0.00	2.00	N/A	N/A	110.00	90.00	100.00	80.00	Fire extinguishers
TOTAL	**0.00**	**0.00**	**1.50**	**11.15**	**3.00**	**10.20**	**0.00**	**0.00**	**235.00**	**210.00**	**225.00**	**210.00**	
GRAND TOTAL	***1495.00***	***2902.13***	***3013.05***	***4887.15***	***5028.13***	***4957.97***	***337.00***	***342.00***	***1791.05***	***650.99***	***986.01***	***881.00***	

* USED AS DEGASSING AGENT
N/A (NOT AVAILABLE)

TABLE 3
OZONE DEPLETING SUBSTANCES IMPORTED BY EGYPT
SHOWING QUANTITIES IN TONS, AND USES
1986 - 1991

MATERIAL	ALL EGYPT						USES
	1986	1987	1988	1989	1990	1991	
				FULLY HALOGENATED			
F 11	335.00	340.00	302.00	206.00	180.00	100.00	Plastic foams
F 12	310.00	320.00	308.00	253.00	293.00	429.00	Refrigerants & aerosols
F 113	2.00	3.00	3.00	2.00	3.00	1.00	Solvents
F 114	14.00	24.00	25.00	23.00	27.00	18.00	Aerosols
F 115	77.00	81.00	92.00	89.00	95.00	95.00	Refrigerants
TOTAL	**738.00**	**768.00**	**730.00**	**573.00**	**598.00**	**643.00**	
				PARTIALLY HALOGENATED			
F 22	200.00	220.00	478.00	545.00	917.00	965.00	Refrigerants (Airconditioners)
CHLOROFLUOROMETHANE	50.00	186.76	0.05	2.00	17.76	123.00	Refrigerants
TOTAL	**250.00**	**406.76**	**478.05**	**547.00**	**934.76**	**1088.00**	
				CHLORINATED HYDROCARBONS			
TRICHLOROETHENE	0.00	629.37	1210.50	3068.00	236.37	810.77	Solvents (Metal degreaser & cleaner)
TETRACHLOROETHYLENE (Per.)	550.00	1087.00	1125.05	587.99	2635.01	1234.00	Solvents (dry cleaning & metal cleaning)
DICHLOROMETHANE (METHYLENECHLORIDE)	52.00	93.00	207.00	371.00	660.00	1473.00	Plastic foams
TETRACHLOROMETHANE	187.00	200.00	202.00	75.00	597.00	100.00	Solvents
TRICHLOROETHANE	0.00	0.00	45.00	50.00	65.00	100.00	Solvents (Metal degreaser & cleaner)
CHLOROETHANE (Ethylchloride)	0.00	0.00	0.00	0.00	0.00	90.00	Plastic foams
HEXACHLOROETHANE *	55.00	60.00	570.00	45.00	60.00	80.00	Degassing
TOTAL	**844.00**	**2069.37**	**3359.55**	**4196.99**	**4253.38**	**3887.77**	
				HALONS			
1211	N/A	N/A	126.50	128.00	128.00	138.20	Fire extinguishers
1301	N/A	N/A	110.00	93.15	100.00	82.00	Fire extinguishers
TOTAL	**0.00**	**0.00**	**236.50**	**221.15**	**228.00**	**220.20**	
GRAND TOTAL	***1832.00***	***5244.13***	***4804.10***	***5638.14***	***6014.14***	***5638.97***	

~~* USED AS DEGASSING AGENT~~
N/A (NOT AVAILABLE)

FIGURE 1
TREND OF OZONE DEPLETING SUBSTANCES IMPORTED
BY EGYPT (AMOUNT IN TONS)
1986 - 1991

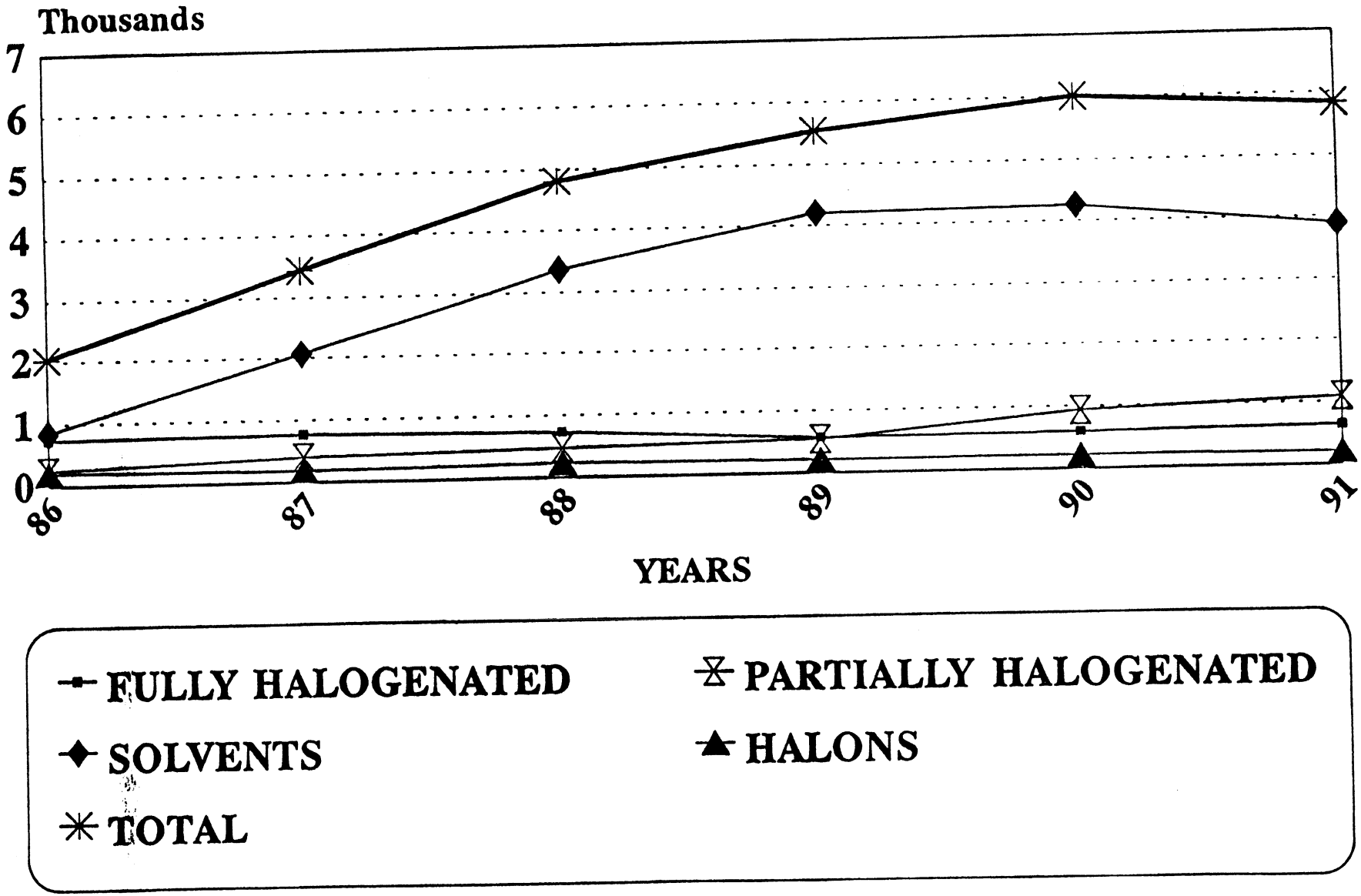
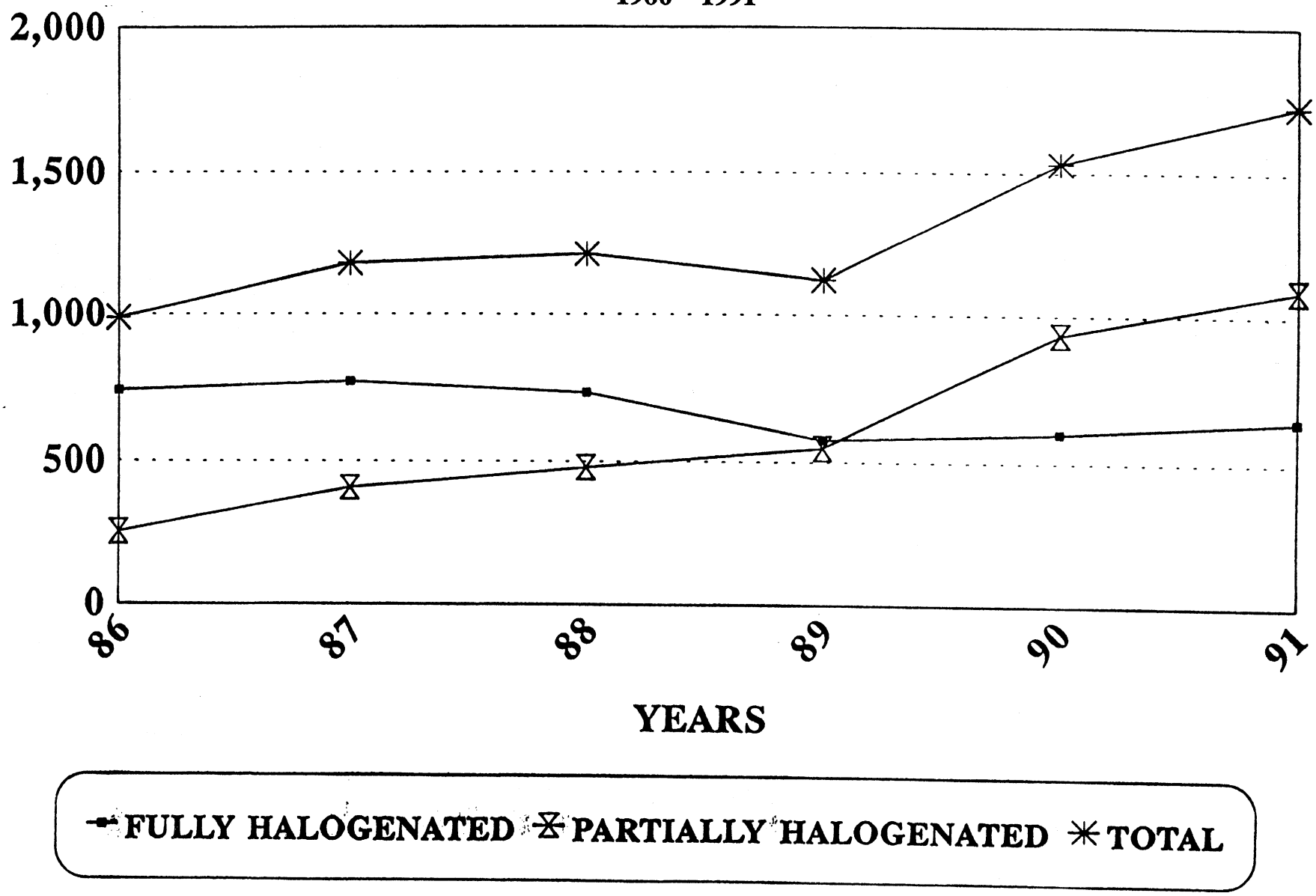


