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# VERIFICATION OF NATIONAL CONSUMPTION TARGETS OF MULTI-YEAR AGREEMENTS (MYAS) for CFCs and CTC In SUDAN IN 2005

## Revised Report
**(Final – version 2006)**


**Verification team leader**

**Hassan A. Osman**
**Sudan University of Science and Technology**
**College of Engineering**
**Department of Mechanical Engineering**
**Mechanical power Section**

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## Abstract

Sudan has ratified the Montreal protocol with all its amendments and have obligated to phase - out the ozone depleting substances (O.D.S). The present verification project of the national CFC/CTC consumption in Sudan in 2005 aims to Annex A- group 1 substances (CFC) especially CFC-11 and CFC- 12, and Annex B- group 11 substances (CTC).

The federal government of Sudan controls the CFC and CTC consumption. The consumption has been gradually declined since 1996.

The present national phase- out plan (NPP) covers Annex A- group 1 substances, Annex B- group 11 substances for the phase out.

Sudan base line average consumption of Annex A- group 1 substances amounted to 456.8 ODS tonnes. The country has always been in compliance with the Montreal protocol control measures for CFC consumption due to multilateral fund assistant scheme.
In the present national phase–out plan, activities are going on to phase – out the small amount of CTC (0.33 ODS tonnes).

Sudan has no CFC production. All CFC consumed for manufacturing and servicing purposes are imported mainly from Western Europe.

In 2003 the CFC consumption in manufacturing sector is relatively small and will be phased–out through relevant programs proposed by (NPP).

The major CFC consumption exists in the refrigeration service sector.
The consumption was effectively reduced through implementation of refrigerant management plan (RMP) with other arrangements; Sudan will achieve the 50 % reduction target in 2005, 85 % reduction in 2007 and zero consumption after 2010 in terms of CFC consumption.

Verification of CFC/CTC consumption in Sudan in 2005 is crosschecked with all authorities, customs offices in east, west and north of the country and evaluation of RMP project.

## 1. Introduction:

Having ratified the Montreal Protocol and its Amendments, Sudan agreed on and undertook obligation to control ozone-depleting substances (ODS). The ODS, particularly CFCs trade in Sudan is under the Government control. There is a precise administrative procedure for issuing licenses for CFCs imports/exports. Although these procedures are similar in Sudan, there are some differences in system of monitoring and reporting on import/export of CFCs in these two countries.

## 2. National legislation polices and procedures on ODS imported.

### 2.1 Channel of Communication

The higher national council for environment and natural resources (HNCENR) and ministry of environment has taken the leading role in the compliance with Montreal protocol. The ( HNCENR ) is the highest government institute to control environmental programmes in Sudan and it is supervising the national ozone unit (NOU). The national committee for implementation of the Montreal protocol, which was selected from best national institutions, was participated in planning forming policies legislation and procedures for running, monitoring all refrigerant management plans in Sudan.

### 2.2 ODS Data Collections

An extensive survey was carried out under the above-mentioned bodies to collect the ozone depleting substances in Sudan. All statistics of their survey were brought to NOU which accordingly divide the ODS consumption into industrial sector, service sector aerosol sector and foam sector.

The main objectives of the survey were to evaluate the potential for ODS and from these start planning of how to control the ODS consumption through a national phase–out plan, which supervises all projects taken into action e.g. R.M.P in refrigeration services sector and rehabilitation of industrial sector. As well as all the training programmes. The first training was carried out for customs. To control all legal or illegal imports of ODS.

Since imports equal consumption. It was found that the refrigeration service sector is the most significant consuming sector. The CFC used in this sector is for maintenance and services of domestics, commercial and industrial refrigeration and air conditioner systems. This sector is widely

dispersed through out the country. The numbers of service workshops are increasing rapidly mainly in greater Khartoum area and other major cities. The number of service workshops in Sudan is about 3000 shops.

The C.F.C consumption in refrigeration service sector and its distribution along C.F.C consumption allocated to aerosol sector (30 ODP tonnes) and 6 ODP tones of C.F.C consumption in foam sector are shown below:

## 2.3 Manufacturing Sectors

## C.F.C/C.T.C consumption in refrigeration manufacturing sector:

The general strategy of reduction of C.F.C. consumption is to minimize the C.F.C. consumption in the aerosol sector. The steps taken are to thank the multilateral fund, which assisted almost in the majority reduction of C.F.C. consumption in the aerosol sector. The 30 ODP tonnes will be processed out with the project included in the national phase out plan (NPP) by 2006. In the refrigeration-manufacturing sector, the companies, which utilize C.F.C. for their production, have already phased out C.F.C. either by implementation of MLF projects or by their own investments.

