

NATIONAL TRAINING ON GOOD PRACTICES IN REFRIGERATION



A SUPPORT GUIDE FOR NOUs

Phasing out ODS in Developing Countries

Multilateral Fund for the Implementation
of the Montreal Protocol



United Nations Environment Programme
Division of Technology, Industry & Economics
OzonAction Programme



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2001

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Foreword

The “Montreal Protocol on Substances that Deplete the Ozone Layer” has been ratified by 175 countries worldwide. As the first international environmental agreement based on precautionary principles, it has entered into history as a pioneering example of international co-operation to address global environmental issues.



The ultimate success of the Protocol will depend on the continuous commitment and efforts of all Parties to achieve the phase-out of ozone-depleting substances (ODS) worldwide. Innovative responses are required to address new challenges such as the increasing illegal trade in ODS, the flow of second-hand ODS-based refrigerators and vehicles into developing countries, and the complex interrelationships with other environmental agreements such as the UN Framework Convention on Climate Change (Kyoto Protocol).

Developing countries are now moving from the “grace period” to the compliance period. In July 1999, the first phase-out obligation applicable to developing countries came into effect and the countries had to freeze their consumption of the five main CFCs at their average consumption level during the years 1995-97. During the following years further reductions will be required for the CFCs as well as other controlled substances, such that the majority will have disappeared by 2010.

Developing countries are now undertaking tremendous efforts to comply with or even to exceed the phase-out schedules of the Montreal Protocol and its amendments. Phase-out can be best achieved and remain sustainable through an overall strategy that integrates national and regional technical, regulatory and policy measures. Low-volume-ODS-consuming countries have developed such integrated strategies specifically for their refrigeration and air-conditioning sectors, because they tend to consume most or all ODS as refrigerants. These strategies at national level are called “Refrigerant Management Plans”.

In many low-volume-ODS-consuming countries, the implementation of the RMP proves to be a time consuming and complex task, which requires the involvement of a wide range of stakeholders. Many conditions need to be put in place such as the introduction of regulatory frameworks and import / export licensing systems for ODS, the establishment of a recovery & recycling scheme for CFCs or the training of service technicians and customs officers in the country.

This guide aims specifically to assist the national ozone officers in organising the training refrigeration technicians in the country. Timely and high quality training is required to prepare the refrigeration and air-conditioning technicians for the changes which will take place in the near future, enable them actively to shape the future development of the sector and to avoid unnecessary emissions of ODS refrigerants through the application of good practice in refrigeration.

This support guide is part of a series of publications produced by UNEP's OzonAction Programme and should be read in conjunction with the following self-help guides and training manuals:

- Guidelines for Recovery & Recycling Systems – Refrigeration Sector, UNEP, 1999
- Guidebook on Implementation of Codes of Good Practices – Refrigeration Sector, UNEP, 1998
- Good Practices in Refrigeration – Training Manual, UNEP, 1994
- Chillers and Refrigerant Management – Training Manual, UNEP, 1994.
- Awareness raising video “Protecting the Ozone Layer – Every Action Counts”
- Training video “Good Practices in Refrigeration”.

We hope you enjoy this publication and find it useful. Please send me your comments and suggestions.

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More information can be found on the World Wide Web at:

<http://www.uneptie.org/ozonaction.html>.

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Common abbreviations

A/C	Air-conditioning
CFC	Chlorofluorocarbon
GWP	Global Warming Potential
HC	Hydrocarbon
HCFC	Hydrochlorofluorocarbon
HFC	Hydrofluorocarbon
IA	Implementing Agency
LVC countries	Low-volume-ODS-consuming countries
MAC	Mobile air-conditioning
MFS	Multilateral Fund Secretariat
NOU	National Ozone Unit
ODP	Ozone-depleting potential
ODS	Ozone-depleting substance
RMP	Refrigerant Management Plan
R&R	Recovery and Recycling
UNEP	United Nations Environment Programme
UNEP DTIE	UNEP Division of Technology, Industry and Economics

About this document

Objective of this module

This document provides **guidance to National Ozone Units (NOUs)**, technical training institutes, refrigeration associations, local trainers and other stakeholders on how to design, prepare, conduct and monitor national training programmes for refrigeration technicians.

Objective of good practice training

The training programmes on good practices in refrigeration aim to reduce the emissions of ozone-depleting refrigerants during servicing, maintenance, installation, commissioning or decommissioning of refrigeration and air-conditioning systems.



Guide for orientation

NOUs and their stakeholder partners will be able to use this document to guide them through the project cycle.

Chapter 2 is particularly relevant to the design stage prior to submitting a project proposal for funding.

Chapter 3 is particularly relevant to implementing approved projects.

Chapter 4 will provide guidance for following up completed projects.

Annexe 1 includes generic workshop elements that are needed during the implementation of training workshops, and which should be adapted to local needs.

Annexe 2 presents useful checklist to organise training in an efficient and interactive manner as well as training materials and tools to be considered when designing training.

Annexe 3 includes a summary of the “Training guidelines for identification of needs and co-ordination of activities” approved at the 23rd Meeting of the Executive Committee. NOUs should make themselves aware of these guidelines to help inform the project process. They include the formats for workshop and follow-up reports.

Context of good practice training

RMP context

Training on good practices in refrigeration is an essential component of the national Refrigerant Management Plan (RMP). The RMP is a comprehensive strategy to phase out the use of ozone depleting refrigerants in the refrigeration and air-conditioning servicing sector.

Co-ordination of activities

The successful implementation of RMPs requires the co-ordination of activities in different sectors including manufacturing, servicing and end-users as well as at different levels including regulatory and trade control, economic incentives and disincentives, training on good practices in refrigeration for refrigeration technicians, training for customs officers, establishing recovery and recycling programmes and raising public awareness of the related environmental issues.

Phaseout strategy in refrigeration servicing sector

The most efficient way to reduce the emissions of CFCs to atmosphere is to inform and train the people who work with these systems.

Inform

Inform them about the problems that are caused, directly by the emissions of ozone depleting substances to atmosphere and indirectly by the energy consumed to drive the refrigeration and air-conditioning systems that they are working with.

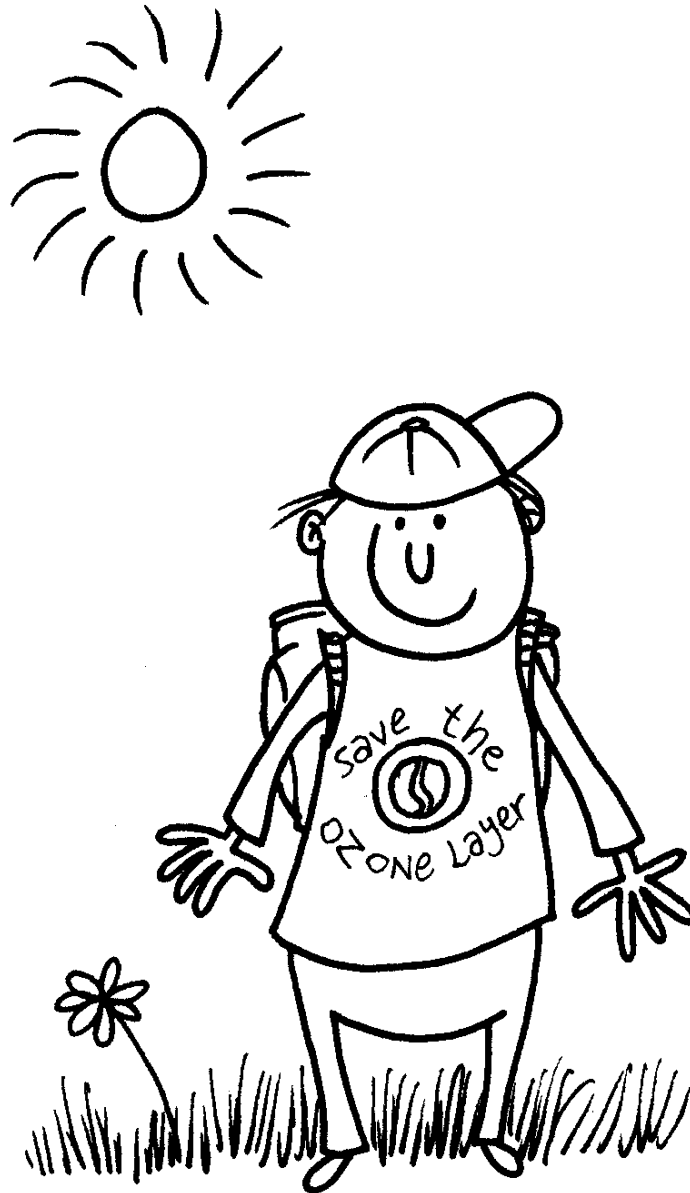
Train

Train them in modern techniques so that their working practices are all aimed at minimising CFC emissions to the atmosphere.

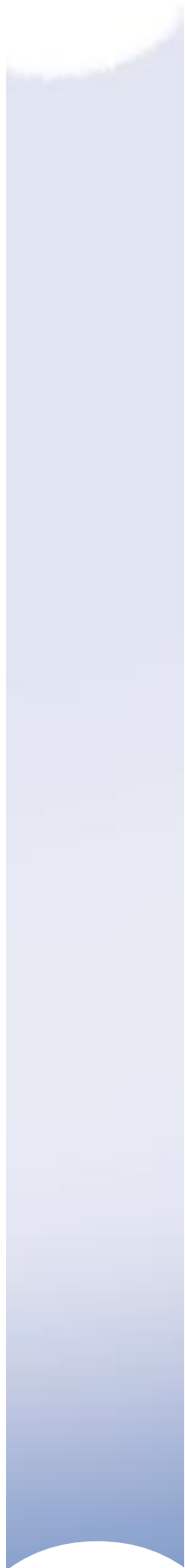
Even with a minimum amount of specialist equipment, a significant reduction in CFC emissions can be achieved by a well trained refrigeration technician who has the desire to improve refrigeration practices.

Potential for reducing emissions

A very large proportion of refrigerant supplied to the refrigeration and air-conditioning industry is used to service and maintain existing systems and is thus used to replace refrigerant that has already escaped to atmosphere. There is therefore a great potential for reducing emissions by improving service and maintenance procedures and practices.



Save the ozone layer



1 Introduction

Global issues

The phase-out obligations of the Montreal Protocol and its amendments will ultimately lead to the complete phase out of the supply of newly produced ozone-depleting substances to industry. However there is a very large “bank” of existing ozone-depleting substances already produced and in systems, or in storage, or in transit. It is this large “bank” of refrigerant which causes concern and the most effective way of reducing emissions of CFCs to atmosphere is to ensure that technicians are made aware of the environmental problems created by emissions and are trained to minimise these emissions by utilising good practices in refrigeration.

Consumption - research shows that in low-volume-ODS-consuming countries, the vast majority of refrigerant consumption (75%-80%) is for servicing and maintenance purposes. This large quantity can be significantly reduced by the improvement of working practices and by introducing alternative, less harmful refrigerant options to the sector.

Sector structure - although this industry sector varies from country to country, the variations are quite small and depend to a large extent on the size of the frozen food market. The normal sector structure is of domestic, commercial and industrial refrigeration and air-conditioning in the following areas:

- The cold chain of food production, storage, distribution, retailing and home storage of chilled or frozen food.
- Air and fluid cooling for industrial and commercial processes.
- Air-conditioning of domestic and commercial premises including offices, hotels, retail outlets and leisure complexes.
- Mobile air-conditioning including cars, trucks, agricultural machinery and buses.

While the refrigeration equipment may vary through the sector, the principles of good servicing practices, which will be taught through these training workshops, will be applicable to all refrigeration and air-conditioning systems and applications. A number of these principles are compiled in UNEP’s guidebook for implementation of codes of good practices.

Globally, the emission of CFC refrigerants to atmosphere leads to the depletion of the ozone layer and to global warming / climate change and thus affects ecosystems and human health. Developed and developing countries are affected by these changes and the response must be appropriate to deal with the existing problem and to lessen the impact in the longer term.

Large bank
of existing
CFCs

Most CFCs
used for
servicing

Industry
sectors
using CFCs

Principles of
good
servicing
practices

Impact of
CFC
emission

Refrigerant Management Plans

Co-ordination and synchronisation of phase-out efforts

Project-by-project approach

Formerly, the phase-out of CFCs in the refrigeration sector was being addressed through a project-by-project approach, assigning high priority to the promotion of refrigerant conservation practices through training of technicians and refrigerant recovery & recycling projects.

Such approach made evident the need to implement projects in a more co-ordinated manner and to create enabling condition through appropriate support measures. The concept of Refrigerant Management Plans (RMP) is the response to that need.

RMP strategy

A RMP is a comprehensive strategy to phase-out the use of ozone-depleting refrigerants (CFCs and HCFCs) used for servicing and maintenance of refrigeration and air-conditioning systems.

Projects previously implemented in isolation from one another are thus part of an overall approach, and synchronised for optimal results.

Co-ordination of activities

The successful implementation of RMPs requires the co-ordination of activities:

- Regulations and trade controls
- Economic incentives and disincentives
- Training programme on good practices in refrigeration for service technicians
- Training programme for customs officers on control and monitoring of ODS
- Establishing recovery & recycling programmes for CFC refrigerants
- Public awareness
- Strengthening of the institutional framework
- Suitable policy and regulatory support framework
- Improved system for collection of data and control and monitoring of ODS consumption.