FIGURE 2
TREND OF CFCs IMPORTED
BY EGYPT (AMOUNT IN TONS)
1986 - 1991



halogenated CFCs starting in 1989. This is due to an increase in demand for partially halogenated CFCs during the same period.

Fully Halogenated CFCs

The drop in importation of fully halogenated CFCs as of 1989 was due to a decrease in the use of F11 for foam production - as it was replaced by dichloromethane and ethylchloride (figure 3).

The pie charts in figure 4 show that F12 accounted for 42% and 67% of all fully halogenated CFCs imported by Egypt in 1986 and 1991 respectively; F115 accounted for 10% and 15%; and F114 accounted for only 2% and 3% of fully halogenated CFCs imported during the same years. The drop in the importation of F11 from 45% in 1986 to 16% in 1991 can be attributed to its replacement by other substances in foam production.

Partially Halogenated CFCs

The importation of partially halogenated CFCs - F22 and F31 - witnessed a slow increase between 1986 and 1988, a levelling out between 1988 and 1989, and a sharp rise as of 1990. The figure reached 1,088 tons in 1991, as opposed to only 250 tons in 1986 (figure 5 and table 3). This can be explained by the increased production and use of air conditioning units and other refrigerators during the last two years (figures 6 and 7).

FIGURE 3
TREND OF FULLY HALOGENATED CFCs IMPORTED
BY EGYPT (AMOUNT IN TONS)
1986 - 1991

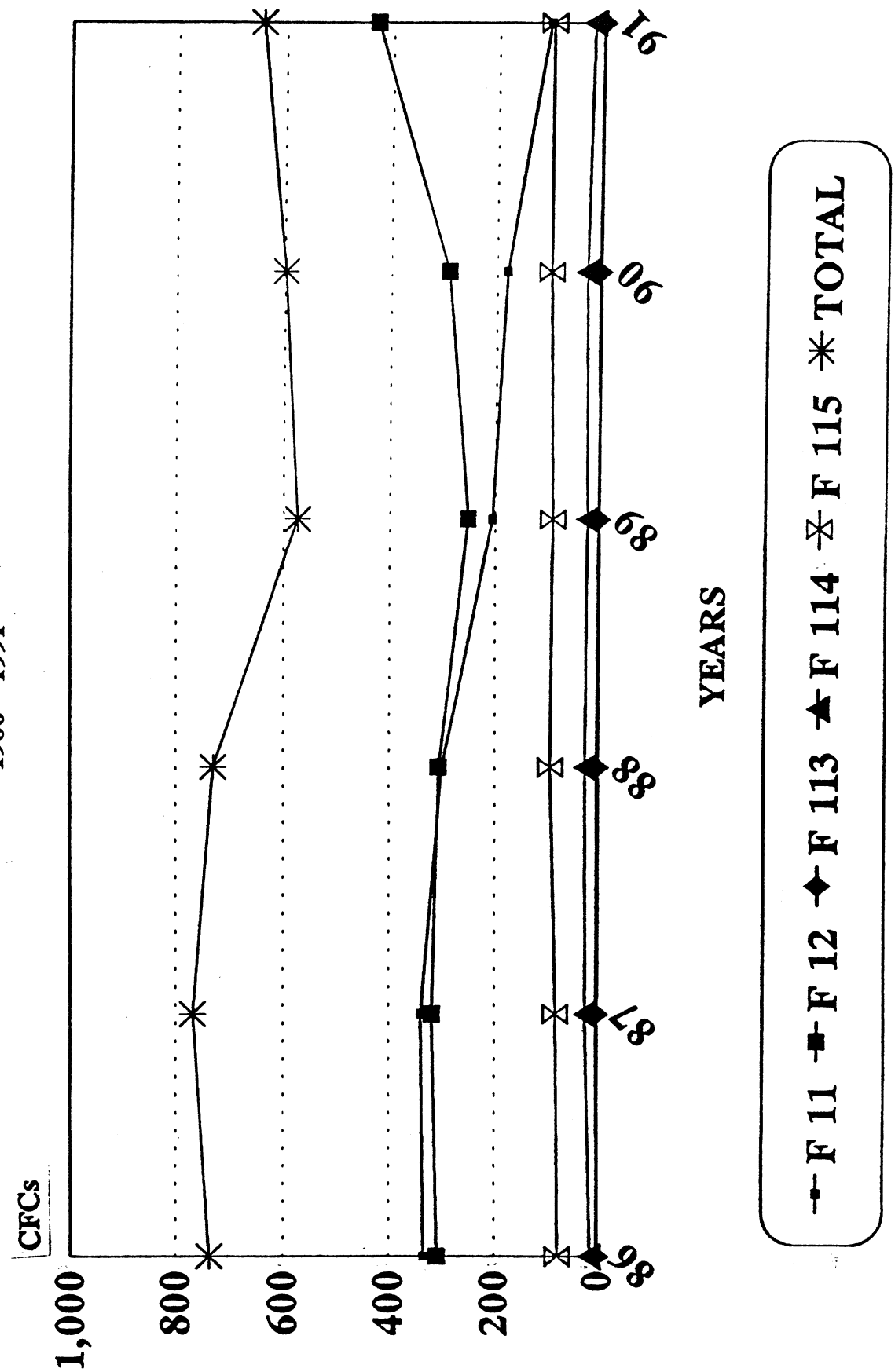
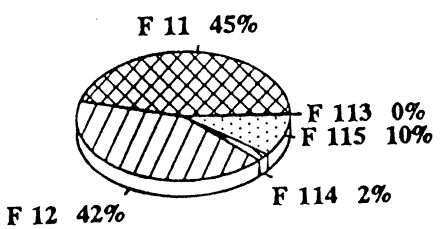
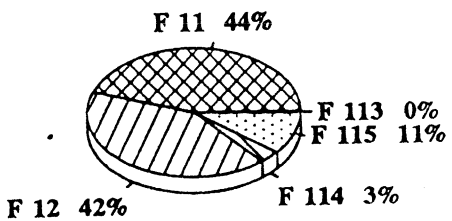


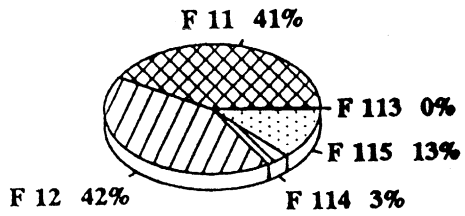
FIGURE 4
TYPE AND PERCENTAGE OF FULLY HALOGENATED CFCs IMPORTED BY EGYPT
1986 - 1991