The mass production of refrigerators and freezers from largest production companies (Cold air, Liebherr and Alraa ) are changed with ozone friendly refrigerant (HFC 134-A) the remaining companies in the manufacturing sector are taken into consideration of RMP projects. Workshops and awareness promotion will ensure the sustainability of non-ODS operation in refrigeration manufacturing sector.

As a summary there will be no C.F.C. consumption in the manufacturing refrigeration sector by 2007. This is an important step toward achieving the compliance of 2007. The CTC consumption in the Sudan is very small amount 0.33 ODP tonnes, which used in laboratories.
It is already phased out replacing with none ODS. The consumption of C.T.C is zero in 2006.

## 2.4 Refrigeration service sector:

A policy establishment and its enforcement in this sector become essential so as to start the long time consuming project with the relevant activities. An international expert carried out the training of trainers in good refrigeration practice. A nation wide (except the south) training techniques in good refrigeration service practices as well as to use the recovery and recycling machines still going on. The

goal of these training programs is to stop the emission of C.F.C to the atmosphere by teaching the good practice and to get rid of the causes and practices that lead to C.F.C. vented into air. Those technicians were thought the best way to recover and recycle the refrigerant charged into the systems. These technicians were considered as a base to train other technicians and craft men all over the largest African country.

## 2.5 RMP in Sudan

The policy instruments to carry out the refrigerant management plan in Sudan were:

1. Teaching the trainers the atheistic of ozone.
2. Teaching them that they must be one of the participants of human well being by protecting the ozone layer.
3. To keep the R and R machines running efficiently and effectively as long as possible.
4. Teaching them the safety factors to deal with chemicals (Refrigerants) and how to detect leaks.
5. To (acquaint) learn good refrigeration maintenance and service practice.
6. Establishment of a good system of communication and feedback between the centers and the NOU.

Cost information

- Cost of recovery at every service workshop and parties who bear the cost,
- Cost of reclamation at every reclaim centre and parties who bear the cost,
- Price of reclaimed CFC refrigerants,
- Other financial information relevant to monitoring the system to reuse ODS
-
- Data and information collected will be analyzed to check the adequate operations of the scheme.

Control of service methods and equipment containing ODS

- Clarification on ban on flushing refrigeration and air-conditioning systems with CFCs;
- Ban on charging systems designed for non CFC with CFC, e.g. ban "backwards retrofits";
- Ban of "top up" charging systems without leak detection and corrective measures.

Refrigerant management legislation

- Ban the sales of CFC to non-licensed entities;
- Harmonising the terminology with that used internationally concerning recycled and reclaimed material;
- Harmonization of ban on use of disposable cylinders with the international community;
- Authority to limit the import of CFC to importers who follow requirements stipulated in the national scheme to cover costs in the recovery/reclamation program;
- Prescribing work with refrigeration and air-conditioning equipment in compliance with the Code of Practice (e.g. when established).

## 2.6 Policy framework:

The policies of the government of Sudan traditionally rely on broad consultation with different interest groups of the society. Command and control policies in areas relevant to the implementation of the Protocol are not generally preferred. However in the current constitutional and administrative situations, the Government has issued rules and regulations.

Taxation especially in the form of excise and import duties is mainly used for revenue collection and has not at all been used as a prevention and control measure.

All key players regarding ODS consumption are in the private ownership in Sudan and no change is expected in this respect. For the Sudanese society and economy food processing and preservation and the textile industry are extremely important. Thus the possible and related measures regarding terminal of ODS are assessed against this background.

The Higher Council for Environment and National Resources has established a special broad based National Committee for the implementation of the Montreal Protocol, including NGOs and the private sector beside relevant representatives of the public sector. It is clearly understood that the phase-out of ODS is a necessity and obligation, and Sudan has to follow the international development. The Government of Sudan believe that the quick phase-out will best serve the interests of the society

economy, industries and business thus preventing the country suffering from outdated equipment and operations in the future.

## 2.7 CTC Phase-out program

Controlled ozone depleting solvents application in Sudan is not significant. CTC is used in Sudan mainly for the following purposes:

- Laboratory purposes by numerous small consumers, 0.6 MT
- Textile cleaning and industrial solvent, 0.4 MT

The use of methyl chloroform as a solvent was also identified by the industrial and consultancy center, but in negligible quantity.

Both of CTC and TCA will be phased-out through technical assistant component (such as workshop on alternative technology) proposed in the NPP, and no investment program is included.

Information will be collected from recycling centres and workshops in terms of CFC quantity and material price and cost; examples of type of information to be collected are as below.