Sectors

In different sectors:

- The manufacturing sector
- The servicing sector
- The end-user sector, for example through end-user conversion projects
- The informal sector

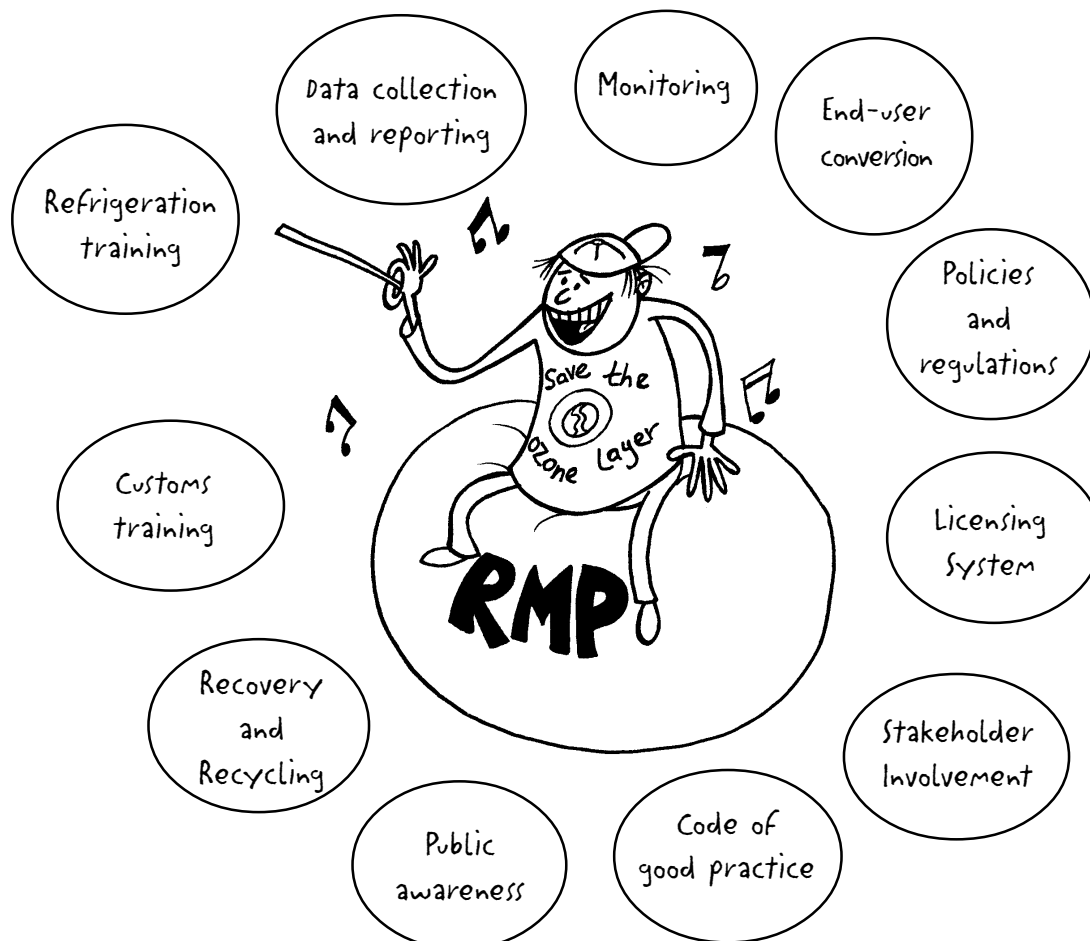
Involving different stakeholders:

- Local training institutes
- Industry associations
- Importers and wholesalers
- Non-governmental organisations
- The civil society.

Good practices including recovery & recycling

A training programme for service technicians within this context, is a key element to achieve a reduction of the ODS consumption due to poor servicing and maintenance practices of ODS-containing equipment, without major capital investment.

Training on good servicing practices

**RMP ELEMENTS**

Training on good practices in refrigeration has provided many servicing professionals with the skills to reduce the emissions of ODS. This includes recovery & recycling of ozone-depleting refrigerants, retrofitting to alternative refrigerants and the introduction of new technologies.

Replacement of CFCs

Retrofitting

There are several options for the end-user sector to phase out ODS use in their companies. In the refrigeration sector, often times ODS-based equipment can be replaced with transitional refrigerants such as HCFCs, or alternative substances. The most commonly used non-ozone depleting refrigerants are HFCs (which have zero ODP, but contribute to global warming) and HCs (which have zero ODP and zero global warming potential, but are flammable and require specific safety precautions).

Retrofitting is the replacement of the refrigerant towards alternatives. It may require replacing specific parts of the equipment. For older refrigeration & air-conditioning systems, it may be more cost-effective to replace rather than retrofit. In addition, new equipment will be more energy and cost-efficient.

Replacement

Replacement of CFC equipment

Replacement of end-of-life ODS equipment may be the most economic option taking into account the energy savings which may be realised by modern technology.

Reduced dependency on ODS equipment

Import restrictions

Finally, import restrictions on ODS-based equipment is another means to reduce the dependency of end-users on ODS.

Local issues

National Ozone Unit

Local co-ordinators

The National Ozone Unit (NOU) is the central national unit for co-ordinating a country's efforts for ozone protection by facilitating ODS phase-out. In general, it is the NOU co-ordinating the implementation of the RMP in co-operation with an implementing agency of the Multilateral Fund. Often, the NOU is attached to the environment agency, trade & industry agency or meteorological service, but this is not the case in all countries.

The main responsibilities of the NOU include:

- Country Programme & Institutional Strengthening Programme implementation
- RMP implementation often including recovery & recycling programmes and training programmes for refrigeration technicians and customs officers

- Preparation of proposals for policies, strategies, laws, regulations, incentives, agreements with the private sector, and other measures for national ODS phase out
- Consultation and co-ordination with stakeholders and organisation of stakeholder meetings as necessary
- Advice and support to industry, servicing sector and end-users on the different phase-out option for ODS
- Promotion of public awareness programs
- Data reporting, as required by the Montreal Protocol.

Government officials in these agencies are well trained on issues pertaining to the Montreal Protocol, but may have little knowledge of the operations of the refrigeration and air-conditioning sector. It is important that the ozone officers and other relevant stakeholders meet early and regularly and that each agency has a clear understanding of their respective roles in implementing national training on good practices in refrigeration. Close coordination is essential to achieving a successful training programme.

NOUs may already be implementing a Country Programme or a Refrigerant Management Plan and the training will be an integral part of such programmes for the phase-out of ODS. The types of ODS and alternative refrigerants being used and the trends will be available from the Country Programme and Refrigerant Management Plan.

NOUs need to co-operate with other government bodies and stakeholders in the country to raise awareness, to gain support and commitment from different interest groups, to enact legislation, to establish an import / export licensing scheme for ODS and a recovery & recycling scheme for CFC refrigerants, to conduct training on good practices in refrigeration and for customs officers in order to enforce the licensing system etc. The NOU should consider implementing all or some of the following measures:

- Legislation making it a criminal offence to deliberately or knowingly discharge ozone depleting refrigerants and other ODS to the atmosphere.
- Legislation making it an offence to “top up” leaking systems until or unless leakage has been repaired.
- Taxation of ozone depleting refrigerants based on the ozone depleting potential. For example punitive or incentive taxes could be applied to all refrigerants with an ozone depletion potential greater than 0.1.
- Certification programme for all technicians who handle refrigerants.

Close
coordination
among
stakeholders

Country
Programme

Stakeholder
support

Measures
supporting
RMP
implementation

Measures for awareness raising

- Registration or licensing programme making it an offence to service, maintain, install or commission refrigeration or air-conditioning systems without a current (renewable) licence or registration issued by the NOU.
- Awareness raising programmes to heighten the knowledge of the general public to the issues of ozone depletion, global warming and climate change.
- Seminars and workshops with refrigeration industry associations and other groups.
- Initiation of joint working parties bringing industry and government together to discuss the issues and to forge stakeholder partnerships and “voluntary agreements”.

In order to raise the awareness of the general public, industry and Government representatives on the ozone issue, the NOU should consider the following issues:

- As limitations on production in the developed countries start to take effect, and the volumes of refrigerant being manufactured decreases, so the price increases, making it commercially advantageous to reduce emissions to atmosphere and to adopt good refrigeration practices, which include refrigerant recovery, recycling and reclaim.
- As the volumes of CFCs produced in developed countries decrease, there will come a time when it will not be economically viable to continue and producers will either cease production early or switch to other more lucrative products with the inevitable consequence that the supply of ozone-depleting refrigerants will dry up. It is entirely possible that these products will cease to be available before the phase out dates, which are relevant in Article 5 countries. Therefore those Article 5 countries which rely on imported refrigerants may find that the phase-out schedule is out of their control and pre-dates the published national phase out date, leading users of refrigerants into a false sense of security.
- When the import of refrigerants ceases and stocks run out, end users of refrigerants will have fairly serious costs for either retrofitting their systems to new generation refrigerants and lubricants, or replacing entire systems. NOUs have a major responsibility for the provision of appropriate information to end users and contractors alike to prepare them for this eventuality.
- Recovering refrigerant for re-use after recycling will play an increasing role as stocks decrease and this subject should receive appropriate attention in any awareness campaign.

2 Guide for organisers

Training approach

Nation-wide training on good practices in refrigeration is usually carried out in 2 phases for cost-effectiveness reasons:

Phase I: An initial train-the-trainers workshop where an international expert trains a selected group of local trainers and senior technicians with supervisory function.

The NOU will co-ordinate the local organization of the workshop, including local invitations for participation. UNEP will arrange for the international consultant and the equipment to be supplied for Phase I training. The NOU will ensure waiver of any applicable duties or taxes, and speedy clearance of training equipment and will ensure appropriate dissemination of information about training programme for technicians.

Phase II: A subsequent train-the-technicians phase where a representative group of all technicians in the country, big enough to effect a change in the current servicing practices, is trained. This training is carried out by local personnel who received training under Phase I. The concept is to multiply the benefits of the Phase I training to all relevant local personnel including the informal sector. Phase II includes the monitoring of evaluation of the project and preparation of a follow-up and evaluation report.

Under the present mode of operation, the implementing agency is responsible for coordinating Phase I training together with the NOU. Phases II is coordinated by the NOU which is reporting to the implementing agency and receiving support and advise as required. It is expected that Phase II will commence within a month of the completion of Phase I, and that the final report will be completed within a month of the completion of Phase II.

In order to facilitate the efficient implementation of “train-the-trainers” and “train-the technicians” workshops for improving refrigeration practices, the following issues must be addressed at the design stage:

- 1) Selection of trainers to attend the train-the-trainer phase
- 2) Target audiences for subsequent train-the-technicians phase
- 3) Venue and training centre equipment specification

Training
the trainers

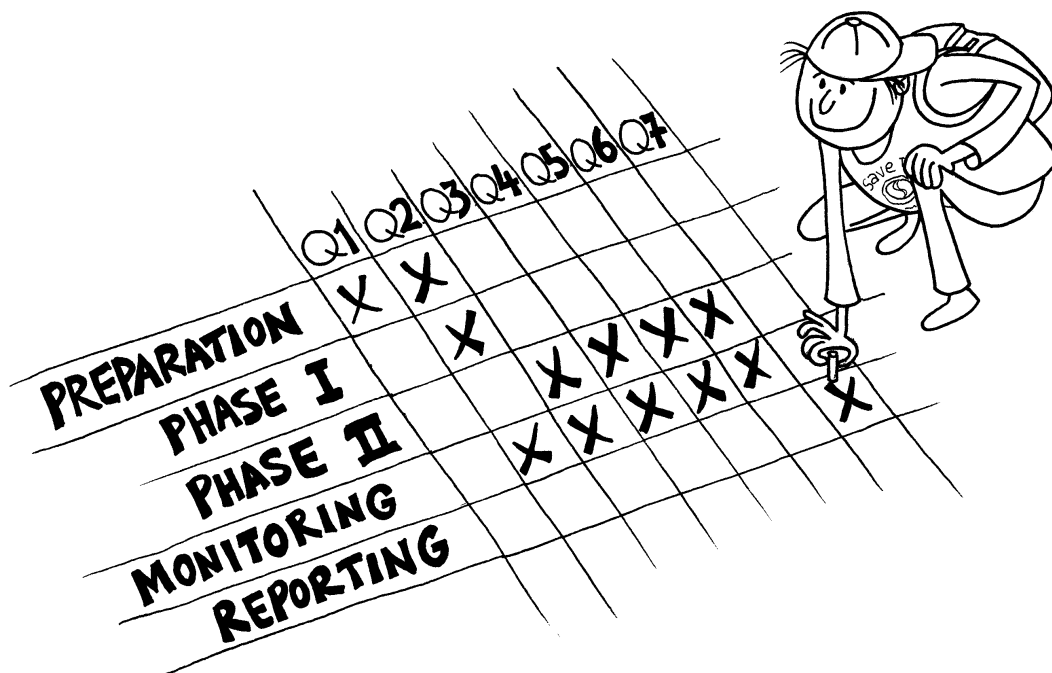
Training of
technicians

Responsibilities
for Phase I
and Phase II

Design of
Phase I
training

- 4) Duration
- 5) Design of training workshops
- 6) Follow-up of training workshops.

Typical time frame



Time schedule

Selection of trainers

Phase I: Training of trainers

Trainer selection forms an extremely important part of the process in that the competence of the trainers is fundamental to the efficient delivery of the training workshop. The implementing agency selects international trainer with proven experience in consultation with the NOUs.

The emphasis should be on the practical experience of the trainers and their interactive teaching skills. A purely theoretical and academic approach is not appropriate for technicians training in developing countries if the reduction of ozone depleting substance emissions is to be achieved. Ideally, the international trainers should match the following profile:

Selection criteria for international trainer

- Dynamic and interactive teaching skills in local language.
- Minimum of five years experience installing, servicing and maintaining appropriately sized commercial refrigeration or air-conditioning systems.
- Minimum of two years experience either teaching refrigeration and air-conditioning to trainees in a college, polytechnic, trade school or company training centre, or as an experienced practitioner with a responsibility for “on the job” apprentice training.
- Appropriate craft and advanced craft qualifications, or evidence from the employer that work complies with recognised standards.

While it is recognised that it may not always be possible to recruit or provide trainers who meet or exceed the specification above, the question should always be asked that if a trainer cannot meet the criteria how effective will the training be? Since the greatest reduction in emissions of CFCs will be achieved by people installing, servicing, maintaining and commissioning equipment the trainers who are delivering new ideas, techniques and procedures must be credible and gain respect by demonstrating that their knowledge and experience is current and appropriate.

It is vital that the “trainers to be trained” are not overwhelmed with theory, they must have a thorough, practically based understanding of the environmental issues so that they are willing to alter their own teaching practices and curricula. Being willing to change from normal practice depends on having faith in the reasons given for that change.

Phase II: Training of technicians

Local trainers for Phase II should have a proven teaching experience at a local training institute. The main criteria for selecting local trainers would be that after successfully completing the train-the-trainers workshop including the examination, they should be able to impart the following skills, knowledge and good practices in refrigeration:

- Ozone depletion - its causes and effects
- Global warming - its causes and effects
- Montreal Protocol and other global measures
- Country Programme and Refrigerant Management Plan
- Local regulations and way forward
- Role of the NOU and other stakeholders
- Role of regional and international agencies and NGOs
- Phase II of the training programme
- Basic principles of refrigeration

Emphasis
on practical
training

Selection
criteria for
local
trainers

- ODS and non-ODS refrigerants
- Handling, transport and storage of refrigerants
- Refrigerant safety and personal protective measures
- Leak prevention and leak detection
- Installation, pressure testing, evacuation, dehydration, charging and running a system
- Decommissioning and disposal
- Redesign, installation
- Preventive inspection
- Record keeping and documentation
- Refrigerant recovery procedures
- Refrigerant recycling and reclaim
- Retrofitting from CFC to HFC, HCFC
- Refrigerant management plan at company level
- Training and certification
- Vision of future development of refrigeration sector.