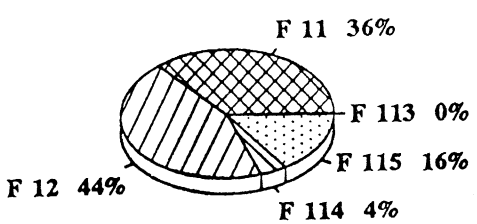
1986



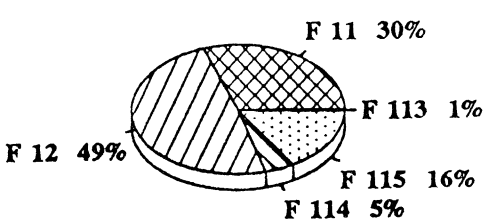
1987



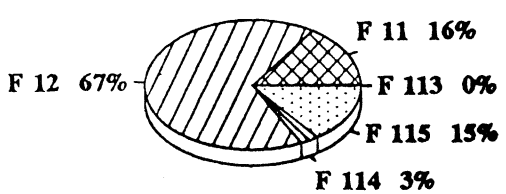
1988



1989



1990



1991

FIGURE 5
TREND OF PARTIALLY HALOGENATED CFCs IMPORTED
BY EGYPT (AMOUNT IN TONS)
1986 - 1991

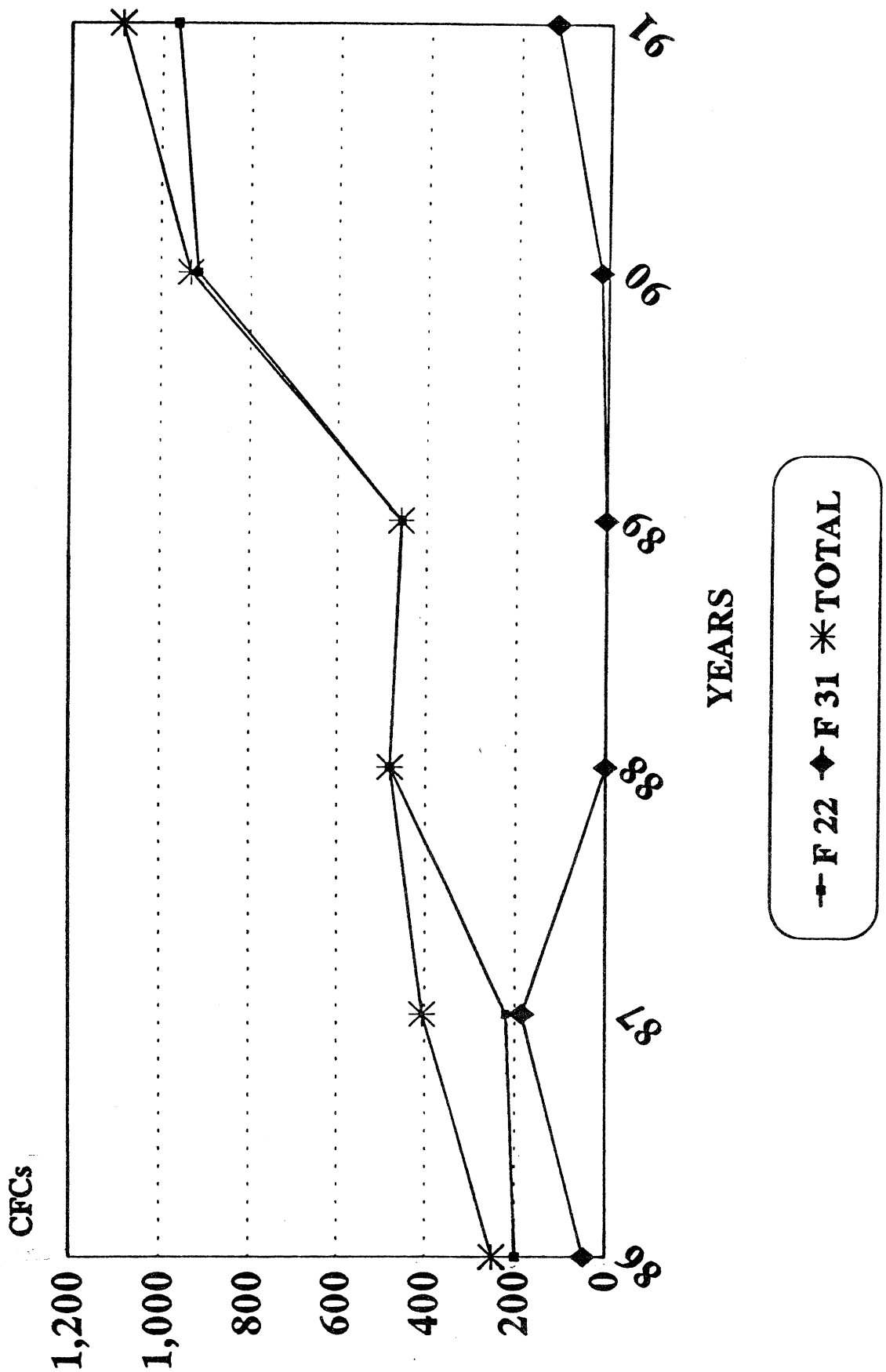


FIGURE 6
GRAPHICAL REPRESENTATION OF THE PRODUCTION
OF AIR CONDITIONING UNITS IN EGYPT
1986 - 1991

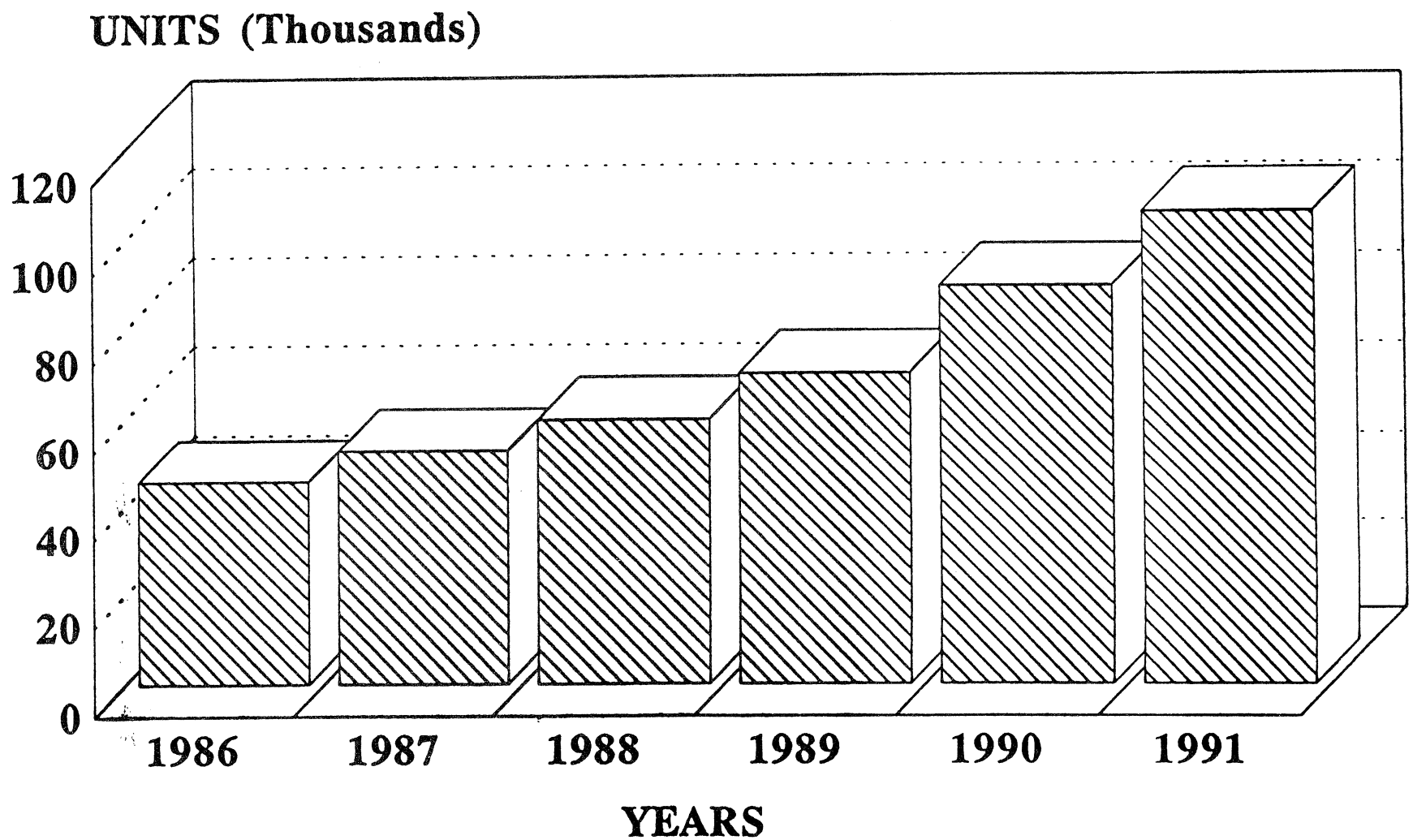
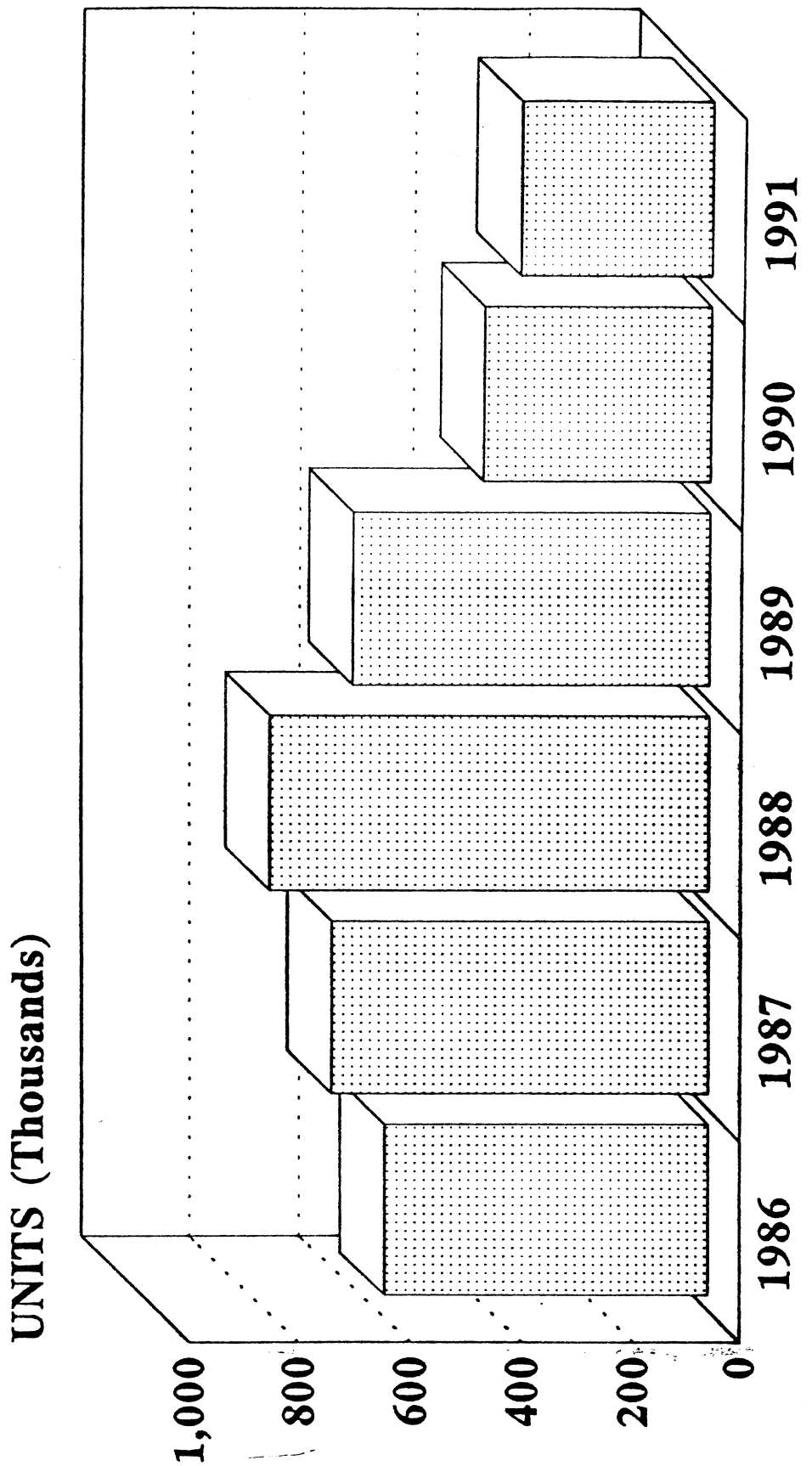


FIGURE 7
GRAPHICAL REPRESENTATION OF THE PRODUCTION
OF REFRIGERANTS IN EGYPT
1986 - 1991



The pie charts in figure 8 illustrate that F22 accounted for 80% and 54% of the partially halogenated CFCs imported during 1986 and 1987 respectively. From 1988 to 1990, the share of F22's soared, accounting for 98% to 100% of the imports of partially halogenated CFCs.

Chlorofluoromethane, F31, presents a serious problem. This chemical has no defined use on its own in industrialized countries, bit is simply an impurity formed during the manufacturing process of F22. Its high carcinogenic potential, however, has resulted in the adoption of new F22 manufacturing processes that greatly reduce contamination by F31. Despite the above, shipments of F31 found their way to Egypt between 1986 and 1991 for use in refrigeration. F31 represented 20% of partially halogenated CFCs imported by Egypt in 1986, soaring to 46% in 1987, and levelling out at under 11% thereafter. During this same period, F31 always maintained a pricing edge over F22, selling at 75% to 80% below F22 prices. It is important to note that in 1991, 123 tons of F31 were imported by Egypt.