## 2.8 Existing legislations

## Existing legislations

Sudan will rely on the existing legal framework (with the necessary amendment and modification in the by-laws). Moreover it is prepared to take all necessary administrative steps to enhance the phase-out measures in a timely manner according to the provisions of the Montreal Protocol and its amendments. The management and organization of Ozone sphere penetrating substances regulation 2001 (by-law issued under Environmental Protection Act 2001)

The highlights of the by-law are:

I. Requirement of permission from the committee, formed under the by-law, for any imports-or exports containing chemical materials mentioned in the schedules of the by-law (ozone depleting substances including CFCs, Halons, Methyl bromide, HCFCS, Equipment containing ODS etc).

II. Ban of import of refrigerators and air conditioners containing or using the materials mentioned in the first schedule (CFCs).

III. As from Jan. 2001 there was a ban on vehicles, which contain refrigerators, and air conditioning units containing ODS mentioned in the first schedules (CFCs).

IV. Ban on import of aerosols containing (ODS) expected in medical sprayers used for asthma.

V. Label requirement.

VI. Requirement of permission from the committee for any new establishment or activity in which the substances under control are used.

VII. Provision of information is mandatory.

VIII. Avoidance of leak of ODS into the air during maintenance and recycling.

IX. Requirement of permission from the committee for any business and repairs operations.

X. Requirement of the availability of leak-detection equipment for ODS in all companies and industries carrying out business of repair.

XI. Ban on using halons material when substitutes like Co2, water and dry powder are available.

XII. Ban on use of halons for training purposes.

XIII. Ban on fire combating systems using halons as from Jan. 2007.

XIV. Ban on use of control materials (ODS) for the manufacture of foaming materials.

XV. Punishment is indicated in the form of a fine and confiscations.

## 2.9 CFC quantity

- Number of appliances subjected to refrigerant recovery and type of these appliances at every service workshop,
- Amount of recovered CFC refrigerants at every workshop,
- Amount of recovered CFC refrigerants sent to the reclaim centres at every workshop,
- Amount of recovered CFC refrigerants stored at every workshop,
- Amount of recovered CFC refrigerants received from service workshops at every reclaim centre,

- Amount of recycled CFC refrigerants at reclaim centres,
- Amount of recycled CFC refrigerants returned (sold) to workshops,
- Amount of recycled CFC refrigerants used in workshops and its application,
- Amount of CFC refrigerants, which can not be recycled and are subject to further treatment (e.g., decomposition plants abroad)
- Other data relevant for monitoring the scheme (amount of imported CFC refrigerants etc.).

## 2.10 Licensing

Introduction of a system of quotas.

Fixing of dates of terminal phase-out of certain ODS.

Regulation of recycled CFCs.

Regulation of importation of recycled CFCs.

Introduction of a system for reclamation.

Ministerial Decree 2001 for the measures for management and control of ozone depleting substances This decree further indicates the mechanisms for the enforcement of the by-law for the Management and Organization of Ozone Penetrating Substances 2001.

## 2.12 Other by-laws

By-laws which are indirectly relevant for the control of ODS are, -

I. Environment Protection Act 2001

II. Pesticides and Pest Control Product Act 1994 (methyl bromide)

III. Pharmacy and Poisons Act (medical aerosols)

IV. Customs Act (control of importation)

V. National Strategy on Environmental Protection (framework)

VI. Meteorology and Standards Act (control)

## 3. Verification of refrigeration management in Sudan:

## 3.1 Verification of import data of CFC and CTC in 2004 and 2005

I order to verify the data reported as provided in Appendix 1, followings governmental, industrial and other users were investigated.

- Ministry of Industry
- Customs offices in Khartoum, Nyala and Halfa.
- User of CTC. One single foam industry and some laboratories.

For the CFC consumption in Sudan the other end users e. g. manufacturing companies which did not appear in the list and some personal end users. Finally we conclude that Sudan will comply with Montreal protocol and will satisfy the obligation that limit the import and control all ODS by the assistant MLF programs.

CFC and CTC consumption in Sudan, 2004 and 2005, MT

| Year | ODS | Reported Data, MT | Imported by listed importers in Appendix 3 | Others End users etc. | Customs data | Verified data by this report |
|---|---|---|---|---|---|---|
| 2004 | CFC | 203 | 153 | 50 | 203 | 203 |
| 2004 | CTC | 0.6 | 0 | 0.6 | 0.6 | 0.6 |
| | | | | | | |
| 2005 | CFC | 185 | 132 | 53 | 185 | 185 |
| 2005 | CTC | 0.3 | - | 0.3 | 0.3 | 0.3 |

3.1.1 CFC-12 Data from Ministry of Industry (Appendix 11)

3.1.2 CTC Data from Ministry of Industry (Appendix 12)

## 3.2 Review of the refrigerant management activity

A graduation Engineering project was conducted in may 2006 under the title "Evaluation of RM P in Sudan" with special reference to Khartoum. A questionnaire and indirect Question to grasp the data they are indeed for evaluation.