Appropriate trainers (who participated in Phase I of the training programme) should be contracted by the NOU and their terms of reference and delivery schedule defined. Additional local resource persons may be invited as appropriate. The available budget should be respected.

Target audiences

Phase I: Training of trainers

The participants of Phase I training should be experienced in servicing refrigeration and air-conditioning equipment and have more than 5 years professional experience.

The target audience for the train-the-trainers workshops will be found in the following groups:

- Teachers and lecturers in refrigeration and air-conditioning in polytechnics, colleges of further and higher education, trade schools, vocational training establishments, company training centres and other training establishments. This group will be delivering training and teaching programmes to national or international standards. These programmes will culminate in the award of a college or centre based certificate or diploma, or in the award of a national or international qualification set by an external awarding body.
- Refrigeration industry practitioners who have provided “on the job” training on a regular basis for apprentices and trainees who have been assigned

**Institutional
trainers**

to them by their company to impart skills and knowledge as part of a company training programme. They should be drawn from different sectors including fishery, food and drinks, hotels, hospitals and servicing workshops

- Relevant representatives of importers, wholesalers and industry associations should also be invited. This will contribute to fruitful discussions and thoughtful recommendations.

Phase II: Training of technicians

The target audience for the train-the-technicians workshops on good practices in refrigeration are technicians and craftsmen currently servicing, installing, commissioning and maintaining refrigeration or air-conditioning systems that utilise ODS. This group will be extremely wide and will include people from anywhere in between:

- Highly trained and qualified technicians
- People who have had no formal training or qualification but work in the formal and well organised sector, often under the supervision of a more experienced colleague
- People from the informal sector.

It is quite common that skills and knowledge are accumulated over time from work colleagues and through experiential learning rather than from formal training programmes. It is also quite common for tradesmen to migrate across to refrigeration from other trades and disciplines and pick up skills and knowledge as they go along. The absence of formal training often means that basic principles have not been fully understood and the trainers (and NOUs) should be aware of this.

NOUs should also be aware that it is often very difficult to reach technicians in this group, especially from the informal sector. A reasonable proportion of these technicians will work for very small companies, or may work in small workshops servicing a whole range of appliances. Refrigeration and air-conditioning may only be a small part of the business. These micro businesses outside of the mainstream industry are difficult to identify, reach and motivate to participate in a training. When publishing training events and certification requirement NOUs should include the following places and organisations; with “points of sale” being particularly important.

- Refrigeration associations
- Manufacturers of refrigeration equipment
- Contractors
- Publicity boards in colleges and training establishments
- Newspapers

**On the job
trainers**

**Wide range
of
qualifications
and skills**

**Involve the
informal
sector**

**How to
reach out to
the informal
sector**

- Refrigerant distributors
- Importers and wholesalers of refrigeration components and refrigerants.

Students and trainees engaged in courses and programmes of study leading to qualifications in refrigeration and air-conditioning. This group will mainly be new entrants to the industry and since they will be studying refrigeration and air-conditioning from first principles, the good practices in refrigeration that they are taught will reflect the latest skills and knowledge required to minimise emissions of CFCs and other refrigerants to atmosphere.

Venue

Classroom presentations and practical exercises

Suitable venues for both Phases I & II training workshops would be colleges, polytechnics, trade schools or company training centres already delivering programmes leading to refrigeration and air-conditioning qualifications. Practical facilities should be appropriate, and adequate equipment tools and components should be available to demonstrate the practical activities and to allow the student/trainee to practice and develop the skills acquired during the training workshop.

Safety

It is absolutely vital that the venue chosen to host a training workshop is appropriate with respect to its safety. NOUs should ensure that host centres can provide safe practical work areas. Of particular importance will be the electrical supply and connections. The venue selection process must include inspection to ensure that the training workshop can be delivered in a safe working environment.

Insurance

In selecting the venue, NOUs should make sure that appropriate insurance cover is available and extends to all participants and visitors to the training workshop.



A suitable venue with appropriate equipment

Duration

Duration of training workshops will vary according to whether they are for trainers (Phase I) or technicians (Phase II):

Phase I: Training of trainers

In order that the trainers can be as thoroughly trained as possible it is recommended that a five day programme be allocated for the trainers. Three days would be utilised by oral presentations and practical demonstrations including opening, closing, examination, certification, hand-over of training equipment and drafting of workshop recommendations. The remaining two days would be spent in practical activity, practising the skills and using the knowledge acquired from the training workshop. During the two days of practical activity the trainers can practice such activities as recovery & recycling, charging, evacuation, pressure testing, leak testing, maintenance procedures and retrofitting from ODS to transitional fluids or new generation refrigerants.

**At least
5 days**

Phase II: Training of technicians

The personnel selected for the trainee programme will normally already be working with refrigeration and air-conditioning equipment, in which case it will be at least necessary that they attend a three-day training workshop to be introduced to the techniques of leak prevention, recovery & recycling and utilising good refrigeration practices. Participants with no formal training and from the informal sector may need an extended training.

**At least
3 days**

The training should be designed in a flexible manner, which allows the participants to participate e.g. through evening courses, weekend courses, day courses spread over several weeks etc. Many technicians from small workshops cannot afford to close the workshop for 3 days.

**Flexible
design**

Failure to complete the practical segment of the programme will invalidate the training.

Training for the trainee or student on full time or part-time refrigeration and air-conditioning training programmes will be continuous and training centres will be required to adopt the practices taught on “train-the-trainers” workshops so that the students / trainees know no other method. There will then be a gradual “bottom-up” spread of good practices in refrigeration throughout industry because of the influence of the trainees and students, at the same time a “top down” spread of good practices in refrigeration can take place because of the influence of the countrywide training programme on the mature, experienced technician / craftsman.

**Training
curricula at
local
training
institutes**

Equipment for practical exercises

Training centre equipment specification

In order to host a train-the-trainers event or a national training workshop for refrigeration and air-conditioning technicians, the training centre should have the following equipment or they should be purchased as part of the training programme:

Operational system comprising:

- Condensing unit (complete with compressor and condenser and service / access valves)
- Thermostatic expansion valve
- Forced convection evaporator
- Interconnecting pipework
- Low pressure switch
- High pressure switch
- Liquid line drier
- Liquid line sight glass
- Refrigerant charge with ozone depletion potential of 0 or less than 0.1.

Or alternatively an appropriate refrigerant training board offering similar features and full access to the system via service valves.

Operational systems

Ideally, there should be sufficient operational systems or training boards so that a maximum of two training course participants will practice on one system at a time i.e. 12 training course participants - 6 operational systems or training boards. The reality in most Article 5 countries is 20-25 participants and 3 recovery machines, which results in groups of 8 per recovery machine.

Tools and service equipment including recovery mechanisms

In addition to the equipment outlined above the host training centre should be equipped with the following tools and service equipment or they should be purchased as part of the training programme:

- Leak detectors suitable for CFC, HCFC and HFC refrigerants
- Service gauge manifolds complete with valved hoses
- Access pliers for piercing domestic refrigerator circuits to remove refrigerant without loss to atmosphere (piercing tools)
- Valve keys / 6mm square drive ratchet spanners or wrenches
- Portable recovery machines able to remove at least 5 kg/hr of vapour in ambient temperature of 40°C
- Empty refrigerant cylinders (tanks) to store recovered refrigerant (two per recovery machine)
- Vacuum pump able to achieve a vacuum better than 500 microns
- Valved connecting hoses (additional to the gauge manifold hoses).

The equipment specification outlined above is the minimum required to host train-the-trainers and train-the-technician workshops. In addition there should be adequate access to normal hand tools such as spanners, screwdrivers, wrenches and test instruments to allow the training programme to proceed without interruption.

Recycling machines are usually not part of the good practice training because of cost reasons. The purchase of recycling equipment is in most countries part of a separate project – the recovery & recycling programme. This programme includes an R&R seminar on the use, maintenance and repair of R&R machines. If possible, welding and brazing equipment should be available for demonstration purposes. Poor welding and brazing practices contribute significantly to system break-down and unnecessary repair work / refrigerant emissions.

Design of training workshops

This module intends to be used when designing training workshops for trainers selected to deliver national training workshops to technicians and other workers in the refrigeration and air-conditioning industry. The concepts developed in this training module are also designed to be used by trainers delivering national training workshops in good practices in refrigeration.

The NOUs must be thorough when designing national training workshops in good practices in refrigeration. The first task must be to analyse the existing provision and to identify the strengths, weaknesses and needs of the current facilities and resources.

Reference to the Country Programme and Refrigerant Management Plan will provide the relevant information to allow the design process to begin. Questions which need to be answered at this stage are:



Stakeholder support

- Who are the stakeholders for this programme?
- Is there any way of including representatives from the informal sector?
- Is there a trade association or society?
- Is the NOU represented on the board of the trade association? If not, arrange for appropriate representation.
- How many training institutions are equipped to train students in refrigeration and air-conditioning?
- What is the current state of the physical and human resources at the training institutions?
- Is it feasible to run training workshops as specified in these guidelines without further upgrading of these training institutions?
- If not, how will this upgrading be done?
- When will the equipment be available for use?
- Who will carry out the upgrading of the human resources in the training institutions?

The following principles and core concepts should be adopted as the norm when designing training workshops:

Pedagogic principles

These training workshops will be delivered by competent trainer / practitioners observing the following principles:

- All subjects should be related to the practical activities performed by the training group in the workplace.
- Practical demonstrations should form an integral part of the teaching programme.
- Participant groups should be small enough so that each individual can gain direct benefit from “hands on” experience.
- Oral presentations should be interspersed with practical demonstrations and appropriate audio visual aids to retain attention, interest and enthusiasm.

Expected knowledge and skill levels for trained trainers and trained technicians

The expected knowledge and skill levels for trainers trained during Phase I and technicians trained during Phase II should not be different except the capability of the trained trainers to train others.

It is absolutely crucial that technicians understand the local regulations pertaining to ozone depletion and global warming as well as the role of the NOU.

National performance criteria

Once the Phase II training has been successfully completed the following performance criteria should be met by industry and monitored by the NOU. More specific performance criteria will be specified in the RMP.

- CFC consumption for the service and maintenance sector should start to fall significantly. NOUs should expect the biggest fall in consumption in the first year after training and certification has been completed. A 20% reduction of CFC consumption should be attainable in that first year (based on pre-training consumption) with 10-15% reductions in consumption in subsequent years being realistic targets.
- Fewer new installations should be charged with CFCs after training has been completed. NOUs should expect reductions in the order of 25% per annum.
- Import of equipment charged with CFCs should reduce by 25% per annum.

Follow-up of training programmes

It will be necessary for the NOU to provide follow-up reports to the implementing agency at suitable intervals following completion of the training workshops. These reports should follow the format indicated in the “Training guidelines for identification of needs and co-ordination of activities” which are summarized in Annex 3. The follow-up and evaluation of training programmes should be taken into account during the design stage.

As part of the ongoing monitoring, NOUs should gather the following information:

Phase I training

- How many trainers have been trained?
- How many senior technicians with supervisory function have been trained ?
- How many training institutions are equipped to deliver national training/workshops?
- How many recovery units were handed over and are still operational?
- How many participants rated the Phase I training good / excellent?
- How many months after approval has Phase I been completed?

Ongoing monitoring is important

Which data to collect?

Phase II training

- How many technicians have been trained and certified (registered)?
- What proportion of the total number of technicians have been trained and certified (registered)?
- How are good practices applied?
- How many technicians from the informal sector have been trained?
- How many technicians are equipped to apply good practices?
- How many technicians rated the Phase II training good / excellent?
- How many months was the duration of Phase II?

CFC consumption

- What was the CFC / HCFC consumption before the start of the Phase II training?
- What is the current CFC / HCFC consumption (during Phase II)?
- What reduction in consumption can be contributed to the application of good practices?

Regular reporting

The above information should be gathered at least on a six monthly basis and reported to the implementing agency until the training and certification (registration) of technicians is completed.

Time schedule

In any event the NOU should expect to have all trainers trained and certified within six months, and all technicians trained and certified within one year.

Impact of training

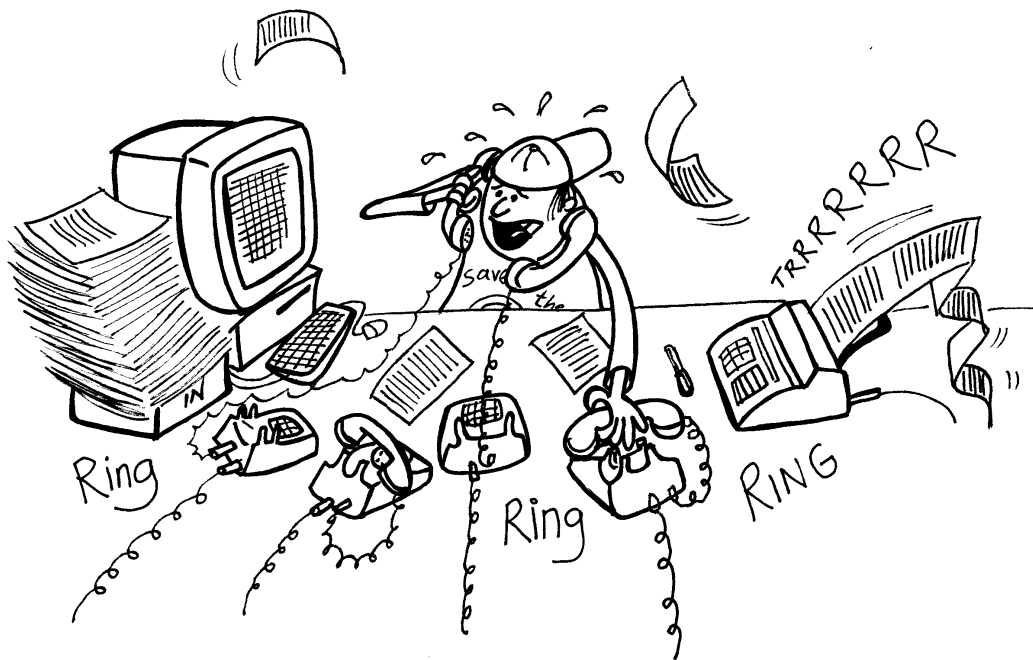
A significant reduction of the CFC / HCFC consumption can be expected over a period of 3 years as a direct result of the training and certification programme, provided that appropriate equipment is available to the technicians enabling them to carry out the good refrigeration practices that they have been taught.