To conclude, CFC importation in Egypt has witnessed a reversal in trends from 1986 to 1991. After accounting for 65% of all CFCs imported in 1986, the share of fully halogenated CFCs dropped in 1991, and accounted for 37% of CFCs imported during that year (figure 9).

Chlorinated Hydrocarbons

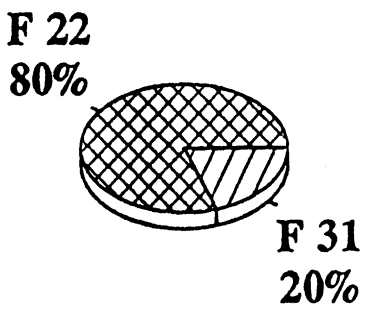
The following chlorinated hydrocarbons are used in Egypt for metal cleaning, dry cleaning, plastic foam production, as solvents, and as degassing agents in aluminum industries.

a. Trichloroethene
b. Tetrachloroethylene
c. Dichloromethane
d. Tetrachloromethane
e. Chloroethane (ethylchloride)
f. Hexachloroethane

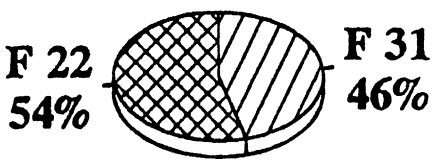
Egypt witnessed an increase of about 88% in the importation of chlorinated hydrocarbons between 1987 and 1991, importing 3,887.7 tons in 1991 as compared with 2,069.3 tons 1987 (table 3). This rise is mainly due to an increase in the importation of dichloroethene, from 93 tons in 1987 to 1473 tons in 1991, which is attributed to the substitution of dichloroethane for F11 in foam production.

Table 3 shows that trichloroethene and tetrachloroethylene are both used as solvents for metal cleaning. Although their importation patterns cannot be easily interpreted separately, collectively they rise from 1986 to 1989, after which there is a drop in importation between 1990 and 1991. Table 3 also shows that as of 1988, trichloroethane, another chlorinated hydrocarbon, is introduced to Egypt for metal cleaning purposes. Figure 10 presents the trend of chlorinated hydrocarbon importation between 1986 and 1991.