The survey covers sixty (60) workshops randomly selected, 132 items were under investigation. Those items are:

- 60 Refrigerators and freezers
- 40 Window / split air conditioners
- 2 Package air conditioners.
- 30 Water coolers.

The average charge per refrigerator or freezer is 0.25 kg of CFC 12.
The average charge per window / split A/C is 1.35 kg of HCFC 22.
The average charge per water cooler is 0.5 kg CFC 12.

The survey lasts for one month. And the total amount of refrigerant recovered and recycled to those items is:

| | |
|---|---|
| 60 x 0.25 = | 15 kg CFC 12 |
| 30 x 0.5 = | 15 kg |
| | --- |
| Total CFC - 12 | 30 kg |

Total amount of recovered HCFC – 22 per month

| | |
|---|---|
| 40 x 1.35 = | 541 kg of HCFC - 22 |
| 2 x 3.5 = | 15 kg |
| | --- |
| Total | 61 kg |

The total amount of CFC recovered per year is,

30 kg/month x 12 month/ year = 360 kg = 0.36 tons

There are about 3,000 service workshops in Sudan 60 % of them in greater Khartoum i.e. 1,800. If 8% of these service shops were recovering that amount them.

The total recovered per year only in greater Khartoum is,

144 x 0.36 = 51.84 tones of CFC–12

therefore the 50% reduction in CFC in refrigeration service sector is reasonable and can be reached – this project was carried out under my own supervision and these figures are actually checked and weighted. By these and other regulatory system the 50% reduction is reasonable and possible to comply with ODS.

All the workshops covered in this project were aided from MLF project by Recovery and recycling machines. Vacuum pump, pricing valve, recovery cylinders and refrigerant filter driers. The technician working in those shops are highly experienced and well prepared to do the job according to the manufacturer's of R an R machine catalog and according to the practical demonstration of recovery and recycling of CFC during training periods.

Also the compressors of HFC-134a is becoming available in the local market and its cost is a little higher. Due to awareness of what is going on and the expectation that CFC will be phased out, the technicians and owners of the refrigerator tend to convert into HFC–134a intentionally.
Also the verification of 50% reduction in CFCs conversion of almost all refrigerators manufacturer were changed into ozone friendly refrigerants.

## 4. Conclusion

To conclude this verification report the policy is accurately investigated:

1) All ODS the refrigeration manufacturing sectors are phased out that all refrigerators and deep freezers are converted to new environmentally friendly refrigerants.
2) The regulation and laws are strictly applied to ban the import of any equipment that contains ODS.
3) In refrigeration service sector the R & R training are giving there results in recovery and recycling of ODS. That means no more refrigerant vented to air.
4) The customs are well equipped by refrigerant type detectors and they are keeping the control of ODS products or equipment that contains ODS. The outcome of the customs is that 20 T of illegal imports of ODS are detained.
5) The amount of CTC does no longer exist in SUDAN. The small amount that reregistered in 2003 are checked and no more CTC.
6) The CFC-11 is zero in all sectors and it is no available in Sudan.

## 5. Recommendation:

1) More advanced training in refrigeration service sector is needed.
2) Follow up and monitoring of out side states centers and workshops are weak.
3) The industrial sector needs more follow up and rehabilitation.

# Appendix 1

## Progress in implementation of Country Programmes (2004)

Data on controlled Substances (In metric Tonnes)