In-country monitoring

3 Phase I and II training

In order to implement national training workshops the NOU and other relevant stakeholders should consider all or some of the measures described in the following sections on planning, organisation, delivery and assessment of training workshops.



The National Ozone Officer

Planning

Planning Phase I training

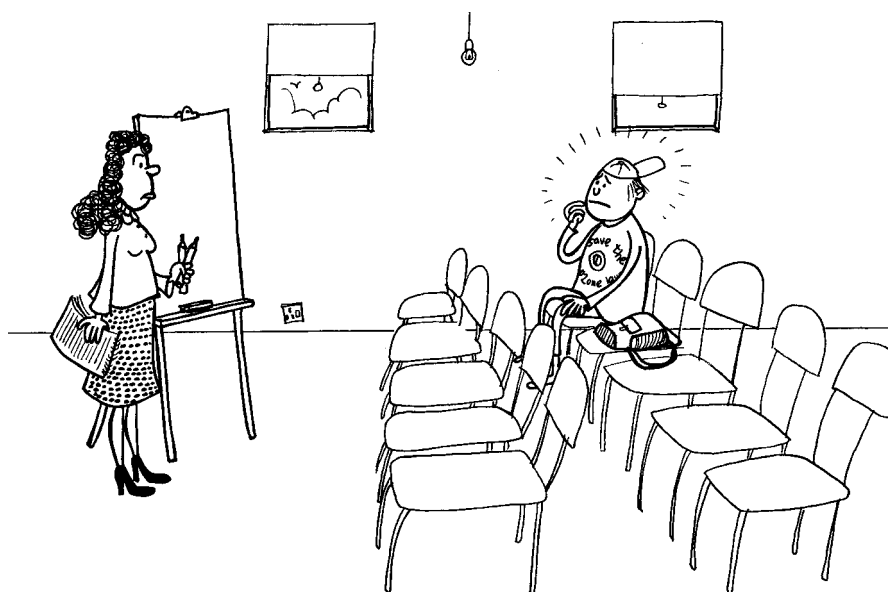
In order to plan the train-the-trainers workshops the NOU and the co-ordinating team will work in close consultation with the stakeholder partners, the implementing agency, the international trainers and the appointed local consultant to undertake the following tasks:

- a) Review the existing training establishments and select the most appropriate to host the train-the-trainers workshop once the physical resources are upgraded if necessary.
- b) Ensure that the host training centres can achieve countrywide coverage.
- c) Identify which of the training establishments will be used to deliver the Phase II training on good practices in refrigeration once the human and physical resources are upgraded.

Involve all partners

Task for planning Phase I

- d) Select the trainers that will need to attend train-the-trainers workshop.
- e) Decide what mechanisms will be used to advertise the train-the-trainers workshop.
- f) Publish the workshop agendas and display them at all points of sale.
- g) Calculate how much funding will be required to provide for travel, accommodation and subsistence for the workshop participants.
- h) Ensure that the necessary funds are available when required.
- i) Make sure that the timing of the train-the-trainers workshop is convenient to the host centres and to the workshop participants - usually it is best to avoid normal term time when other standard courses are running. Holiday seasons, festivity seasons and rain seasons should also be taken into account.
- j) Make sure that there will be efficient communications and liaison between the NOU, the host training establishments and the local trainers.
- k) Make sure that promotional materials are recognised and ensure that local and national press and other media are kept well informed and given every opportunity to raise public awareness levels.
- l) Ensure that appropriate training aids are available such as overhead projectors, wallboards, flip charts and appropriate writing implements.
- m) Ensure that adequate resources will be available for the workshop participants, such as training and reference materials, workshop evaluation forms and other supplies.



The morning session

Planning Phase II training

Phases I and II should be planned in parallel. In order to plan the Phase II training on good practices in refrigeration, the NOU and its co-ordinating team will work in close consultation with the local training institutes and stakeholder partners to undertake the following tasks:

- a) Use the Country Programme and Refrigerant Management Plan to estimate the number of technicians working in the refrigeration and air-conditioning sector.
- b) Estimate the number of workshops required for each region.
- c) Consult with the training establishments to co-ordinate activities and to ensure that convenient times are selected to run the training workshops.
- d) Estimate the requirement for consumable items and ensure that adequate equipment and other resources are available for the number of trainees expected.
- e) Check that all trainers have successfully completed the train-the-trainers workshop.
- f) Decide in consultation with industry partners how to advertise and publicise the training workshops.
- g) Decide on what basis the training will be delivered in terms of funding taking into account the funding provided from the Multilateral Fund for the Implementation of the Montreal Protocol as well as any counterpart contributions from the Government, industry or participation fees from participants.
- h) Ensure that the funding mechanisms are thoroughly understood and that all parties know what is expected from them.
- i) Make sure that the timing and frequency of the training workshops cause minimum disruption to industry (e.g. by avoiding the hottest time of year).
- j) Ensure that the trainer delivering the training workshop is fully briefed and has adequate resources to deliver the training workshop effectively.
- k) Determine the arrangements for food and shelter required by the workshop participants and who will be responsible for the funding and organisation.
- l) Ensure that adequate support and resources are made available for the workshop participants.
- m) Ensure that the training and reference materials, and assessment and workshop evaluation documents are available and in good supply.

**Good
planning
is important**

**Tasks for
planning
Phase II**

Organisation

NOUs will have overall responsibility for organisational issues but will of course be acting in consultation with their stakeholder partners. Reference to the Refrigerant Management Plan will at all times inform the organisational process, while actively involving the stakeholder partners will ensure the relevance and acceptability of the training workshops.

Stakeholders to be involved

Stakeholder partners could be drawn from the following areas in accordance with their sector relevance:

Industrial, institutional and other stakeholders

- Professional and industry associations and institutions
- Technical training institutes
- Contracting companies
- Service and maintenance companies
- Facility managers for large buildings
- Importers and distributors of refrigerant
- End users - supermarkets, cold stores etc.
- Refrigeration and air-conditioning technicians
- Workshop owners and managers
- Informal sector.

Ministerial stakeholder representation

- Agriculture and fisheries
- Environment
- Industry
- Education and training
- Transport
- Defence
- Health.



Stakeholder involvement

While representatives from both groups of stakeholders will be involved in the design process, the industrial and institutional stakeholder will be most vigorously involved in the planning and implementation processes with technicians employed by the ministerial stakeholders involved in the implementation as required to gain training and certification.

NOUs and their co-ordinating teams should involve the stakeholder partners in such activities as:

- Design
- Planning
- Implementing
- Selection of venues
- Selection of trainers
- Selection of trainees
- Optimising promotional and awareness raising opportunities.

Note:

Where industry associations do not exist, the NOU should make the formation of appropriate trade associations a high priority. It is extremely beneficial to have active trade associations available for networking and for the effective dissemination of information. Once trade associations are developed they can form the focal point for the development and implementation of codes of good practices, technicians certification and training and for appropriate voluntary agreements.

Delivery

International consultants or training institutes are used to deliver the Phase I training, imparting new skills and knowledge to be cascaded through the country and then to be used in normal training courses (i.e. Phase II training) for new entrants to the industry. The NOU will be working with the Implementing Agency to set up these workshops for prospective trainers.

Pre- and post training assessment

Pre-training assessment

Pre-training assessment is used to establish the baseline for knowledge and/or skills and should be carried out before the training workshop starts. In order to cover the widest possible spectrum it is recommended that multi-choice items are used, samples of which are included in Annexe 1.e.

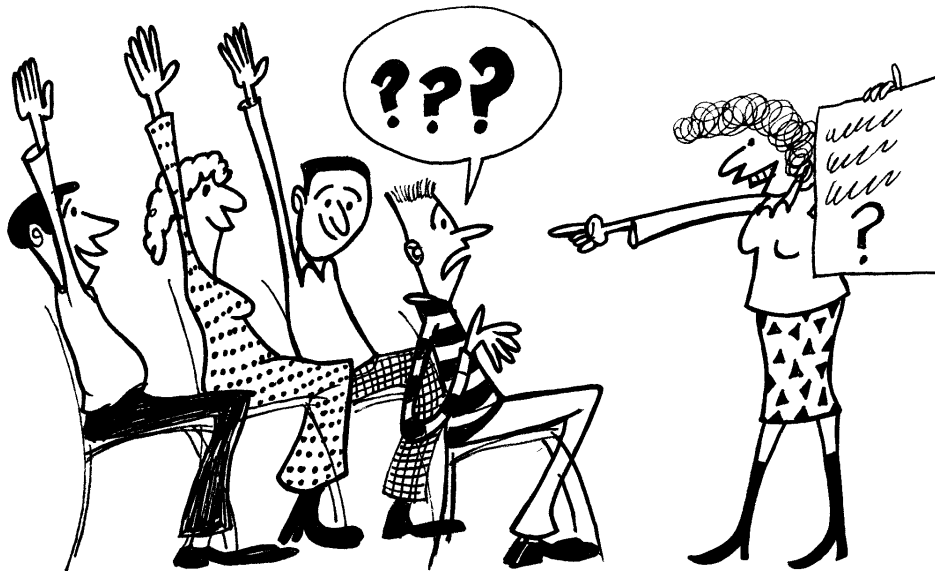
Activities for stakeholder involvement

Involve industry associations and private sector

Training consultants and institutes

Baseline for knowledge

Pre-tests should be analysed in order to detect weaknesses in the current provision and to identify the scale of the task on both Phase I and Phase II training.



The importance of pre-training assessment

Post training assessment

Analysis of learning progress

Post-training assessment can be used for two purposes. The first is to simply enable an analysis of progress made and this can be used to encourage students to greater efforts.

Certification schemes are important

The second purpose is to enable certification of successful trainees as part of a national certification scheme, which in turn can be a competitive advantage for certified technicians and servicing workshops. National legislation may restrict the access to CFC refrigerants to certified technicians and servicing workshops following a pre-defined time schedule.

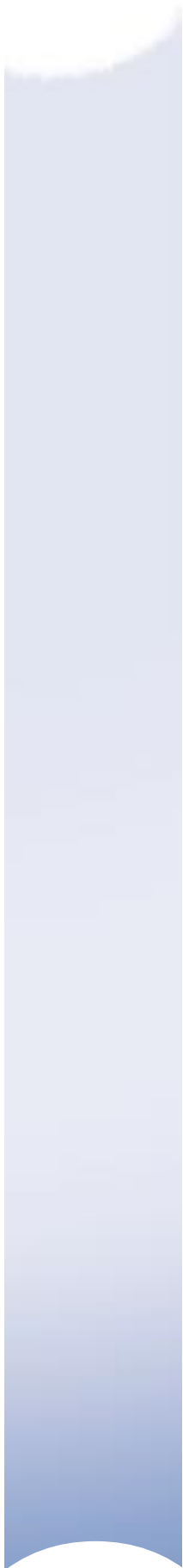
National and international certification schemes

The NOU will assess whether it is more appropriate to use a certification programme devised by national educational experts and with certificates either awarded by the National Awarding Body or by the NOU itself. Alternatively it is possible to “participate” in internationally recognised certification schemes developed by refrigeration association or training institutions in other countries. Such international certificates can be “localised” as necessary and provide the benefit of harmonising standards in those countries that use them.

While pre-training assessment is often best carried out using multiple choice items as described in Annexe 1.e, only knowledge can be properly assessed this way. Any post-training certification assessment should include a rigorous practical assessment reinforced by question and answer sessions. A sample assessment specification can be found in Annexe 1.e.



The importance of post-training assessments



4 Monitoring & evaluation

The implementation of the training programme should be closely monitored and evaluated during all stages of Phase I and II in order to demonstrate the success, effectiveness and sustainability of the training. In case the progress or the results are not satisfactory, the training approach needs to be critically reviewed and corrective measures initiated.

The quality of each training workshop should be assessed and evaluated e.g. by collecting the participants' feedback by means of an evaluation questionnaire. The participants' evaluation should provide an overall evaluation of the workshop as well as specific evaluations of the:

- Quality of the lead trainer
- Quality of the training materials
- Composition of the participants
- Effectiveness of each training session
- Local organisation.

Participants should be invited to provide additional comments and improvement suggestions for subsequent training programmes. Sample evaluation questionnaires are included in Annex 1.f.

Once technicians have been trained on good practices in refrigeration and have received certification it is useful to monitor in the longer term how they are applying the good practice principles and whether they remain committed to implement the ideas, skills and knowledge gained at the training. The refrigeration association if existing could help with the longer term monitoring and organise periodic follow-up meetings for their members.

This may support the NOUs in monitoring the supply and use of refrigerant in accordance with the RMP. An efficient method to monitor the supply and use of refrigerant is to enact legislation, which encompasses the following action points:

- Introduce mandatory certification of technicians allowing them to purchase and handle ODS refrigerants.
- Declare it an offence to supply refrigerants to uncertified individuals and introduce penalties.
- Oblige companies to only employ certified technicians to purchase and handle ODS refrigerants.
- Require companies to record the purchase and use of ODS refrigerants and to report this information to the NOU.

Monitoring of
Phase I and
Phase II

Workshop
evaluation

Monitoring in
the longer
term

Methods of
monitoring

Register of certified technicians

- Require companies to record the amounts of ODS refrigerants recovered, recycled and reused and to report this information to the NOU.
- Include appropriate clauses in the certification conditions which require re-assessment of competence after a certain period or which allow withdrawing a certificate in case the individual or company does not comply with the codes of good practices.
- Set a deadline for certification to allow technicians and companies enough time to certify and communicate this deadline to all stakeholders involved. The wholesalers and refrigeration association may be good communication channels.

Certification should not be awarded for a lifetime. In order to keep track of the certified technicians and companies and the expiry dates for the certification, a register of certified technicians and companies should be maintained. The register should include the following information:

- Name of technician or company
- Address and contact details
- Date of birth
- Date of certification
- Reference number of certification
- Certification body or institute
- Expiry date
- Recent photograph
- National insurance number or identity card number or other unique personal feature
- Refrigerants and equipment the technician is qualified to handle.



Examination and certification

For certified technicians or companies, a registration card should be issued which should allow identification of the certified person or company as well as the expiry date. In order to extend the validity of the certification, the NOU and its stakeholder partners will decide if there is need for a further assessment of skills and knowledge after expiry or not. If not, the technician or company simply renews the registration card.