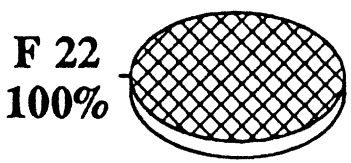
FIGURE 8
TYPE AND PERCENTAGE OF PARTIALLY HALOGENATED CFCs IMPORTED BY EGYPT
1986 - 1991



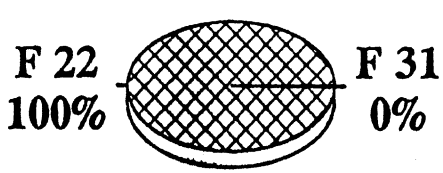
1986



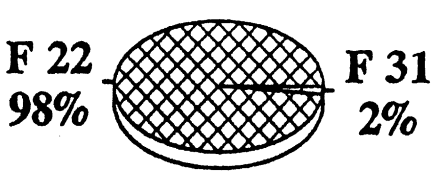
1987



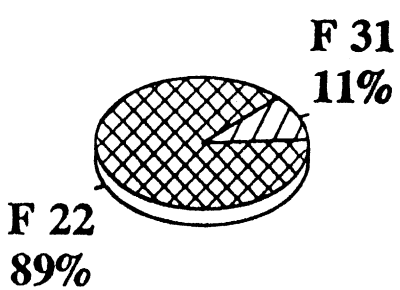
1988



1989



1990



1991

FIGURE 9
TYPE AND PERCENTAGE OF CFCs
IMPORTED BY EGYPT
1986 - 1991

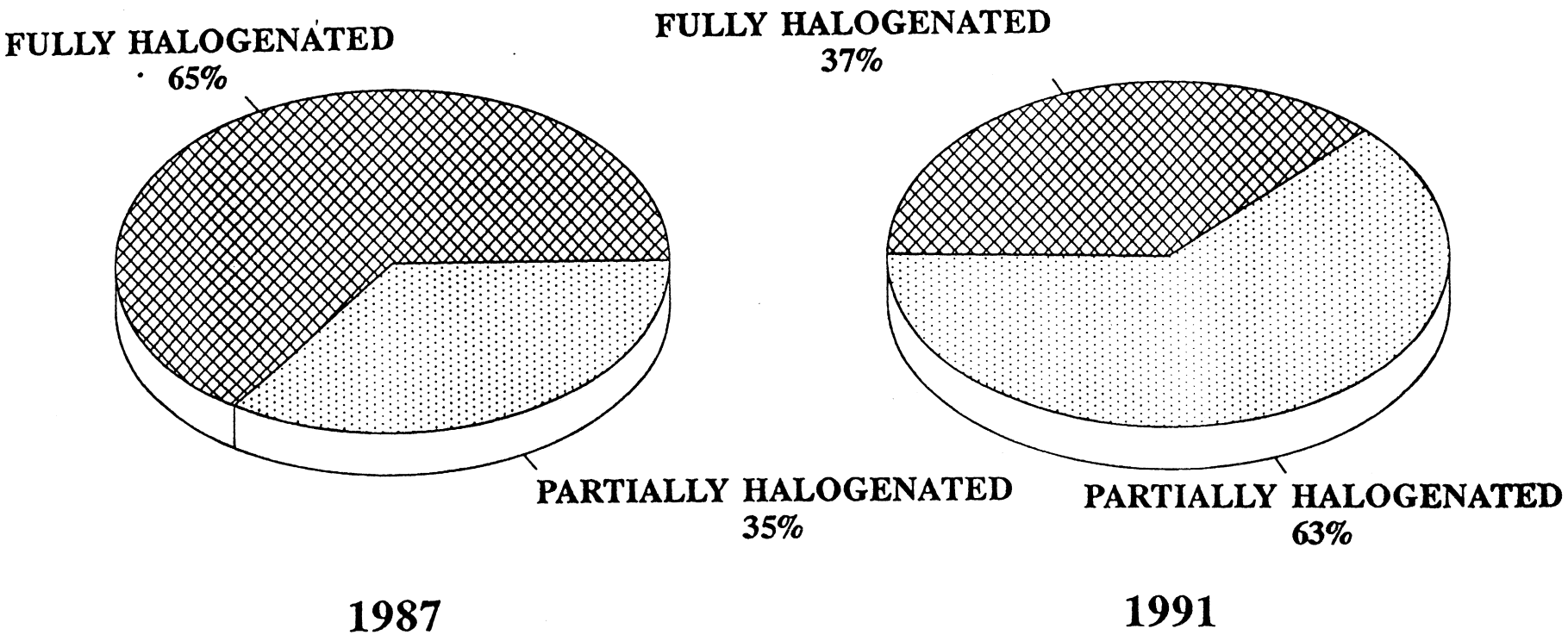
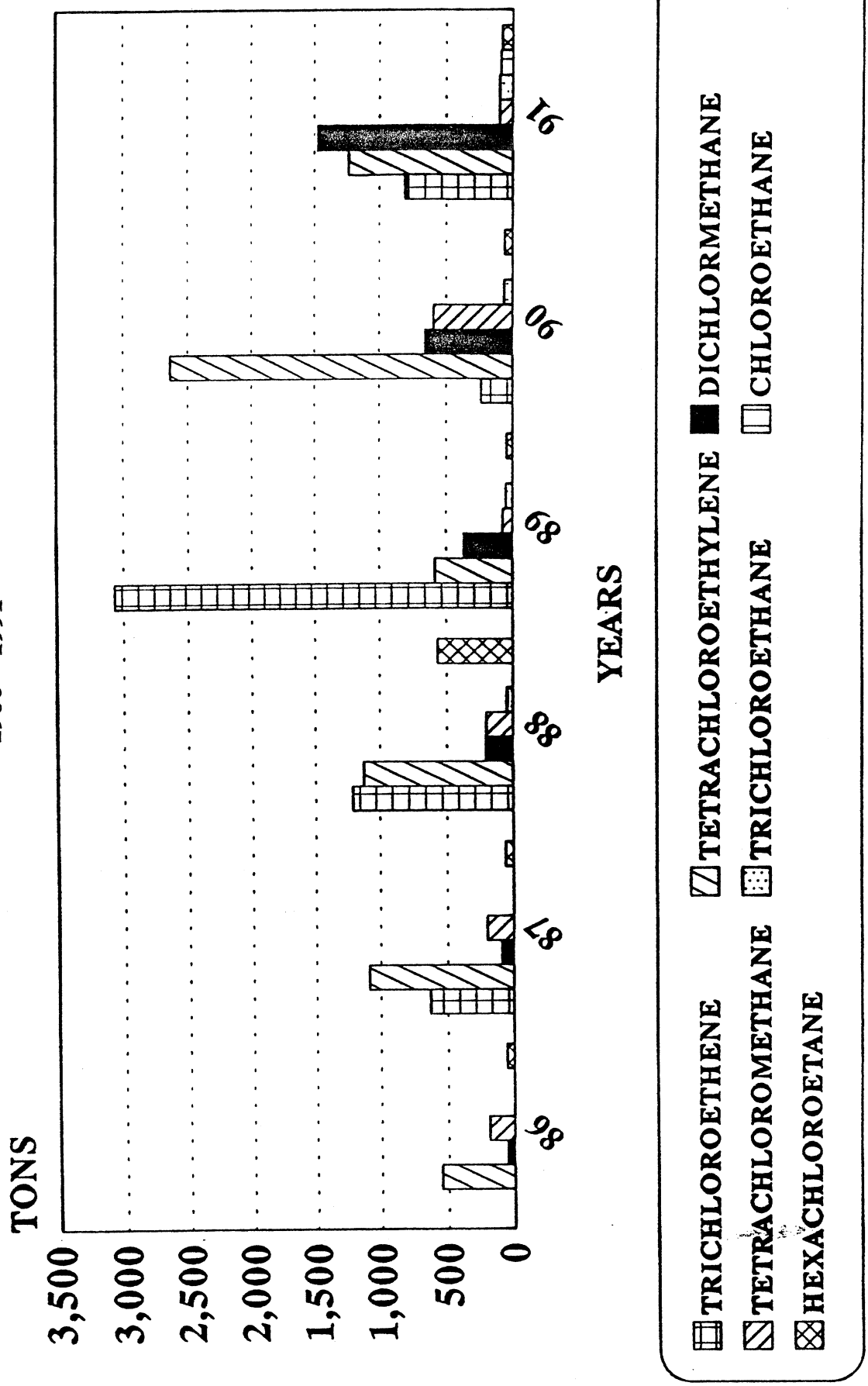


FIGURE 10
TREND OF CHLORINATED HYDROCARBONS IMPORTED
BY EGYPT (AMOUNT IN TONS)
1986 - 1991



Halons

No information on the importation of halons can be traced prior to 1988, possibly because of their minimal use in Egypt before this date. Egypt's importation of halons as of 1989 is restricted to halon 1211 and halon 1301, for use as fire extinguishers. Figure 11 shows a stable importation of halons between 1988 and 1991, ranging from 236.5 tons and 220.2 tons (table 3). Figure 12 shows that halon 1211 represented 63% of halon importation in 1991.

Uses of Ozone Depleting Substances in Egypt

ODSs are mainly used in the refrigeration industry, in plastic foam production, as aerosol propellants, solvents, and fire extinguishers.

Refrigeration

The use of CFCs in the refrigeration industry increased between 1986 and 1991, from 587 to 1,577 tons, as shown in table 4. Fully halogenated CFCs used for household and commercial refrigeration in Egypt are F12 and F115. Partially halogenated CFCs used are F22 and F31, which are mainly used in small quantities for air conditioning units.

The total increase in the use of ODSs in the refrigeration industry is mainly attributed to the increase in the production of air conditioning units, as shown in figure 6. This has resulted in a combined increase in the imports of F22 and F31, from 250 tons in 1986 to 1088 tons in 1991. This means that the use of partially halogenated CFCs in 1991 was four times as high as it had been in 1986. A drop in the production of refrigerators, however, resulted in the decreased use of F12 and F115 between 1988 and 1990, as presented in figure 7.