| Substance | Consumption by Sector | | | | | | | | | | | Import | Export | production |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Aerosol | Foam | Fire fighting | Refrigeration | | Solvent | Process agent | Methyl bromide | | Tobacco fluffing | Total | | | |
| | | | | Manufacturing | Servicing | | | QPS | Non-QPS | | | | | |
| Annex A Group 1 | | | | | | | | | | | | | | |
| CfC-11 | | | | | | | | | | | 0.00 | | | |
| CFC-12 | 30.00 | | | | 173.00 | | | | | | 203.00 | | | |
| CFC-123 | | | | | | | | | | | 0.00 | | | |
| CFC-114 | | | | | | | | | | | 0.00 | | | |
| CFC-115 | | | | | | | | | | | 0.00 | | | |
| Sub-Total | 30.00 | 0.00 | | 0.00 | 173.00 | 0.00 | 0.00 | | | 0.00 | 203.00 | 0.00 | 0.00 | 0.00 |
| Annex A, Group II | | | | | | | | | | | | | | |
| Halon 1211 | | | | | | | | | | | 0.00 | | | |
| Halon 1301 | | | | | | | | | | | 0.00 | | | |
| Halon 2402 | | | | | | | | | | | 0.00 | | | |
| Sub. Total | | | 0.00 | | | | | | | | | | | |
| Annex B, Group II | | | | | | | | | | | | | | |
| Carbon tetrachloride | | | | | | 0.60 | | | | | 0.60 | | | |
| Sub. Total | | | | | | 0.60 | 0.00 | | | | 0.60 | 0.00 | 0.00 | 0.00 |
| Annex B, Group III | | | | | | | | | | | | | | |
| Methyl | | | | | | | | | | | 0.00 | | | |

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Chloroform | | | | | | | | | | | | | | |
| Sub. Total | | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | | | | 0.00 | 0.00 | 0.00 | 0.00 |
| Annex C, Group I | | | | | | | | | | | | | | |
| HCFC-22 | | | | | | | | | | | 0.00 | | | |
| HCFC-141b | | | | | | | | | | | 0.00 | | | |
| HCFC-142b | | | | | | | | | | | 0.00 | | | |
| HCFC-123 | | | | | | | | | | | 0.00 | | | |
| Other | | | | | | | | | | | 0.00 | | | |
| Sub. Total | | | | | | | 0.00 | | | | 0.00 | 0.00 | 0.00 | 0.00 |
| Total | 30.00 | 0.00 | 0.00 | 0.00 | 173.00 | 0.60 | 0.00 | | | 0.00 | 203.6 | 0.00 | 0.00 | 0.00 |

## Revised Country Programme Report Format 2005

Data on Controlled Substances (In metric Tonnes)

| Substance | Consumption by Sector | | | | | | | | | | | | | Import | Export |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Aerosol | Foam | Fire fighting | Refrigeration | | Solvent | Process agent | MDI | Lab Use | Methyl bromide | | Tabacco fluffing | Total | | |
| | | | | Manufacturing | Servicing | | | | | QPS | Non-QPS | | | | |
| Annex A Group 1 | | | | | | | | | | | | | | | |
| CfC-11 | | | | | | | | | | | | | 0.00 | | |
| CFC-12 | 30.00 | | | | | | | | | | | | 185.00 | | |
| CFC-123 | | | | | | | | | | | | | 0.00 | | |
| CFC-114 | | | | | | | | | | | | | 0.00 | | |
| CFC-115 | | | | | | | | | | | | | 0.00 | | |
| Sub-Total | 30.00 | 0.00 | | 0.00 | 155.00 | 0.00 | 0.00 | 0.00 | 0.00 | | | 0.00 | 185.00 | 0.00 | 0.00 |
| Annex A, Group II | | | | | | | | | | | | | | | |
| Halon 1211 | | | | | | | | | | | | | 0.00 | | |
| Halon 1301 | | | | | | | | | | | | | 0.00 | | |
| Halon 2402 | | | | | | | | | | | | | 0.00 | | |
| Sub. Total | | | 0.00 | | | | | | | | | | 0.00 | 0.00 | 0.00 |
| Annex B, Group II | | | | | | | | | | | | | | | |
| Carbon tetrachloride | | | | | | 0.20 | | | 0.10 | | | | | | |
| Sub. Total | | | | | | 0.20 | 0.00 | | 0.10 | | | | 0.3 | 0.00 | 0.00 |
| Annex B, Group III | | | | | | | | | | | | | | | |
| Methyl Chloroform | | | | | | | | | | | | | 0.00 | | |
| Sub. Total | | | | | | 0.00 | 0.00 | | 0.00 | | | | 0.00 | 0.00 | 0.00 |
| Annex C, | | | | | | | | | | | | | | | |

| Group I | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| HCFC-22 | | | | | | | | | | | | | 0.00 | | |
| HCFC-141b | | | | | | | | | | | | | 0.00 | | |
| HCFC-142b | | | | | | | | | | | | | 0.00 | | |
| HCFC-123 | | | | | | | | | | | | | 0.00 | | |
| Other | | | | | | | | | | | | | 0.00 | | |
| Sub. Total | | 0.00 | 0.00 | 0.00 | 0.00 | | | | | | | | 0.00 | 0.00 | 0.00 |
| Total | 30.00 | 0.00 | 0.00 | 0.00 | 155.00 | 0.20 | | | 0.1 | | | 0.00 | 185.00 | 0.00 | 0.00 |