Otherwise, the technicians have to be re-assessed or if necessary first re-trained and then re-assessed. This opportunity for re-training and re-assessment thus occurs periodically after the expiry of the certification and allows the technicians to remain updated concerning newest technology developments.

It also allows the NOU to ensure that the skills and knowledge of the technicians are appropriate and to control and monitor the supply and use of refrigerant.

Such periodic refresher training could be provided through the national training institutes or the refrigeration association if existing and would need to be financed through participants' contributions.

**Registration
card for
certification**

**Re-
assessment
for renewal**

**Refresher
courses are
important**



Keep the momentum

Annexes

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Annex 1: Sample Workshop Elements

Annex 1.a: Concept note

1. Background

In most developing countries, the largest remaining sector in which ozone-depleting substances are used is the refrigeration and air-conditioning servicing sector. In [year], [country] consumed approximately [number] ODP tons of ozone-depleting substances (ODS) in the refrigeration & air-conditioning sector of a total consumption of [number] ODP tonnes of ODS. [Country] imports all its ODSs. Any abrupt non-availability of CFC refrigerants will adversely impact on important sectors of the local economy. It is therefore essential for CFC users to be able to reduce and subsequently phase-out their consumption in a co-ordinated, planned and cost-effective manner.

The Refrigerant Management Plan (RMP) of [country] was approved by the [number]'s Meeting of the Executive Committee of the Multilateral Fund to be jointly implemented by [bilateral donor] and [implementing agency]. [Country]'s RMP is a comprehensive approach to phase out the use of ODS in the refrigeration and air-conditioning sector.

The Implementing Agency co-ordinates the implementation of the two training elements of the Refrigerant Management Plan, viz;

1. The training programme on good practices in refrigeration; and
2. The training programme for customs officers on the control and monitoring of ODS imports and exports.

The train-the-trainers programme on good practices in refrigeration is part of a comprehensive approach to reduce the CFC consumption in the refrigeration servicing sector. Such approach is defined in the Refrigerant Management Plan (RMP) of [country].

A significant amount of CFC emissions could be avoided through the application of good practices during design, installation, operation, servicing and decommissioning of refrigeration and air-conditioning equipment. Good practices include activities such as preventive maintenance and inspection, record-keeping, appropriate training, recovery & recycling as well as the safe handling of refrigerants. Good practices are easy to follow methods to achieve an early reduction of the CFC consumption in the refrigeration sector.

[Country] has about **[number]** service technicians operating in the refrigeration and air-conditioning sector. Many technicians received formal training in a technical training centre. However, a huge number of technicians is working in the informal sector and their training is based on “experience” or “training on the job”.

An abrupt non-availability of CFC refrigerants in the future may affect the ability of industries to perform. It is essential for the CFC users to be able to reduce and subsequently phase-out their consumption in a co-ordinated, planned and cost-effective manner. A combination of containment practices such as recovery and recycling and conversion to alternative technologies are expected to ease the economic consequences of the phase-out.

Therefore, training on good practices in refrigeration and an effective recovery and recycling programme combined with prudent retrofitting and timely replacement are part of the overall phase-out strategy and will assist **[country]** in meeting the control measures under the Montreal Protocol sustaining the freeze in consumption of Annex A CFCs in 1999.

2. Objectives

The main objective of this train-the-trainers workshop is to reduce the CFC consumption in the refrigeration and air-conditioning sector in **[country]** and to assist the country to comply with the phase-out schedule for CFC under the Montreal Protocol by:

- Increasing participants awareness about ozone depletion, the Montreal Protocol, the environmental and economic benefits of good servicing practices and refrigerant management
- Introducing and demonstrating procedures that eliminate refrigerant emissions during preventive and unscheduled maintenance including refrigerant containment
- Disseminating information on CFC-free technologies available today and retrofitting of existing equipment
- Demonstrating the conversion of existing refrigeration equipment to alternatives
- Introducing the concept of RMPs for major end-users
- Stimulating the development of a network for information sharing throughout the sector
- Helping the country to achieve the planned phase-out in a co-ordinated, planned and cost-effective manner, allowing to run existing CFC equipment until the end of its economic life or to retrofit if economically feasible.

3. Expected results

The expected result of the training programme is to enhance good servicing and business practices in the refrigeration sector assisting the sector to switch over to non-CFC equipment in a smooth way without causing an unnecessary burden to the consumers.

It also includes the consequent training of the remaining service technicians operating in the formal and informal refrigeration and air-conditioning sector and the incorporation of a Montreal Protocol related training module on good practices in refrigeration in the normal curricula of the technical training institutes in Jamaica, ensuring that future technicians do not need re-training on this aspect.

Other expected results are the following:

- Raised awareness regarding the harmful effects of ozone layer depletion through reporting in the media
- Minimization and elimination of uncontrolled emissions of CFCs through better maintenance practices and leak prevention
- CFC recovery and recycling through training of refrigeration service technicians
- Reduction of venting of CFC during purging and flushing
- Increased use of non-CFC equipment and technology and non-CFC coolants.

4. Participants

Approximately **[number]** senior refrigeration technicians and lecturers with at least 5 years of working experience from major industry companies and service workshops, government ministries, training institutes as well as the military and police force are expected to participate in the train-the-trainers workshop.

5. Methodology

The training programme will use the train-the-trainers approach, where in a first phase a number of trainers will be trained on good practices in refrigeration. This five-day train-the-trainers workshop consists of both theoretical presentations and practical “hands-on” demonstrations. The trained trainers are expected to train the remaining service technicians in the refrigeration and air-conditioning sector in **[country]**.

UNEP’s training manuals on “Good Practices in Refrigeration” and on “Chillers and Refrigerant Management” will be used as resource documents. UNEP’s guidebook for “Implementation of Codes of Good Practice - Refrigeration Sector”

may help the National Ozone Unit to initiate the establishment of a national code of good practice in the refrigeration and air-conditioning sector.

6. Content

During the five-day training workshop, the participants will learn about the importance of ozone layer protection and the harmful effects of an increased UV-B radiation. The training explains the Montreal Protocol and its amendments and the role of UNEP in the implementation of this treaty. The lectures review the basic principles of refrigeration and respond to the questions on how to service refrigeration and air-conditioning equipment in order to avoid refrigerant emissions and which alternative refrigerants could be used for retrofitting. They cover the different types of CFC, HCFC, HFC and HC refrigerants and inform about preventive maintenance programmes, record-keeping and safety issues. New CFC-free technologies are presented and the concept of RMPs at company level is introduced.

During the hands-on sessions, the participants practice the use of recovery machines as well as recharging and retrofitting of refrigeration and air-conditioning systems.

Wrap-up sessions will be held at the end of every day and the participants will conduct a workshop evaluation and agree a final set of recommendations.

Each participant will receive a "Certificate of Participation" from the Government of [country] and become registered at the end of the workshop. It is proposed that this training and certification should become mandatory for all customs officers.

The workshop report will be disseminated to all participants and members of the contact group on customs training. It will also be placed on UNEP's homepage at: <http://www.uneptie.org/ozonaction.html>.

7. Follow-up

This training programme is part of the Refrigerant Management Plan for [country]. As such it will be accompanied by other training and policy related activities as defined in the Refrigerant Management Plan.

The NOU will establish a monitoring mechanism to ensure that the objectives of the training programme are met and will produce a follow-up report on the status of implementation of the training programme.

The National Ozone Unit will consider and, as far as possible, implement the workshop recommendations as adopted by the workshop participants. The recommendations should also be communicated to the relevant decision-makers and politicians.

Annex 1.b: Training agendas for Phase I and II

Sample Agenda for Phase I training

In general each day will be divided into five sessions. Tentative times are suggested below, but as explained above, this may vary from country-to-country:

Session 1	9 am to 10.45 am,
Session 2	11 am to 12.30 pm
Session 3	1.30 pm to 3.15 pm
Session 4	3.30 pm to 5 pm
Session 5	5 pm to 5.30 pm (Daily wrap-up sessions & recommendations)

Where a session is shown to be an oral presentation it is expected that the trainer will devise a formula for varying his presentation by making use of practical demonstration, overhead projector slides and by drawing attention to examples in the training room.

If more than one trainer is allocated to each workshop then it may be possible to split the trainees into groups and to have simultaneous sessions taking place, but this would require the availability of at least one more similarly equipped room.

Note: Ref () and OH () refer to the relevant sections and overhead numbering in UNEP's training manual on "Good Practices in Refrigeration".

Day 1 (oral presentation and demonstration)

8:30 Registration of participants

9:00 Opening ceremony and media briefing

- Welcome address and workshop objectives by Ozone Officer (10 min)
- UNEP DTIE's OzonAction Programme (10 min)
- The training team and workshop approach (5 min)
- Statements of special guests (5 min each, maximum of 2)
- Workshop address by Refrigeration industry representative (5 min)
- Workshop opening by Government representative (10 min)
- Answers and questions by the media (10 min)

10:00 Break

10:15 Introduction

- Expected output of the training workshop for the participating trainers
- Training materials and display
- Self-introduction of participants including questions & answers

Sessions 1-2 Pre-training assessment (30 mins)
 Global warming - cause and effects
 Ozone depletion - cause and effects
 Montreal Protocol, Country Programme, RMP (presented by NOU while pre training assessment papers are marked)
 Ref (1) OH (1-5) inc.

Session 3 Review basic principles of refrigeration - compressors, expansion devices, condensers and evaporators
 Ref (3) (5) OH (38 -118)

Session 4 Refrigerants - hazards, storage and transportation
 CFC and their effect on the environment
 HCFC and HFC refrigerants - single fluids and blends
 Ref (7) OH (152-163)

Session 5 Wrap-up sessions and workshop recommendations

Day 2 (oral presentation and demonstration)

- Session 1 Good practices in refrigeration
Fitting and removing gauges without loss of refrigerant
Leak prevention and leak detection procedures
Ref (4) OH (21-37)
- Session 2 System pressure testing with nitrogen
Evacuation and dehydration
Ref (4) OH (21-37)
- Session 3 Charging refrigerant as a vapour (for single fluids only)
Charging refrigerant as a liquid into:
a) high side of system (static)
b) low side of system (rotating)
Ref (5) OH (106-108)
- Session 4 Retrofitting
Ref (7) OH (156-161)
- Session 5 Wrap-up sessions and workshop recommendations

Day 3 (oral presentation and demonstration)

- Session 1 Recovery machines - what they are and how to operate them
Recovery of refrigerant as a liquid, or as a vapour
Ref (6) OH (118-151)
- Session 2 Recycling machines - what they are and how to use them
Recycling refrigerant from a burn out for re-use
Ref (6) OH (118-151)
- Session 3 Refrigerant reclaim and how it differs from recovery and recycling
Ref (6) OH (118-151)
- Session 4 Working with zeotropic blends
Working with hydrocarbon refrigerants
Ref (7) OH (158-156)
- Session 5 Wrap-up sessions and workshop recommendations

Day 4 (participant practice and tutorials)

- Sessions 1-4 Good Refrigeration Practice - install, pressure test, evacuate, dehydrate, charge and run a test system
Ref (4)(5) OH (21-117)
- Session 5 Wrap-up sessions and workshop recommendations

Day 5 (participant practice and tutorials)

- Session 1 Good Refrigeration Practice - service and maintenance, recovery of charge, recycling charge for re-use
Safe handling techniques, leak testing and maintenance to improve energy efficiency
Ref (4)(5) OH (118-152)
- Session 2 Post training assessment for written test or oral testing. Observation of participants' practice over days 3 and 4 will also be part of the practical assessment necessary for the national certification scheme.
- Session 3 **Action planning for Phase II and III of the refrigeration training**
- How to design Phase II training for technicians (approach duration, agenda, schedule, trainers, participants etc.)
 - Which training materials should be used for Phase II and what should be the key contents of the training
 - How to ensure timely implementation, monitoring and reporting during Phase II and III
 - Discussion
- Session 4 **Workshop evaluation**
- Completion of evaluation questionnaires
 - General feedback and comments from participants and organisers
- Session 5 **Closing session and media briefing**
- Conclusions and outlook by Ozone Officer (10 min)
 - Closing statement by UNEP DTIE's OzonAction Programme (5 min) - optional
 - Closing remarks by the training team (5 min)
 - Hand-over of participation certificates (15 min)
 - Closing remarks by Refrigeration industry representative (5 min)

- Conclusions on synergies on co-operation between related Conventions (5 min)
- Closing of workshop by Government representative (10 min)
- Questions and answers by the media (10 min)

Note: A site visit may be organised on a voluntary basis outside the official workshop hours, e.g. as an “Open Door” initiative after the workshop or in the evening if this is feasible.

Sample agenda for Phase II training

In general each day will be divided into five sessions. Tentative times are suggested below, but as explained above, this may vary from country-to-country:

Session 1	9 am to 10.45 am,
Session 2	11 am to 12.30 pm
Session 3	1.30 pm to 3.15 pm
Session 4	3.30 pm to 5 pm
Session 5	5 pm to 5.30 pm

(Daily wrap-up sessions & recommendations)

Where a session is shown to be an oral presentation it is expected that the trainer will devise a formula for varying the presentation by making use of practical demonstrations, overheads and by drawing attention to examples in the training room. If more than one trainer is allocated to teach the workshop then it may be possible to split the trainees into groups and to have simultaneous sessions taking place, but this would require the availability of at least one more similarly equipped room.