In 1991, the increase in the demand for mobile air conditioners in cars, buses, trains, and mobile food freezers, resulted in increased importation of F12, reaching 394 tons from 221 tons in 1990.

Aerosols

Pesticides and Cosmetics were the two main industries in Egypt using the fully halogenated CFCs, F12 and F114, as aerosol propellants. In the late 80s, the production boom of both industries resulted in an increase in their importation from 64 tons in 1986 to 99 tons in 1990, as shown in table 5. However, the Minister of Industry's Decree on November 8, 1989, banning the use of CFCs as propellants in aerosols as of 1991, and the subsequent replacement of CFCs by liquified petroleum gas (LPG) in the pesticide industry and, to some extent, in cosmetics, resulted in a sharp drop in the use of CFCs as propellants to 53 tons in 1991. The importation of F12 and F114 for use in the above-mentioned industries is expected to be negligible in 1992

FIGURE 11
TREND OF HALONS IMPORTED BY EGYPT
1988 - 1991

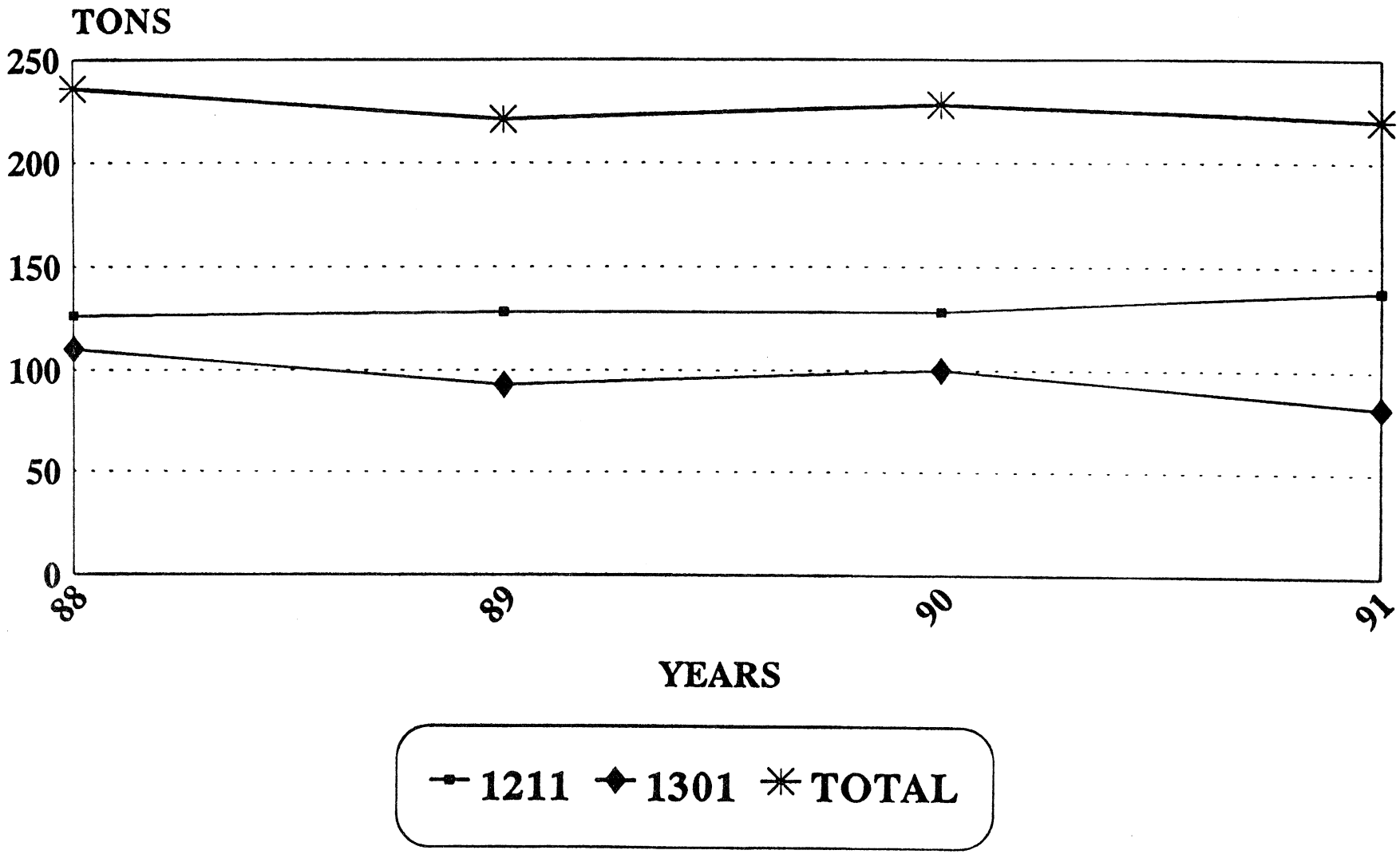
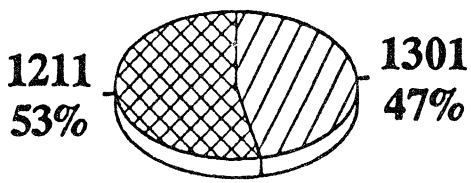
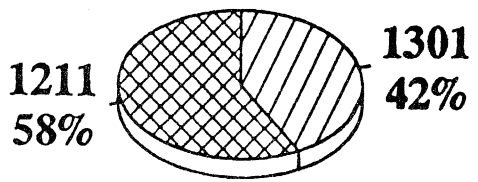


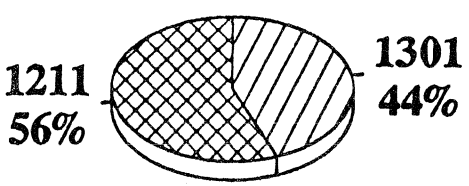
FIGURE 12
TYPE AND PERCENTAGE OF HALONS IMPORTED
BY EGYPT
1988 - 1991



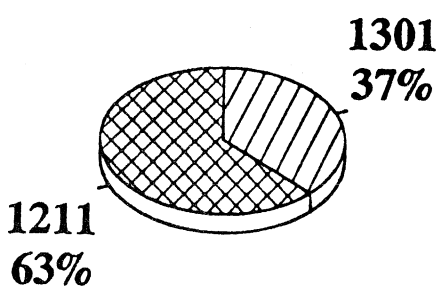
1988



1989



1990



1991

TABLE 4
OZONE DEPLETING SUBSTANCES USED IN EGYPT
AS REFRIGERANTS (AMOUNT IN TONS)
1986 - 1991

ABBREVIATION	SUBSTANCE	FORMULA	REFRIGERANTS					
			1986	1987	1988	1989	1990	1991
FULLY HALOGENATED CFC'S								
F 12 *	DICHLORODIFLUOROMETHANE	CCl2F2	260.00	266.00	249.00	185.00	221.00	394.00
F 115 *	CHLOROPENTAFLUROETHANE	CCIF2–CF3	77.00	81.00	92.00	89.00	95.00	95.00
SUB TOTAL			337.00	347.00	341.00	274.00	316.00	489.00
PARTIALLY HALOGENATED CFC'S								
F 22 **	CHLORODIFLUOROMETHANE	HCCLF2	200.00	220.00	478.00	454.00	917.00	965.00
F 31 **	TRIFLUOROMTHANE	CHF3	50.00	186.00	0.05	2.00	17.00	123.00
SUB TOTAL			250.00	406.00	478.05	456.00	934.00	1088.00
GRAND TOTAL			587.00	753.00	819.05	730.00	1250.00	1577.00

* MAINLY USED IN REFRIGERATORS

** MAINLY USED IN AIR CONDITIONERS

TABLE 5
OZONE DEPLETING SUBSTANCES USED IN EGYPT
AS PROPELLANTS (AMOUNT IN TONS)
1986 - 1991

ABBREVIATION	SUBSTANCE	FORMULA	PROPELLENTS					
			1986	1987	1988	1989	1990	1991
F 12	DICHLORODIFLUOROMETHANE	CCl2F2	50.00	54.00	59.00	68.00	72.00	35.00
F 114	1,2–Dichlorotetrafluoroethane	CCIF2–CCIF2	14.00	24.00	25.00	23.00	27.00	18.00
TOTAL (TONS)			64.00	78.00	84.00	91.00	99.00	53.00

Plastic Foam Production

Rigid and soft plastic foams have different properties and applications. Rigid plastic foams are primarily used as filler and as packing material. Soft foam is primarily used in upholstered furniture, car seats, mattresses, and so forth. F_{11}, which is a fully halogenated CFC, has been the major blowing agent in the plastic foam industry in Egypt. This is because of its high Maximum Allowable Concentration (MAK), in addition to its being particularly well suited to manufacturing polyurethene because of its high boiling point (24 C) and its low thermal conductivity. Consequently, no substance other than F11 has been used to date for the production of rigid foam in Egypt. Chlorinated hydrocarbons have been introduced into the plastic foam industry to replace F11 as blowing agents for the production of soft foam. Consequently the importation of dichloromethane, F30, rose from 520 tons in 1986 to 1,473 tons in 1991. Chloroethane (ethylchloride), or F160, another chlorinated hydrocarbon used in Egypt as a blowing agent, was only introduced to the country in 1991, when 90 tons were imported for soft foam production. Table 6 shows the considerable drop in the use of F11 between 1986 and 1991, despite the overall increase in foam production over that same period.