# Appendix 2

**Sector distribution of CFC consumption in 2003**

| | Aerosol | Foam | Ref.manuf. | Ref/w/s | Total |
|---|---|---|---|---|---|
| CFC11 | 0 | 6 | 0 | 0 | 6 |
| CFC 12 | 30 | 0 | 0 | 180 | 210 |
| Total | 30 | 6 | 0 | 180 | 216 |
| Total ODP (Tonnes) | 30 | 6 | 0 | 180 | 216 |

## Appendix 3

Companies that Imports ODS in 2004

| Name of Company | Tel. number | Quantity |
|---|---|---|
| El Italalli Basilli | 00249918877600 | 10 t |
| El Baddia trade | 00249912155832 | 20 t |
| Meannafarma Trade | 002499183775523 | 20 t |
| Abbrsi trade | | 20 t |
| Air liquification | 002499183461006 | 20 t |
| Dizsor trading | 002499183774709 | 10 t |
| Siba investment & trading | 002499183462572 | 6 t |
| Switch Engineering trading | 002499183489166 | 7 t |
| Union Distribution | 002499183772082 | 10 t |
| Al Mustakhal | 002499187463929 | 10 t |
| Menjos trading | 002499183781357 | 10 t |
| Elraa | 00249912309845 | 10 t |
| Total | | 153 t |

Companies that Imports ODS in 2005

| Name of Company | Tel. number | Quantity |
|---|---|---|
| El Italalli Basilli | 00249918877600 | 15 t |
| El Baddia trade | 00249912155832 | 20 t |
| Meannafarma Trade | 002499183775523 | 10 t |
| Abbris trade | | 11 t |
| Air liquification | 002499183461006 | 10 t |
| Dizsor trading | 002499183774709 | 10 t |
| Siba investment & trading | 002499183462572 | 10 t |
| Switch Engineering trading | 002499183489166 | 8 t |
| Union Distribution | 002499183772082 | 5 t |
| Al Mustakhal | 002499187463929 | 8 t |
| Menjos trading | 002499183781357 | 20 t |
| Elraa | 00249912309845 | 5 t |
| Total | | 132 t |

# Appendix 4

## Service equipment distributed to training/recycling centres

| No | State | Training/ Recycling Centre | Vacuum Pump | Recovery Machine | Recycling Unit | Drying filter | Recycling Cylinder | Recycling Bag | Piercing valve |
|---|---|---|---|---|---|---|---|---|---|
| 1 | Greater Khartoum | Khartoum North | 2 | 1 | 1 | 10 | 2 | 1 | 10 |
| 2 | Greater Khartoum | Khartoum 2 | 4 | 1 | 2 | 20 | 4 | 2 | 48 |
| 3 | Greater Khartoum | University of Sudan | 1 | 1 | - | - | 4 | 2 | 48 |
| 4 | Greater Khartoum | Omdurman | 2 | 1 | 1 | 10 | 2 | 1 | 10 |
| 5 | Greater Khartoum | Burry | 2 | 1 | 1 | 10 | 2 | 1 | 48 |
| 6 | Red Sea | Port-Sudan | 2 | 1 | 1 | 10 | 2 | 1 | 10 |
| 7 | Gazera | Wadi Madani | 2 | 1 | 1 | 10 | 2 | 1 | 48 |
| 8 | Gadarif | Alquadarif | 2 | 1 | 1 | 10 | 2 | 1 | 10 |
| 9 | North Kaordofam | Alobied | 2 | 1 | 1 | 10 | 2 | 1 | 10 |
| 10 | River Nile | Atbara | 2 | 1 | 1 | 10 | 2 | 1 | 10 |
| | | Total | 21 | 10 | 10 | 100 | 24 | 12 | 252 |

# Appendix 5

## National training programme on good practices in refrigeration for service workshop technicians

| No. | Training Centre Location | No. of Training Courses | Venue | Total NO. of participants |
|---|---|---|---|---|
| 1 | Wadi Madani | 2 | VTC | 34 |
| 2 | Omdurman | 3 | Youth Place Training Centre | 61 |
| 3 | Alquadaref | 1 | VTC | 18 |
| 4 | Alobied | 2 | VTC | 28 |
| 5 | Atbra | 1 | VTC | 23 |
| 6 | Kassala | 1 | VTC | 25 |
| 7 | Burry (Khartoum east) | 2 | Ekhbary VTC | 35 |
| 8 | Khartoum North | 3 | VTC | 64 |
| 9 | Port-Sudan | 2 | VTC | 50 |
| 10 | Khartoum -2 | 2 | VTC | 36 |
| 11 | University of Sudan | 2 | Faculty of M/Engineering | 32 |
| | **Total** | **21** | | **406** |