Day 1 (oral presentation and demonstrations)

8:30 **Registration of participants**

9:00 **Opening ceremony and media briefing**

- Welcome address and workshop objectives by Ozone Officer (10 min)
- UNEP DTIE's OzonAction Programme (10 min)
- The training team and workshop approach (5 min)
- Statements of special guests (5 min each, maximum of 2)
- Workshop address by Refrigeration industry representative (5 min)
- Workshop opening by Government representative (10 min)
- Answers and questions by the media (10 min)

10:00 **Break**

10:15 **Introduction**

- Expected output of the training workshop for the participating technicians
- Training materials and display
- Self-introduction of participants including questions & answers

- Session 1 Pre-training assessment (30 mins)
Presentation by NOU (while trainer marks pre-assessment papers)
Ozone depletion, Montreal Protocol, Country Programme, RMP, local regulations
Ref (1) OH (1-5)
- Session 2 Review of basic principles of refrigeration
Safe handling of cylinders, refrigerant hazards
Ref (3)(5) OH (38-118)
- Session 3 Introduction to good practices in refrigeration
Comparison of good and bad practices and the potential damage from not applying good practices
Introduction of fitting and removing gauges without loss of refrigerant to atmosphere
Leak prevention and detection
Ref (4) OH (21-37)
- Session 4 Pressure and leak testing without using pure refrigerant
Evacuation and dehydration
Charging refrigerant
Ref (4) OH (21-37)
- Session 5 Daily wrap-up sessions & recommendations

Day 2 (oral presentation and demonstration)

- Session 1 Good practices in refrigeration
Recovery machines and how to use them
Recovering liquid, recovering vapour
Ref (6) OH (118-151)
- Session 2 Recycling machines and how to use them
Recycling refrigerant for re-use
Ref (6) OH (118-151)
- Session 3 Retrofitting procedures CFC to HFC
Ref (7) OH (156-161)
- Session 4 Retrofitting procedures CFC to HCFC/HFC zeotropic blend
Ref (7) OH (156-161)
- Session 5 Daily wrap-up sessions & recommendations

Day 3 (practice and assessment)

Sessions 1-2

Practice evacuation, dehydration, using gauges, charging, recovery, recycling, retrofitting and retrofitting
Ref (4)(5)OH (21-117)

Session 3 Practice and post-training assessment

Session 4 **Workshop evaluation**

- Completion of evaluation questionnaires
- General feedback and comments from participants and organisers

Session 5 **Closing session and media briefing**

- Conclusions and outlook by Ozone Officer (10 min)
- Closing statement by UNEP DTIE's OzonAction Programme (5 min) - optional
- Closing remarks by the training team (5 min)
- Hand-over of participation certificates (15 min)
- Closing remarks by Refrigeration industry representative (5 min)
- Conclusions on synergies on co-operation between related Conventions (5 min)
- Closing of workshop by Government representative (10 min)
- Questions and answers by the media (10 min)

Annex 1.c: Break-out session

Purpose of the Assignment:

By analysing the group work exercises, making and presenting recommendations, and discussing with your colleagues and resource speakers, you will have a chance to identify ways to effectively reduce the emissions of ozone-depleting refrigerants during servicing, maintenance, installation, commissioning or decommissioning of refrigeration and air conditioning systems, and to practice communicating the information you have acquired during the program.

Instructions:

1. The training team will propose 2 topics for the mini groups during a break. Suggest 2 additional topics. **Topics will be selected during introduction to break out sessions.**
2. Inscribe to 1 mini group only on a “first comes first served” basis - 5 participants maximum per group. Participants may choose topics which are not related with their usual work area so they contribute their own fresh views and are exposed to alternative views. **To be done during break.**
3. Identify 1) the group leader to co-ordinate the group work and for the time management, 2) the group secretary to take notes and to fill in the report form and 3) the spokesperson that will present your recommendations. **Not more than 5 minutes.**
4. Read group work example and raise any questions you have. **Not more than 15 minutes.**
5. Discuss the questions posed for each topic and add your own questions. Also consider the information presented during the program sessions as you work through your assignment. Prioritise 3-4 questions. **Time available as per agenda.**
6. Complete the group activity form. One report from each group should be submitted to the workshop facilitator after each presentation. **Plan at least 15 minutes.**
7. Present your findings and recommendations to the class. Each team will have **maximum 10 minutes.**

Topics for the break-out session:

Topic 1: Successful implementation of RMPs requires the coordination of activities at different levels and in different sectors

- 1) What is a RMP?
- 2) Which sectors are important in the coordination of phase out of ozone depleting refrigerants?
- 3) What types of activities can be undertaken to effect the phase out?
- 4) How can the informal sector be involved?
- 5) What role can industry associations play?
- 6) How can a national accreditation system be set up?
- 7) Other questions ...

Topic 2: Monitoring and evaluation of RMP based refrigeration training activities

- 1) How can the monitoring and evaluation be undertaken?
- 2) What are some qualitative indicators of success?
- 3) What are some quantitative indicators of success?
- 4) Other questions....

Topic 3: To be suggested by participants

- 1)
- 2)
- 3)
- 4)
- 5)

Topic 4: To be suggested by participants

- 1)
- 2)
- 3)
- 4)
- 5)

Break-out session report form

Your findings and recommendations will be part of the workshops results and be included in the workshop report. They will guide the preparation of Phase II of the refrigeration training programme. **Please write in ink and use the other side of this sheet if you need more writing space.**

Session:

Mini group:

Topic:

Participants:

Key issues / problem identification

Obstacles to achieving desired outcome

Key results of the discussion (consensus-disagreement)

Discussion notes:

Recommendations & lessons learned

Actions to be taken:

Resources required:

Summary & conclusions

**Thank you for returning this form to the workshop
facilitator.**

Annex 1.d: Hands-on session

Resources required:

- One operational system for every two participants
- For each operational system there should be:
 - 1) Gauge manifold set complete with 2 gauges and 3 valved hoses
 - 2) Vacuum pump of adequate size
 - 3) Appropriate refrigerant cylinder (tank)
 - 4) Appropriate recovery (empty) cylinder (tank)
 - 5) Recovery/recycling machine plus spare, valved, hoses
 - 6) Leak detection device
 - 7) Valve key and suitable spanners/wrenches
 - 8) Nitrogen bottle, regulator and gauge

Each pair of participants should be allocated an operational system and given the following tasks:

Task A

- Pressure test system with nitrogen
- Soap (bubble) test joints - repair leaks if appropriate
- Release nitrogen safely
- Evacuate and dehydrate system - prove vacuum tight
- Charge system with correct quantity of refrigerant
- Record operating conditions

Task B

- Stop system
- Connect recovery/recycling machine to system
- Connect empty recovery cylinder (tank) to recovery/recycling machine
- Recover refrigerant from system, recycle refrigerant
- Record weight of refrigerant removed
- Record system pressures after recovery is complete

Each participant should in turn take the lead, and provide assistance so that each task will be completed twice by each group of two.

Task C

Repeat task A but instead of charging the original refrigerant, retrofit with a “drop-in” replacement.

Practical assessment can be carried out by the trainer(s) during either Task A, B or C.

Annex 1.e: Pre-training assessment and marking scheme

The following pre-training assessment is designed to provide the trainers with as much information as possible so that you can gain the maximum benefit from this workshop.

The first section will indicate your current state of knowledge. Please do not guess at the answer, if you do not know, leave blank.

Circle the correct answer for each of the questions.

Section 1 Pre-training assessment - knowledge

1. A halide lamp is used to detect the presence of a leak of R12. If the leak is small the flame colour changes to:
 - a. Blue
 - b. Green
 - c. Orange
 - d. Purple.

2. Which one of the following refrigerants is NOT miscible with mineral oil:
 - a. R12
 - b. R22
 - c. R502
 - d. R134a.

3. A cascade system operating within the temperature range of +35°C and -70°C would use the following combination of refrigerants:
 - a. R11 and R12
 - b. R12 and R502
 - c. R22 and R13
 - d. R717 and R502.

4. Which one of the following refrigerants is in common use in large low-temperature cold rooms?
 - a. R11
 - b. R12
 - c. R13
 - d. R502.

5. Which one of the following properties is particularly related to the viscosity of a refrigeration quality oil?
 - a. Thickness
 - b. Density
 - c. Heat content
 - d. Wax content.

6. When more than one compressor is used with one or more evaporators in a common circuit it is essential to ensure that:
 - a. Oil returns to the suction line header
 - b. Compressor oil levels are balanced
 - c. Oil pressure controls are used
 - d. Oil pressure controls are fitted.

7. When a compressor is installed above the evaporator two small bore tubes may be used as the suction line riser in order to:
 - a. Use smaller, more easily handled tubing sizes
 - b. Provide an alternative channel if one blocked
 - c. Assist oil return of the compressor operates partially unloaded
 - d. Avoid the need to use a suction line strainer.

8. To evacuate a system contaminated by moisture it is necessary to:
 - a. Heat the system
 - b. Pull a vacuum of at least 29 inch Hg gauge
 - c. Maintain a vacuum for at least 24 hours
 - d. Have a sufficient vacuum to evaporate moisture at the ambient temperature.

9. When fitting a new piston to a reciprocating compressor, the fit should be such that the piston will:
 - a. Slip through a dry bore without pressure
 - b. Slip through a lubricated core without pressure
 - c. Go through a lubricated bore with light pressure
 - d. Go through a lubricated bore with heavy pressure.

10. Which one of the following gives a condition under which refrigerant is absorbed into the compressor crankcase oil?
 - a. During the off cycle period
 - b. When the compressor is running
 - c. During a pump down cycle
 - d. When the compressor crankcase oil is "thin".

11. If the filter of a domestic air-conditioner becomes dirty the effect will be that the:
 - a. Evaporator temperature will rise
 - b. Temperature of the air off-coil will rise
 - c. Evaporator will become frosted
 - d. Room will get too cold.

12. Into which one of the following refrigerant lines can the charge of refrigerant be safely introduced when the compressor is static:
 - a. Discharge line
 - b. Liquid line
 - c. Suction line
 - d. Hot gas line.

13. Which one of the following is the voltage between a live and neutral conductor in a 415 volt 50 hertz four wire alternating current supply?
 - a. 110 volts
 - b. 120 volts
 - c. 240 volts
 - d. 415 volts.

14. External pressure equalising devices should be incorporated in thermostatic expansion valves for refrigeration systems, which are used:
 - a. At very low temperatures
 - b. With widely varying refrigeration duties
 - c. With more than one evaporator and one compressor
 - d. With a substantial pressure drop through the evaporator.

15. A low-pressure float valve opens and closes as a result of changes in:
- Condenser pressure
 - Evaporator pressure
 - Condenser liquid level
 - Evaporator liquid level.
16. If the voltage of a single-phase power supply feeding an electric motor reduces, the current drawn by the motor when fully loaded:
- Increases
 - Decreases
 - Is not changed
 - Fluctuates up and down.
17. Which one of the following refrigerants has the highest potential to destroy ozone in the stratosphere?
- R717
 - R502
 - R12
 - R22.
18. Which one of the following service valve combinations is correct when fitting gauges or a service manifold?
- Suction service valve front seated, discharge service valve front seated
 - Suction service valve front seated, discharge service valve back seated
 - Suction service valve back seated, discharge service valve back seated
 - Suction service valve back seated, discharge service valve front seated.

19. Assuming gauges are fitted directly to the compressor head, which one of the following service valve combinations is correct for testing the suction valve reeds of a reciprocating compressor?
- Suction service valve front seated, discharge service valve front seated
 - Suction service valve front seated, discharge service valve back seated
 - Suction service valve back seated, discharge service valve back seated
 - Suction service valve back seated, discharge service valve front seated.
20. In order to pump the refrigerant charge of a system down into the liquid receiver, it is necessary to
- Front seat the discharge service valve
 - Front seat the liquid stop valve
 - Front seat the suction service valve
 - Front seat the crankcase pressure regulating valve.
21. Which one of the following gives the most accurate measurement of a deep vacuum?
- Compound gauge
 - Pressure gauge
 - Torr gauge
 - Water gauge.
22. Which one of the following methods gives a reasonable approximation of the length of tube remaining on a partly used coil?
- 3 x coil diameter x length of one coil
 - 3 x coil diameter x number of complete coils
 - 3 x coil circumference x number of complete coils
 - 3 x coil circumference x length of one coil.
23. Which one of the following refrigerants has the lowest potential to destroy stratospheric ozone?
- R717
 - R502
 - R12
 - R22.

24. A single-phase motor, which has a capacitor in series with the highest resistance winding, is called:
- Split-phase motor
 - Capacitor start motor
 - Capacitor start and run motor
 - Shaded pole motor.
25. The function of an evaporator pressure-regulating valve is to:
- Maintain a constant suction pressure
 - Maintain a constant evaporator pressure
 - Prevent the evaporator pressure falling below some pre-set minimum
 - Prevent the evaporator pressure rising above some pre-set maximum.
26. The Montreal Protocol is which of the following:
- List of do's and don'ts of how to behave in Canada
 - List of suggestions for working with all refrigerants
 - International agreement regulating the consumption and production of ODS
 - Advisory body promoted by the United Nations for surplus food production.
27. Which of the following refrigerants is a CFC?
- R12
 - R123
 - R22
 - R134a.
28. Which of the following refrigerants is an HCFC?
- R12
 - R502
 - R22
 - R134a.
29. Which of the following refrigerants is an HFC?
- R502
 - R12
 - R134a
 - R123.

30. The ozone layer surrounding the earth's atmosphere is being depleted by contact with:
- a. Fluorine
 - b. Chlorine
 - c. Hydrogen
 - d. Carbon dioxide.
31. Which of the following describes the term refrigerant reclaim?
- a. Removing refrigerant from a system for re-use or disposal
 - b. Removing refrigerant from a system for disposal to atmosphere
 - c. Reprocessing refrigerant to virgin quality
 - d. Reprocessing refrigerant to remove some of the solids, moisture etc.
32. Which of the following describes the term refrigerant recovery?
- a. Removing refrigerant from a system for re-use or disposal
 - b. Removing refrigerant from a system for disposal to atmosphere
 - c. Reprocessing refrigerant to virgin quality
 - d. Reprocessing refrigerant to remove some of the solids, moisture etc.
33. Which of the following describes the term refrigerant recycling?
- a. Removing refrigerant from a system for re-use or disposal
 - b. Removing refrigerant from a system for release to atmosphere
 - c. Reprocessing refrigerant to virgin quality
 - d. Reprocessing refrigerant to remove some of the solids, moisture etc.
34. Which of the following should be an illegal process?
- a. Removing refrigerant from a system for re-use or disposal
 - b. Removing refrigerant from a system for release to atmosphere
 - c. Reprocessing refrigerant to virgin quality
 - d. Reprocessing refrigerant to remove some of the solids, moisture etc.

35. Which of the following refrigerants is an HC?
- a. R134a
 - b. R600a
 - c. R404a
 - d. R407c.
36. Which of the following refrigerants is an azeotropic blend?
- a. R134a
 - b. R502
 - c. R408a
 - d. R409a.
37. Which of the following refrigerants is a zeotropic blend?
- a. R134a
 - b. R290
 - c. R600a
 - d. R404a.
38. Which of the following procedures should be used to remove acid residues from hermetically sealed refrigeration circuit after a motor burn out?
- a. Flush the system through with R11
 - b. Flush the system through with R134a
 - c. Install a "catch all" drier in the suction line
 - d. Install a "catch all" drier in the liquid line.
39. Which of the following procedures should be used to remove a service gauge manifold connected to both high and low side service valves?
- a. Backseat HP service valve, backseat LP service valve and remove gauge lines
 - b. Frontseat HP service valve, frontseat LP service valve and remove gauge lines
 - c. Backseat HP service valve, open gauge manifold valves, draw refrigerant residue into suction, then backseat LP service valve and remove gauge lines
 - d. Backseat LP service valve, open gauge manifold valves, draw refrigerant residue into receiver, then backseat HP service valve and remove gauge lines.