Fire Extinguishers

Halons are ozone depleting halogenated hydrocarbons used mostly for fire extinguishing purposes. The only halons used in Egypt are halon 1301 and halon 1211. These compounds have the highest ozone depletion potentiality relative to F11. Until 1987, these two compounds were used in very small quantities in Egypt. In 1988, however, the increased awareness of the importance of fir safety led to an increase in the production of fire extinguishers, and resulted in the importation of 236.5 tons that year, dropping slightly to 220.2 tons in 1991 (table 3).

Solvents

ODSs used as solvents are mainly chlorinated hydrocarbons and - in much smaller quantities CFCs. The main CFC, F113, is a fully halogenated CFC used as a cleaning agent in the electrical engineering and electronics fields. the amount of F113 used during the period from 1986 to 1991 never exceeded 3 tons per year (table 7). Chlorinated hydrocarbons are largely used in Egypt due to their excellent degreasing properties. They are primarily used as solvents for surface treatment and dry cleaning purposes. Chlorinated hydrocarbons used as metal degreasers and cleaners in Egypt are mainly trichloroethene and tetrachlorethane, which are used interchangeably. Their combined trend shows an increase in consumption from 1,716 tons in 1987 to 2,871 tons in 1990. As of 1988, another chlorinated hydrocarbon, trichloroethane, was introduced for sue as a metal cleaner. This substance has been used in limited quantities of 45 to 100 tons per year. Finally, tetrachloroethane is still widely used as a solvent in Egypt - 597 tons in 1990 - although it is now rarely used in the West because of its toxic properties.

TABLE 7
NE DEPLETING SUBSTANCES USED AS SOLVENTS BY EGYPT (AMOUNT IN TONS) 1986 - 1991

STANCE	FORMULA	SOLVENTS					
		1986	1987	1988	1989	1990	
UOROETHANE	CCL2F-CCL2F	2.00	3.00	3.00	2.00	3.00	
IENE	CHCL=CCL2	0.00	629.00	1210.00	3068.00	236.00	
METHANE	CCL4	187.00	200.00	202.00	75.00	597.00	
ETHENE (Per.)	CL2C=CCL	550.00	1087.00	1125.00	587.00	2635.00	1
ANE	CH3-CH2CL	0.00	0.00	45.00	50.00	65.00	
N S)		739.00	1919.00	2585.00	3782.00	3536.00	2

ABBREVIA
F 11
F 30
F 160

TABLE 6
OZONE DEPLETING SUBSTANCES USED IN FOAM PRODUCTION BY EGYPT (AMOUNT IN TONS) 1986 - 1991

TION	SUBSTANCE	FORMULA	PLASTIC		
			1986	1987	1988
	TRICHLOROFLUOROMETHANE	CCl3F	335.00	340.00	302.00
	DICHLOROMETHANE	CH2CL2	52.00	93.00	207.00
	CHLOROETHANE (Ethylchloride)	CH3–CH2CL	0.00	0.00	0.00
	TOTAL (TONS)		387.00	433.00	509.00

1991
1.00
810.00
100.00
234.00
100.00
245.00

Ozone Depletion Potentiality (ODP) in Egypt

Table 8 presents the ODP of ODSs used in Egypt, calculated against one metric ton of F11. It shows a drop in Egypt's ODP from an F11 metric ton equivalent of 2,443.2 in 1988 to an F11 metric ton equivalent of 2,021.05 in 1991. This is largely due to a drop in the importation of fully halogenated CFCs and the rising cost of halon imports.

COST OF IMPORTS OF OZONE DEPLETING SUBSTANCE

Figure 13 is a graphical representation of the cost of ODS importation between 1986 and 1991, by substance and year. Table 9 gives a breakdown of ODSs imported between 1986 and 1991, classified by quantity, price, and price per ODS.

The steady rise in the cost of importing ODSs is a result of an increase in both quantity demanded and price. It is noteworthy, however, that in the case of fully halogenated CFCs, Egypt's expenditures rose by 26% from 1987 to 1991, despite a 16% decrease in the quantities imported for these same years. The price of F12, for example, rose from US $ 1,490/ton in 1987 to US $ 2,150/ton in 1991. Finally, Egypt spent a total of US $ 7.4 million on the importation of CFCs in 1991, as compared with US $ 2.7 million four years earlier.

Cost of Compliance with the Montreal Protocol

The Montreal Protocol allows developing countries a ten-year grace period, during which they can meet their basic needs, provided they maintain annual consumption levels of controlled ODSs below 0.3 kg per capita. Despite this leeway, and despite per capita consumption levels that are well below those stipulated by the Montreal Protocol, Egypt made serious efforts to reduce its consumption level of CFCs as of 1989. The nation's per capita consumption of 0.02 kg in 1988 dropped even further in 1991, to reach 0.018 kg. This drop is largely due to a reduction in the use of fully halogenated CFCs as aerosol propellants and in the plastic foam industry.

Cost of Phasing Out CFCs in Aerosols

The use of CFCs as aerosol propellants was phased out as of August 1991. The capital cost of phasing out CFCs in pesticides was US $ 4.2 million, while that of phasing out CFCs in cosmetics was US $ 2.1 million.

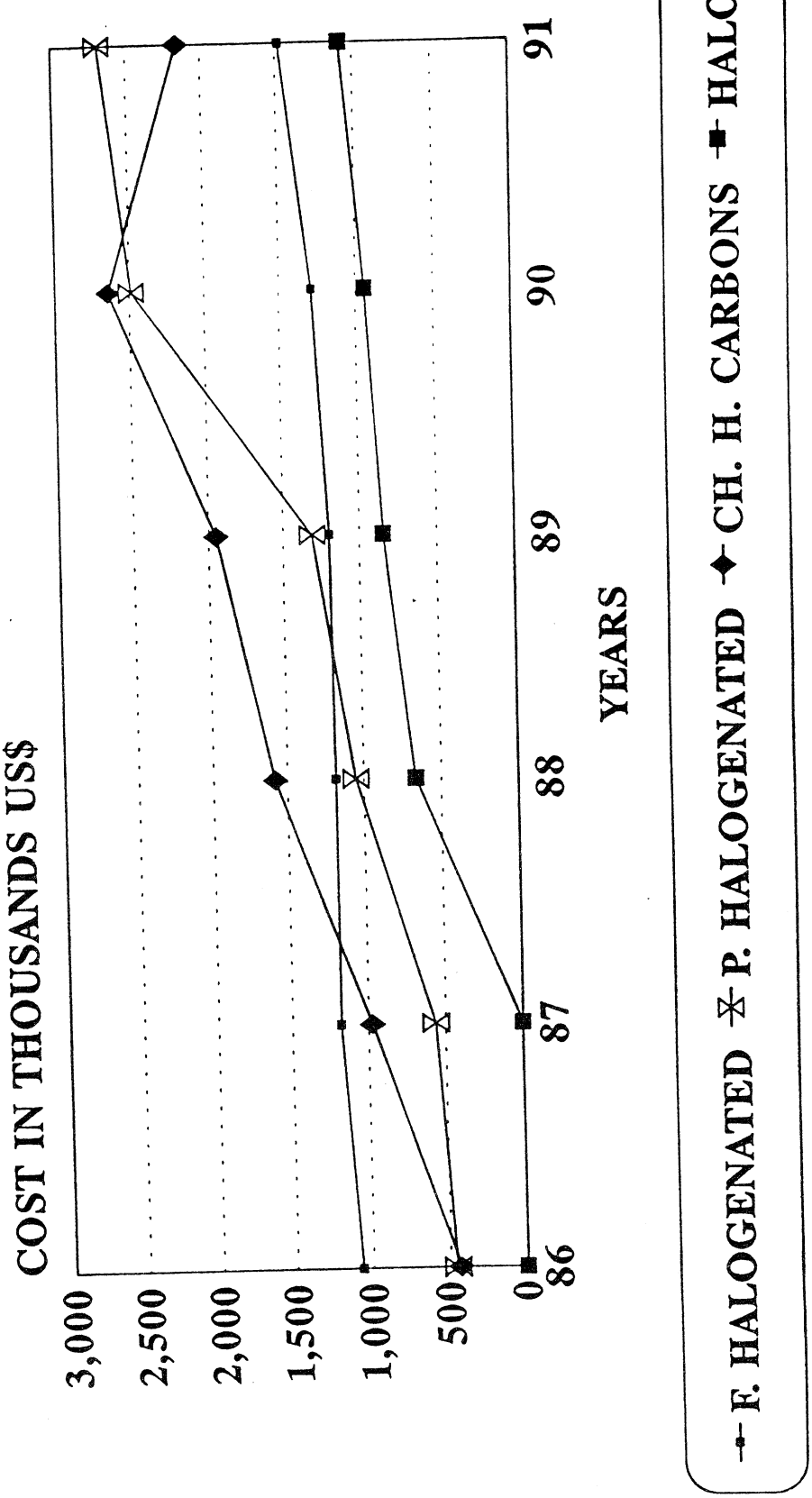
Cost of Replacing CFCs in Soft Plastic Foam Production

The capital cost of replacing F11 with chlorinated hydrocarbons was about US $ 3.6 million. To complete the phaseout of CFC use in soft and rigid foam production by 2010, the estimated cost ranges between US $ 12.6 million and US $ 14 million.