# Appendix 6

## Service equipment distributed to service workshops

| No. | State | Location/ Area | Vacuum Pumps | Recovery Machine | Recycling cylinders | Recovery bags | Piercing Valves |
|---|---|---|---|---|---|---|---|
| 1 | Greater Khartoum | Khartoum | 52 | 52 | 52 | 52 | 52 |
| 2 | Greater Khartoum | Khartoum North | 33 | 33 | 33 | 33 | 33 |
| 3 | Greater Khartoum | Omdurman | 39 | 39 | 39 | 39 | 39 |
| 4 | Red Sea | Port-Sudan | 25 | 25 | 25 | 25 | 25 |
| 5 | Gazera | Wadi Madani | 25 | 25 | 25 | 25 | 25 |
| 6 | Gadarif | Alquadaref | 18 | 18 | 18 | 18 | 18 |
| 7 | River Nile | Atbara | 23 | 23 | 23 | 23 | 23 |
| 8 | North Kordofan | Alobied | 25 | 25 | 25 | 25 | 25 |
| | TOTAL | | 240 | 240 | 240 | 240 | 240 |

# Appendix 7

## CFC Consumption reduction schedule, in ODP tonnes

| CFC | 2003 actual | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 |
|---|---|---|---|---|---|---|---|---|
| Montreal Protocol Reduction Schedule | 456.8 | 456.8 | 228.4 | 228.4 | 68.52 | 68.52 | 68.52 | 0 |
| **Target of total consumption, all sectors** | 216 | 216 | 200 | 130 | 65 | 45 | 25 | 0 |
| Total reduction by on-going activities | - | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Total reduction by new activities | - | 0 | 16 | 70 | 65 | 20 | 20 | 25 |
| Aerosol sector | 30 | 30 | 30 | 0 | 0 | 0 | 0 | 0 |
| reduction by on-going | - | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| reduction by new activity | - | 0 | 0 | 30 | 0 | 0 | 0 | 0 |
| Foam sector | 6 | 6 | 6 | 0 | 0 | 0 | 0 | 0 |
| reduction by on-going | - | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| reduction by new activity | - | 0 | 0 | 6 | 0 | 0 | 0 | 0 |
| Refrigeration manufacturing sector | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| reduction by on-going | - | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| reduction by new activity | - | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Refrigeration service sector | 180 | 180 | 164 | 130 | 65 | 45 | 25 | 0 |
| reduction by on-going | - | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| reduction by new activity | - | 0 | 16 | 34 | 65 | 20 | 20 | 25 |

## CTC Consumption reduction schedule, in ODP tonnes.

| CTC | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 |
|---|---|---|---|---|---|---|---|---|
| Montreal Protocol Reduction Schedule | No control | No control | 0.33 | 0.33 | 0.33 | 0.33 | 0.33 | 0 |
| Target | 1.1 | 1.1 | 0.33 | 0.33 | 0.33 | 0.33 | 0.33 | 0 |
| Total reduction by on-going activities, all sectors | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Total reduction by new activities, all sectors | 0 | 0 | 0.77 | 0 | 0 | 0 | 0 | 0.33 |

# Appendix 8

## Price information of refrigerants 2006

| Refrigerant | Packing (kg) | Khartoum states, US$/kg | Nyala Western states US$/kg | Halfa Northern states US$/kg |
|---|---|---|---|---|
| CFC-11 | 13.6 | N-exist | 0 | 0 |
| CFC-12 | 13.6 | 12 | 14 | 15 |
| HCFC-22 | 13.6 | 13 | 15 | 16 |
| HFC-134a | 13.6 | 15 | 17 | 20 |