40. Which of the following describes the overall impact of a refrigerant on the environment?
- a. HGWP
 - b. TEWI
 - c. ODP
 - d. ODS.

Section 2 Pre-training assessment - background

1. Are you experienced in:

- | | |
|---------------|-----|
| Training | () |
| Installation | () |
| Service | () |
| Maintenance | () |
| Commissioning | () |
| Retrofitting | () |
| System design | () |
| Manufacture | () |

2. Do you have experience of any of these systems?

- | | |
|--------------------------|-----|
| Domestic | () |
| Commercial | () |
| Cold storage | () |
| Freezers | () |
| Chillers | () |
| Transport | () |
| Marine | () |
| Mobile air-conditioning | () |
| General air-conditioning | () |

3. What quantity of refrigerant do you handle in one year (kg)

- | | |
|------------|-----|
| 1 - 10 | () |
| 10 - 100 | () |
| 100 - 1000 | () |
| >1000 | () |

4. What average refrigerant charge is usual in the systems you most often work on (kg)?

- | | |
|---------|-----|
| 0 - 1 | () |
| 1 - 5 | () |
| 5 - 10 | () |
| 10 - 50 | () |
| > 50 | () |

5. What type of refrigerants do you work with?

- R11 ()
- R12 ()
- R22 ()
- R502 ()
- R134a ()
- R404a ()
- R407c ()
- Ammonia ()

Others, specify:

6. Do you have previous experience with any of the following processes:

- Refrigerant recovery ()
- Refrigerant recycling ()
- Refrigerant reclamation ()

7. What level of training have you received?

- Craft ()
- Technician ()
- Diploma ()
- Degree ()
- On the job ()

8. When did you last receive any formal training?

- In the last year ()
- 1 - 5 years ago ()
- 5 - 10 years ago ()
- Longer ()
- Never ()

Please now fill in the details below and hand this completed pre-training assessment form to the NOU representative.

Name:

Company / organisation / institute:

Address:

Tel:

Fax:

Marking scheme for pre-training assessment

1.	b	11.	c	21.	c	31.	c
2.	d	12.	b	22.	b	32.	a
3.	c	13.	c	23.	a	33.	d
4.	d	14.	d	24.	b	34.	b
5.	a	15.	d	25.	c	35.	b
6.	b	16.	a	26.	c	36.	b
7.	c	17.	c	27.	a	37.	c
8.	d	18.	c	28.	c	38.	c
9.	c	19.	b	29.	c	39.	c
10.	a	20.	b	30.	b	40.	b

Annex 1.f: Sample evaluation questionnaire Phase I and II

For each of the following questions please evaluate the workshop using the following scale:

- 1 = not useful
- 2 = not very useful
- 3 = useful
- 4 = very useful
- 5 = extremely useful

Questions		1	2	3	4	5
1)	How do you rate the workshop overall?					
2)	How do you rate the contribution of the participants?					
3)	How do you rate the composition of the participants?					
4)	How do you rate the theoretical information provided?					
5)	How do you rate the practical information provided?					
6)	Were the contents of the presentation useful in explaining:-					
	a) Good practices in refrigeration					
	b) Safe practices					
	c) Leak detection and prevention					
	d) Recovery					
	e) Recycling					
	f) Reclamation					
7)	How do you rate the practical demonstrations?					
8)	How do you rate the local information supplied to you?					
9)	How do you rate the materials available for you to train others?					
10)	How do you rate the:					
	a) Workshop organisation					
	b) Programme					
	c) General discussions					
	d) Presenters					
	e) Audiovisuals					
	f) Practical facilities					
	g) Question and answer periods?					
11)	How do you rate the practice sessions?					
12)	How do you rate the equipment demonstrated?					

Annex 1.g: Post training assessment

In order to be awarded a certificate it will be necessary for the training workshop participant to be assessed against the following specification:

The Post Training Assessment Specification shall apply to all who are to be certified whether they are attending Train the Trainers or National Training courses in Good Refrigeration Practices.

The post-training assessment is divided into the assessment of knowledge and competence:

Knowledge

Each candidate shall have his/her knowledge tested by written or oral question and answer. The Assessor should confirm that the candidate has sufficient knowledge in each of the following areas to be safe and to show due regard for the environment.

The number in brackets indicates the relevant chapter in UNEP's training manual on "Good Practices in Refrigeration"

- | | | |
|----|--|-------------|
| 1) | Montreal Protocol and global issues | (Chapter 1) |
| 2) | Role of the NOU, Country Programme and RMP | (Chapter 2) |
| 3) | Local regulations | (Chapter 8) |
| 4) | Hazards of refrigerants | (Chapter 6) |
| 5) | Cylinder storage, transportation and handling | (Chapter 5) |
| 6) | Basic refrigeration principles | (Chapter 3) |
| 7) | Good refrigeration practices: | |
| | a) Leak prevention and detection | (Chapter 5) |
| | b) System pressure testing, evacuation and dehydration | (Chapter 5) |
| | c) Charging refrigerant | (Chapter 5) |
| | d) Recovery and recycling | (Chapter 6) |
| | e) Retro-fitting alternative refrigerants | (Chapter 7) |
| 8) | Alternative refrigerants | (Chapter 7) |

Competence

Each candidate shall demonstrate that the following tasks can be completed safely, while minimising the loss of refrigerant to atmosphere.

- a) Fitting and removing service gauges (Chapter 5)
- b) Evacuating and charging systems (Chapter 4,5)
- c) Leak testing using a variety of methods (Chapter 4)
- d) Recovering refrigerant from systems (Chapter 6)
- e) Recycling refrigerant for re-use (Chapter 6)

Annex 1.h: Generic participation certificate for Phase I

Government of [Name of Country]	UNEP	
[Name of collaborating Institute]		
CERTIFICATE OF PARTICIPATION		
[Organisation coordinating the training], Ministry of [Name of Ministry] of [Country],		
[Name of implementing agency]		
[Name of training Institute]		
certify that		
Mr./Ms. _____		
has participated in the		
National Train-the-Trainer Workshop on Good Practices in Refrigeration,		
[Town, Country, Dates]		
This training is part of the Refrigerant Management Plan of [Country] for the phase-out of ozone-depleting substances and funded by the Multilateral Fund for the Implementation of the Montreal Protocol.		
On behalf of the Ministry of [Name of Ministry] of [Name of Country]	On behalf of [Implementing Agency]	On behalf of [Training Institute]

Annex 2: Checklists and tools

The organisation of a successful training programme is a complex task and requires dedication and organisational skills. Annexes 2.a to 2.c provide a non-exhaustive checklist of activities which need to be addressed during the preparation of Phase II training workshops in general.

Annex 2.a: Checklist for workshop preparation

Design and approach

- Define the objective, scope, approach including the number of technicians to be trained and the number workshops to be held.
- Define the overall timeframe of the Phase II training including all major milestones to be achieved. Phase II should be completed within 12 months. The milestones may include the establishment of a register of refrigeration technicians in the country, a register of certified or trained technicians, recruiting the presenters, selecting the participants, providing the venue, preparation and reproduction of training materials, preparation of certificates, media briefing etc.
- Determine the financial, human and physical resources available and estimate the necessary resources for the training organisation. Find compromises to accommodate the required resources within the available funding.
- Design most appropriate type of training including day, evening or weekend courses. Consider also training on the job, training as part of ongoing refresher courses or training integrated in training programmes for refrigeration technicians. Define the duration the training and whether an examination and certification will be should be defined. A 3-day training agenda is suggested in Annex B.
- Take into account local habits and conditions such as festivity seasons, rain seasons, holiday seasons or peaks of workload as well as the usual working time of the participants, which differs from country to country. Local traffic conditions should also be considered.
- Involve, consult and co-ordinate with the relevant stakeholders including the local resource persons, trainers and participants. This ensures the support by these stakeholders.

Training material

- ❑ Adapt and finalise training materials and the agenda in consultation with the local trainers and specify the necessary training tools and materials such as videos, appliances of demonstration purposes and the practical exercises etc.
- ❑ Prepare the concept note and send it well in advance to the workshop participants, presenters and the media. It should summarise the objective, scope, target group, approach and contents of the training programme. It should also explain the organisational arrangements and indicate the training location and dates.
- ❑ Prepare the folders containing the workshop information and training materials well in advance. This may include photocopying of the concept note, training agenda, and other documents. Reproduce the training materials and training elements in time.
- ❑ Hand out the folders containing the training materials during the registration in order to keep track to whom they were handed over. Explain the different materials and documents at the beginning of the workshop.
- ❑ Further reference materials should be displayed at a separate table, e.g. near the entrance of the classroom.

Trainers and local resource persons

- ❑ Select the training institutes or industry associations delivering the Phase II training. These institutes or associations may also be responsible for conducting examinations, providing certification and maintaining registers of refrigeration service technicians which may potentially participate in the Phase II training as well as those which have been certified.
- ❑ Prepare the terms of reference and delivery schedule. Additional local resource persons may be invited as appropriate. The available budget should be respected.

Participants

- ❑ Define the target group of the Phase II training and establish a register of refrigeration technicians in the country. Wholesalers and importers may provide useful information. Advertising the training possibility is another way of collecting contact information of potential participants, especially from the informal sector. Identify and invite potential participants in time.

- Participants should be invited well in advance. Participants who do not confirm their participation should be replaced with participants from the reserve list. The careful selection of the right participants is crucial for a successful workshop.
- Participants should receive a preliminary agenda and some background information regarding the training programme
- The registration form, preliminary list of participants, participation certificates etc. should be prepared in advance. The participation certificates should be signed by a Government representative and the trainer.
- Request each participant to complete the registration form with the full name, function, contact address, fax, phone, email etc. before the workshop starts.
- Hand out training materials, nameplates, badges and other workshop information to the participants during registration. All papers should be contained in one folder.
- Circulate the list of participants during the workshop to verify the contact data.
- Complete the list of attendance for every workshop day.
- Hand out a participation certificate at the end of the workshop to those participants who successfully attended all workshop days.
- Include participants in the register of trained officers. The register should also include the information whether the participants passed an examination.

Media briefing

- Inform local media including TV and radio. They should be informed about the training and receive a briefing note as well as the concept note and other relevant information materials.
- Arrange for radio and TV interviews and invite local newspapers to attend the introductory presentations. It is useful to provide the press with a draft article.

Support personnel

- Provide sufficient support personal for registration, photocopying, preparation and distribution of papers (list of participants, workshop recommendations etc), local transport, lunch and coffee arrangements etc.

Logistics

- Inform all participants and presenters of logistical arrangements, such as location, travel arrangement, meal arrangements, materials, etc.
- Arrange lunch preferably at the training site in order to save time. The participants need to be informed about the lunch arrangements.

Venue

- Inspect and prepare the classrooms well in advance. It should be equipped with all necessary equipment, e.g. chairs, tables, overhead projectors, television, video, slide projectors, screen, extension cables etc. as required.
- Check all electrical equipment in advance and connect it before the training starts.
- Provide a table for displaying further reference documents and examples of R&R equipment and ODS cylinders.
- ODS related posters may be placed at the walls of the classroom.
- Ensure that the practical sessions are held in a well-ventilated workshop facility equipped with basic tools, power, adapters, extension cables etc. All electric equipment and connections should be safe to use.

Equipment

- Make available the R&R equipment for the practical hands-on sessions. The equipment should be checked before the training. Ensure that the necessary work tools, extension cables and adapters are available for the training.
- Make available operational appliances for demonstration purposes and the practical exercises such as domestic refrigerators, stationary air-conditioning unit, air-conditioned vehicle etc as well as different type of refrigerants.

Evaluation

- Distribute and collect evaluation questionnaires during the last day of training. The questionnaires may follow the model of those for Phase I of the training.

- There should also be short feed-back session on the effectiveness of the different sessions and how to improve future training.

Follow-up

- Monitoring and evaluation of the results of the training programs and preparation of a follow-up report by the NOU.

Annex 2.b: Tools for Phase II training

When preparing the Phase II training, consider using the following tools. Review each of the tools and decide how to use them during Phase II.

Phase I course materials

These materials were the basis for the Phase I training and provide all necessary information and overheads for the Phase II training. It may be complemented with additional information.

UNEP training manual on good practices in refrigeration

The UNEP training manual provides additional background information on good practices in refrigeration and contains additional guidance on how to conduct training as well as additional overheads.

Videos

The following 3 videos were used during Phase I of the training programme and copies should be available from the National Ozone Unit. Select relevant segments which are useful to support your presentations and training module. The videos are:

- “Saving the Ozone Layer – Every Action Counts”*
- “Good Practices in Refrigeration”*
- “Back to the Future – Working Safely with Hydrocarbons”*

Overheads

Overheads are an important visual tool that you can use in Phase II. The IIR / UNEP training course as well as the UNEP training manual on good practices in refrigeration offer a series of overheads that might be used during the Phase II training. Develop or adapt additional overheads as required.

Examples of ODS refrigerants and ODS-based appliances

These are another excellent visual aide for use in Phase II training. A local refrigeration service company may be able to provide some refrigerant containers and appliances.

Ozone poster

Ozone posters can be used to decorate the classroom and to raise additional awareness. They should be available with the National Ozone Unit or can be requested from UNEP's OzonAction Programme.

Evaluation questionnaire

Evaluation questionnaires are one tool to get feedback from the participants. Once returned to the trainers, they provide the opportunity to improve the training materials and the organisation of the workshop itself.

WWW

The final version of this training course will be made available in PDF format through the Web site of UNEP DTIE's OzonAction Programme. It will also be included in UNEP's CD-ROM OASIS.