TABLE 8
ESTIMATED ODP IN EGYPT
EQUIVALENT TO F11 METRIC TONS

POTENTIAL	SUBSTANCE	ALL EGYPT					
		1986	1987	1988	1989	1990	1991
	FULLY HALOGENATED						
1.00	F 11	335.00	340.00	302.00	206.00	180.00	100.00
1.00	F 12	310.00	320.00	308.00	253.00	293.00	429.00
0.80	F 113	1.60	2.40	2.40	1.60	2.40	0.80
1.00	F 114	14.00	24.00	25.00	23.00	27.00	18.00
0.60	F 115	46.20	48.60	55.20	53.40	57.00	57.00
	PARTIALLY HALOGENATED						
0.05	F 22	10.00	11.00	23.90	27.25	45.85	48.25
	CHLORINATED HYDROCARBONS						
1.20	TETRACHLOROMETHANE	224.40	240.00	242.40	90.00	716.40	120.00
0.14	TRICHLOROETHANE	--	--	6.30	7.00	9.10	14.00
	HALONS						
3.00	1211	--	--	378.00	384.00	384.00	414.00
10.00	1301	--	--	1100.00	930.00	1000.00	820.00
	GRAND TOTAL	941.20	986.00	2443.20	1975.25	2714.75	2021.05

FIGURE 13
COST OF OZONE DEPLETING SUBSTANCES
IMPORTED BY EGYPT
1986 - 1991



ALL PRICES ARE IN US$

TABLE 9
PRICE & TOTAL COST OF OZONE DEPLETING SUBSTANCES IMPORTED FOR USE IN EGYPT
1986 - 1991

SUBSTANCE	1986			1987			1988			1989			1990			1991		
	QTY.	P/TON	T.PRICE	QTY.	P/TON	T.PRICE	QTY.	P/TON	T.PRICE	QTY.	P/TON	T.PRICE	QTY.	P/TON	T.PRICE	QTY.	P/TON	T.PRICE
FULLY HALOGENATED																		
F 11	335	1100	368500	340	1130	384200	302	1200	362400	206	1200	247200	180	1200	216000	100	1250	125000
F 12	310	1380	427800	320	1490	476800	308	1490	458920	253	2150	543950	293	2150	629950	429	2150	922350
F 113	2	2600	5200	3	2830	8490	3	2900	8700	2	3310	6620	3	3310	9930	1	3300	3300
F 114	14	2380	33320	24	2390	57360	25	2410	60250	23	2470	56810	27	2470	66690	18	2600	46800
F 115	77	3010	231770	81	3100	251100	92	3170	291640	89	3850	342650	95	3850	365750	95	4050	384750
SUB TOTAL	**738**		**1066590**	**768**		**1177950**	**730**		**1181910**	**573**		**1197230**	**598**		**1288320**	**643**		**1482200**
PARTIALLY HALOGENATED																		
F 22	200	2150	430000	220	2200	484000	478	2200	1051600	545	2400	1308000	917	2700	2475900	965	2700	2605500
CHLOROFLUOROMETHANE	50	410	20500	186.76	410	76571.6	0.05	480	24	2	550	1100	17.76	630	11188.8	123	700	86100
SUB TOTAL	**250**		**450500**	**406.76**		**560571.**	**478.05**		**1051624**	**547**		**1309100**	**934.76**		**2487088**	**1088**		**2691600**
CHLORINATED HYDROCARBONS																		
TRICHLOROETHENE	0	360	0	629.37	370	232866.	1210	400	484000	3068	400	1227200	236.37	410	96911.7	810.77	505	409438.
TETRACHLOROETHYLENE (Per.)	550	460	253000	1087	490	532630	1125.0	540	607527	587.99	540	317514.	2635.0	415	1093529	1234	375	462750
DICHLOROMETHANE (METHYLENECHLORIDE)	52	495	25740	93	510	47430	207	560	115920	371	560	207760	660	600	396000	1473	620	913260
TETRACHLOROMETHANE	187	530	99110	200	530	106000	202	1550	313100	75	1550	116250	597	1590	949230	100	1600	160000
TRICHLOROETHANE	0	690	0	0	725	0	45	760	34200	50	760	38000	65	800	52000	100	810	81000
CHLOROETHANE (Ethylchloride)	0	440	0	0	455	0	0	565	0	0	565	0	0	570	0	90	600	54000
HEXACHLOROETHANE *	55	895	49225	60	910	54600	30	930	27900	45	930	41850	60	950	57000	80	1015	81200
SUB TOTAL	**844**		**427075**	**2069.3**		**973526.**	**2819.0**		**1582647**	**4196.9**		**1948574**	**4253.3**		**2644670**	**3887.7**		**2161648**
HALONS																		
1211	N/A	N/A	0	N/A	N/A	0	126.5	2100	265650	128	3000	384000	128	3500	448000	138	4900	676200
1301	N/A	N/A	0	N/A	N/A	0	110	3600	396000	93	4960	461280	100	4960	496000	82	5040	413280
SUB TOTAL	**0**		**0**	**0**		**0**	**236.5**		**661650**	**221**		**845280**	**228**		**944000**	**220**		**1089480**
GRAND TOTAL	**1832**		**1944165**	**3244.1**		**2712048**	**4263.6**		**4477831**	**5537.9**		**5300184**	**6014.1**		**7364079**	**5838.7**		**7424928**

* USED AS DEGASSING AGENT

N/A (NOT AVAILABLE IN EGYPT)

Estimated Cost of Phasing Out CFC Use in the Refrigeration

a. Household Refrigerators

- Estimated cost for the replacement of fully halogenated CFCs by ternary blends is US $ 5.60 per kg of CFC, totaling about US $ 4.3 million. The total cost includes the incremental capital cost from 1992 to 2010.

- The estimated cost for the replacement of fully halogenated CFCs by HFC-152a is US $ 7.42 per kg, totaling about US $ 3.7 million. Incremental capital cost covers 1992 to 2010.

- The estimated cost of reducing fully halogenated CFCs in household refrigerators by 50% by using an evaporator and condenser tubing that is longer and smaller in diameter to provide the same refrigeration characteristics with higher energy efficiency is US $ 4.75 million.

b. Industrial/Commercial Refrigerators

The estimated cost for the replacement of CFCs by ternary blends over the period from 1992 to 2010 amounts to a total of US $ 2.4 million.

c. Air Conditioners

The estimated cost for the replacement of CFCs in the production of air conditioners over the period from 1992 to 2010 is estimated at US $ 5.3 million for both household and mobile units.

The cost to Egypt of phasing out CFCs by the year 2010 would be: US $ 7,564,000 according to scenario 1; US $ 64,013,000 according to scenario 2; US $ 10,938,000 according to scenario 3; and US $ 92,576,000 according to scenario 4 (table 10).

TABLE 10

Costs to Egypt of phasing out CFC consumption for 1990 - 2010 period (Thousands of U.S.$)

			Scenarios			
			I	II	III	IV
Growth Rate Consumption		Percentage (%)	2	2	4	4
Growth Rate Costs		Percentage (%)	5	30	5	30
Compound	End Use	Substitute				
CFC-11	Insulation and Packing Foam	HCFC-123	643	5,443	930	7,871
CFC-12	Refrigeration and Air Conditioning	HCFC-134A	6,919	58,555	10,006	84,683
	Aerosols	Compressed Gas	0	0	0	0
CFC-113	Solvent	Aqueous Clean	2	15	3	22
CFC-114	Aerosols	Compressed Gas	0	0	0	0
Total Costs			7,564	64,013	10,938	92,576