# Appendix 9

## Timetable for implementation of NPP, Sudan

| Year | 2004 | 2005 | | 2006 | | 2007 | | 2008 | | 2009 | | 2010 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | H2 | H1 | H2 | H1 | H2 | H1 | H2 | H1 | H2 | H1 | H2 | H1 | H2 |
| **Project approval** | * | | | | | | | | | | | | |
| **Project management** | | | | | | | | | | | | | |
| Local office set up | | | | | | | | | | | | | |
| Monitoring systems set up | | | | | | | | | | | | | |
| Monitoring | | | | | | | | | | | | | |
| Reporting | | | * | | * | | * | | * | | * | | * |
| ***General technical assistance*** | | | | | | | | | | | | | |
| Awareness activity | | | | | | | | | | | | | |
| Workshop for ministries | | | | | | | | | | | | | |
| Update and enforcement of policy instruments | | | | | | | | | | | | | |
| Supplementary customs training | | | | | | | | | | | | | |
| Technical assistance for CTC using industry | | | | | | | | | | | | | |
| Technical assistance for CFC using industry | | | | | | | | | | | | | |
| Aerosol sector program | | | | | | | | | | | | | |
| Foam sector program | | | | | | | | | | | | | |
| Refrigeration manufacturing sector program | | | | | | | | | | | | | |
| **Service sector program** | | | | | | | | | | | | | |
| Establishment of additional training centre | | | | | | | | | | | | | |
| Supplementary technician training | | | | | | | | | | | | | |
| Provision of additional equipment | | | | | | | | | | | | | |

# Appendix 10

## Performance targets of the national CFC phase-out plan, Sudan

| Year | Management And technical support | Manufacturing sector | Refrigeration service sector |
|---|---|---|---|
| 2004 | Project approval | | |
| 2005 | Establishment of operational mechanism for management and monitoring of the phase-out plan<br><br>Coordination groups set up<br><br>Initiate review of supportive legislation<br><br>Start of awareness promotion<br><br>Workshops e.g., supplementary training<br><br>Licensing system for service technicians upgrading | Working agreement with enterprise in the manufacturing sector<br><br>Bidding of foaming equipment and charging units<br><br>Bidding for modification of aerosol enterprise<br><br>Initiate research at aerosol enterprise<br><br>Provision of foaming and charging units to enterprises | Coordination office set up and relevant training of staff<br><br>Selection of training institutes and initiated training of trainers<br><br>Initiate bidding for additional service equipment for workshops<br><br>Training of technicians (phase 1)<br><br>Selection of centres for reuse of ODS and initiated bidding of equipment for centers to reuse ODS<br><br>Additional custom officers trained |
| 2006 | Monitor and evaluation<br><br>Workshops e.g., supplementary training | Commissioning of foaming equipment and charging units<br><br>Commissioning of modified Aerosol production facility | Delivery of service equipment (phase 1)<br><br>Training of staff at centers for reuse of ODS |
| 2007 | Monitor and evaluation<br><br>Legislation updated incl. ban on venting, and ban on new installations | | Training of technicians<br><br>Delivery of service equipment |

| | | | |
|---|---|---|---|
| 2008 | Monitor and evaluation | | |
| 2009 | Monitor and evaluation | | |
| 2010 | Monitor and evaluation | | |

## Appendix 11

### CFC – 12 in ODP tonnes

| Year | 2004 | 2005 |
|---|---|---|
| Montreal protocol Reduction Schedule | 456.8 | 228 |
| Max. Allowable total consumption as per agreement | 216 | 200 |
| Reported Consumption | 203 | 185 |
| Verification of CFC – 12 from the Ministry of Industry, Importers | 153 | 132 |
| Verification of CFC – 12 from the Ministry of Industry, End users | 50 | 53 |

## Appendix 12

### CTC in ODP tonnes

| Year | 2004 | 2005 |
|---|---|---|
| Montreal protocol Reduction Schedule | N. A | 0.33 |
| Max. Allowable total consumption as per agreement | 1.1 | 0.33 |
| Reported Consumption | 0.66 | 0.33 |
| Verification of CTC from documents of the Ministry of Industry, Importers | 0.00 | 0.00 |
| Verification of CTC from documents of the Ministy of Industry, End users | 0.66 | 0.33 |

## Appendix 13

### CFC-12 imported by end users

| | 2004, MT | 2005, MT |
|---|---|---|
| Ahmaed Allaha Co. | 20 | 20 |
| Moumin Co. | 20 | 15 |
| Umeameer | 20 | 5 |
| Elfabi Coldstore | 0 | 7 |
| Abumufaab | 0 | 6 |

End users are mainly refrgeration maintenance companies, that use CFC for their own requirement to provide maintenance servises to their customers.

Sudan Customs Police Department of Statistics, Headquarters Khartoum, Products (imports)

Priod from Janauary upto December 2004/2005

| Commodty Code | Product description | | | | |
|---|---|---|---|---|---|
| | Mass (kg) | Customs value (Used) | (Im/Ex)port Duty (SDD) | Other taxes (SDD) | % aGe |
| 29031400 | Carbon tetrachloride | | | | |
| | 0.00 | 0.00 | 0.00 | 0.00 | 0.00% |
| Total | 0.00 | 0.00 | 0.00 | 0.00 | 0.00% |