Annex 2.c Checklist to be an effective trainer

The trainers's role is to promote the learning process taking into account the challenges faced by refrigeration technicians at their workplace, and the challenges of the material presented in the training itself. There is no set way to facilitate a programme, however some tasks usually performed by an effective trainer are listed below:

- Check audio-visual equipment in the classroom before the workshop starts.
- Introduce programme presenters to participants and let the participants present themselves.
- Initiate discussions by asking questions and ensuring that participants' questions are addressed in the session or raised again in a more appropriate, subsequent session.
- Highlight examples and participants' concerns that presenters can reference in their sessions.
- Link session content and key points to subsequent or previous sessions.
- Help participants ask questions that they are too afraid or uncomfortable to ask on their own.
- Collect additional reference materials from presenters that they agree to locate for participants once they return to their offices after delivering a session.
- Clarify for participants their responsibilities for learning activities once assignments for session activities have been presented to them and they are working in small groups.
- Observe groups and be aware of occasions when participants become confused, disillusioned, fatigued or saturated so that programme discussions can be clarified, interrupted for a break, or shortened.
- Understand and articulate participants' needs to connect them with appropriate people, ensuring that the participants are able to leave the programme satisfied and as fully empowered to address their challenges.
- Listen to in-session and outside-session discussions to assess how the programme is proceeding and identify ways to address participants' emerging needs and/or concerns.

- Listens to and acknowledges all ideas.
- Praises participants' ideas when appropriate.
- Allows other members in the group to attempt to answers questions raised by individuals.
- Writes down participants' ideas on a board in front of the group to show that their ideas are valid and valuable.
- Reminds participants of points made previously in the training to show an inter-relation among concepts.
- Refers to presenters by name when referencing points they made during their technical discussions so they become familiar to the participants.
- Points out positive behaviours displayed by participants and their effect.
- Reinforces group compliments to an individual and elaborates upon them.
- Asks for examples from the group's own experiences.
- Shares own experiences.
- Diffuses arguments and avoids expressing judgement on what may be considered "right" or "wrong" in discussing different options.
- Spends additional time with participants and presenters during breaks and before and after the day's sessions to learn more about their background, training needs, assessment of training experience and expectations.
- Focuses on the participant's concerns and always tries to address them.
- Gives complete instructions when advising the participants on the schedule and/or activities and explains why requests are important.
- Takes notes and fulfils promises to provide assistance or additional information.
- Begins and ends sessions on time
- Gives constructive feedback and builds behaviours through positive reinforcement.

Annex 3: Training guidelines for identification of needs and co-ordination of activities

Annex 3.a Identification of training needs

GUIDELINES

The following principles and procedures shall be followed when identifying non-investment project training needs:

Implementing Agencies (IAs) and National Ozone Units (NOUs)/Focal Points (FPs) shall discuss, if applicable, proposals for non-investment project training activities at the relevant regional Network meeting before being submitted to the Executive Committee. The results or recommendations from such discussions shall be included in the training project proposal.

- All proposals for non-investment project training activities shall include:
 - a section describing the different stake-holders involved in the training and their role in it.
 - a section describing how the activity complements the national phase-out plans, and reflects the Government strategies, as contained in the Country Programme. There shall be specific indications as to the process for evaluation, including a call for an evaluation one year after completion of the activity, to determine whether or not desired results are being achieved.
- IAs and NOUs/FPs concerned will be jointly responsible to ensure that the training addresses, in a cost effective manner, the priority issues identified by the Executive Committee for the period;
- All proposals for non-investment project training activities shall be presented as per the project proposal format attached.
- IAs shall ensure that these guidelines are known to the NOU/FP concerned when starting a national training activity and that the incentives and/or policy framework needed to ensure that the training will be put to good and continued effect are already present or prepared and in the process of being put in place. Relevant incentives and/or policy framework should be clearly stated in the project proposal.

IAs shall ensure that all proposals for non-investment project training activity take into account lessons learned and do not duplicate any work already done or being done at the moment.

The NOU/FP shall send to the relevant implementing agency a Transmittal Letter to accompany any proposal to the Executive Committee for non-investment project national training activity, as per the format attached.

ISSUES TO BE CONSIDERED

When possible, the training proposals shall also be discussed at the Network meetings to gain from experiences of others within the region. The results or recommendations of such discussions should be included in the project proposal.

There may be additional delays in the presentation of certain proposals for non-investment project training activities due to the timing of Network meetings. This inconvenience can be overcome by early planning of non-investment project training activities, as well as UNEP informing all implementing agencies of the timing of Network meetings well in advance.

TRANSMITTAL LETTER FOR TRAINING PROJECT PROPOSAL

1. Sent by Official NOU/FP
2. Addressed to Multilateral Fund Secretariat, for the attention of the Chief Officer
3. Contents shall include:

Country and National Coordinating Agency submitting the request

Title of project and amount of funds being requested from the Multilateral Fund

Short description of how the activity complements the national phase-out plans, and reflects the Government strategies, as contained in the Country Programme.

Government's statement that the necessary incentives and/or policy instruments have been or will be put in place, prior to implementation of the activity, in order to ensure continued application of the training following its completion.

Note: In the case of regional training the Transmission Letter shall be sent by the Official NOU/FP, of the host country.

FORMAT FOR TRAINING PROJECT PROPOSAL (maximum five pages long)

PROJECT COVER SHEET

COUNTRY/REGION:

SECTOR(S) COVERED:

PROJECT TITLE:

PROJECT DURATION:

PROJECT IMPACT:

PROPOSED BUDGET:

INCREMENTAL COST:

IMPLEMENTING AGENCY:

NATIONAL COORDINATING AGENCY:

PROJECT DESCRIPTION

1. Background: (maximum one page)

Brief description of the situation of the sector that is going to be addressed by the training: consumption, sector structure, main problems, etc. If more information needs to be provided about the sector, it shall be included in an annex.

Strategic framework for the course: how the activity complements the national phase-out plans, and reflects the Government strategies, as contained in the Country Programme.

If applicable, Network meeting where the training project was discussed, and the recommendations coming out of these discussions.

If applicable, role of the training project within the Refrigerant Management Plan of the country concerned.

2. Objectives (maximum half a page):

Problems that are going to be addressed during the training. Long-term and short-term objectives of the activity.

3. Expected results and criteria for success (maximum half a page):

List the possible measurable and concrete outputs from the course, e.g., % of ODS consumption reduced, development of refrigeration phase out strategy and work plan, development of refrigerant management plan, etc., and how these results will be evaluated.

4. Target audience (maximum half a page):

Description of the profile of the potential participant in correspondence with the objectives of the training and in order to target the course to the needs of this audience, e.g., are the participants from a decision-making or an operating level, do they design or install, how big is the target audience in the country, how many will be covered by the training, etc.

5. Approach (maximum half a page):

Description of how the courses will be structured, e.g., presentations, discussions, demonstration, practices, field visits, round-tables, conferences, “train the trainer” approach, etc.

There shall be indication of the total number of courses expected to cover the whole of the target audience, duration of each course, and the number of participants in each course. Full title of training and support material shall also be provided

6. Time Frame (maximum half a page):

Proposed date/s for the course/s taking into account that a minimum of six months is needed, after approval of the project, to organize a training activity.

7. Cooperating partners and their role (maximum half a page):

National or international cooperating bodies, and their specific role within the project.

8. Supporting and follow up actions (maximum half a page):

Actions needed, if any, by the key players involved, to ensure that the objectives and the expected results of the course are achieved. Policy instruments needed in order to realize the full benefits of the training project. Actions proposed after the course, to ensure that the results of the activity are achieved, and the time frame for these actions. Such supporting and follow up actions will also be monitored in the framework of the follow up report to be prepared one year after completion of the activity.

9. Detailed budget (approximately half a page):

Annex 3.b: Coordination of training activities

GUIDELINES

The following principles and procedures shall be followed for the coordination of non-investment project training activities:

1. Coordination at the INTER-AGENCY level:

- Implementing agencies (IAs) shall use inter-agency coordination meetings for the coordination of formulation, implementation and follow up of training activities, as well as discussion of related status reports and information, background and policy papers.

UNEP will produce a separate report which will include any conclusions, decisions or recommendations reached in this respect.

- IAs shall produce a final report after each training activity, following the format enclosed. A copy of such final report shall be forwarded to the MFS, other IAs, and UNEP.
- IAs shall forward a copy of all presentations, training and background material used during training activities to UNEP's central registry/depository of training material.
- IAs shall produce a report on follow up activities immediately after completion of a training activity, as per the format enclosed. A copy of such report shall be forwarded to the MFS Evaluation Officer and UNEP.

2. Coordination between implementing agencies and the country:

- IAs shall keep the National Ozone Units/Focal Point (NOU/FP) involved at all stages of the identification, formulation and implementation of the training project.
- IAs and NOU/FPs will use, as far as practicable, Regional Network meetings as fora for formulation, coordination and follow up of training activities.
- Reports of Network meetings produced by UNEP will have a separate section to include any decisions, conclusions, or recommendations resulting from such discussions.

- IAs shall ensure that all support elements made available by UNEP in the framework of the implementation of the training strategy are taken into account in the development and implementation of training projects.
- IAs shall forward to the NOU/FP, the final and follow up reports of a given training activity, in enough numbers for further distribution to each participant.

3. Coordination at the national level:

- NOU/FPs shall ensure that:
 - all relevant stake-holders are adequately identified and involved from the start of the project;
 - all local resources are conveniently mobilized to leverage the support from the Multilateral Fund; and that
 - the proposed training appropriately reflects the Government strategy as contained in the Country Programme report.

NOU/FPs shall forward to each participant a copy of the final and follow up reports of a given training activity.

FORMAT FOR REPORT OF TRAINING ACTIVITY

(maximum 7 pages long)

This report will be prepared by the international trainers for Phase I training:

TABLE OF CONTENTS

EXECUTIVE SUMMARY (maximum two pages)

Summary of the report, presenting each chapter in a few sentences. When the training is conducted in a language different from English, the report shall be in the original language, and an additional Executive Summary in English shall be included.

1. BACKGROUND (maximum half a page)

Executive Committee meeting where the activity was approved, national and international organizations that participated in the implementation and/or funding of the project, and their specific role.

Strategic framework for the course: how the activity complements the national phase-out plans, and reflects the Government strategies, as contained in the Country Programme.

Brief description of the situation of the sector that is being addressed by the training: consumption, sector structure, main problems, etc. If more information needs to be provided about the sector, it shall be included in an annex.

2. OBJECTIVES (maximum half a page)

Problems that were addressed during the training. Long-term and short-term objectives of the project.

3. EXPECTED RESULTS (maximum half a page)

Measurable and concrete outputs that were expected from the course, e.g., % of ODS consumption reduced, development of refrigeration phase out strategy and work plan, development of refrigerant management plan, etc.

4. PARTICIPANTS (maximum half a page)

Number and profile of participants, speakers, trainers and observers as well the full list and contact information of participants, speakers/trainers, and observers.

5. METHODOLOGY (maximum half a page)

Description of how the courses were structured, e.g., presentations, discussions, demonstration, practices, field visits, round-tables, conferences, “train the trainer” approach, etc.

6. CONTENT (maximum one page)

General description of the subjects covered by the presentations, with reference to ANNEXES 10.1, 10.4 and 10.5, as well as indication of how to obtain full copies of presentations as well training and background documents.

7. RESULTS, CONCLUSIONS, RECOMMENDATIONS AND LESSONS LEARNED (maximum two pages)

Immediate results obtained from the course, as compared to the expected results stated in section 3. Evaluation of the course based on such results. Conclusions, recommendations and lessons learned

8. FOLLOW UP ACTION PLAN (maximum one page)

Actions proposed after the course, to ensure that the results of the activity are achieved, **report that the policy framework has been put in place**, and to evaluate those results, and the time frame and persons/organizations responsible for these actions. Expected additional results shall be indicated.

9. EVALUATION BY PARTICIPANTS (maximum half a page)

Description of how the course was perceived by participants, based on an evaluation questionnaire given to them. It shall include evaluation of content, trainers, training material, training methods and organization. The evaluation scale shall range from 1 to 5, with 5 as the best possible rating.

10. ANNEXES

10.1 AGENDA

10.2 LIST OF PARTICIPANTS

10.3 LIST OF TRAINERS/SPEAKERS

10.4 LIST OF PRESENTATIONS

10.5 LIST OF TRAINING AND BACKGROUND MATERIAL

FORMAT FOR REPORT ON FOLLOW-UP TRAINING ACTIVITY (two pages maximum)

This report will be prepared by the NOU after completion of Phase I and II of the training programme.

- 1. TITLE:**
- 2. PROJECT NUMBER:**
- 3. COUNTRY:**
- 4 IMPLEMENTING AGENCY:**
- 5. DATE WHEN PROJECT WAS APPROVED:**
- 6. DATE WHEN PROJECT WAS COMPLETED:**
- 7. DATE OF FOLLOW UP REPORT**
- 8. INITIAL EXPECTED RESULTS**
(taken from the final report of the activity: List of the possible measurable and concrete outputs from the course, e.g., % of ODS consumption reduced, development of refrigeration phase out strategy and work plan, development of refrigerant management plan, etc., and how these results will be evaluated.)
- 9. STATUS AND EVALUATION OF EXPECTED RESULTS**
(stating reasons and suggested solutions for problems and delays)
- 10. INITIAL FOLLOW UP ACTION PLAN**
(taken from the final report of the activity : Actions needed by the key players involved, to ensure that the objectives and the expected results of the course are achieved. Policy instruments put in place in order to realize the full benefits of the training project. Actions proposed after the course, to ensure that the results of the activity are achieved, and the time frame for these actions.)
- 11. STATUS AND EVALUATION OF FOLLOW UP ACTION PLAN**
(stating reasons and suggested solutions for problems and delays)
- 12. MODIFICATION TO FOLLOW UP ACTION PLAN (if any)**

Annex 4: Additional training and reference material

NOUs can access a substantial amount of appropriate reference material from the list below:

- 1 Training Manual on Good Practices in Refrigeration (main support document), UNEP DTIE, 1994
- 2 Training Manual on Chillers and Refrigerant Management UNEP DTIE, 1994
- 3 Elements for Establishing Policies, Strategies and Institutional Framework for Ozone Layer Protection, UNEP DTIE, 1994
- 4 Practical Guidelines for Industry for Managing the Phase-out of Ozone Depleting Substances, UNEP DTIE, 1994
- 5 Guidebook for Implementation of Codes of Good Practice, Refrigeration Sector, UNEP DTIE, 1998
- 6 Policy Design and Setting Up of Legislation, ODS Import/Export Licensing Systems Resources Module, UNEP DTIE, 1997
- 7 Guidelines for Recovery and Recycling Systems - Refrigeration Sector, UNEP DTIE, 1999
- 8 Code of Practice for the Minimisation of Refrigerant Emissions from Refrigerating Systems, The Institute of Refrigeration, UK, 1997.

Annex 5: About UNEP DTIE and its OzonAction Programme

About the OzonAction Programme

Nations around the world are taking concrete actions to reduce and eliminate emissions of CFCs, halons, carbon tetrachloride, methyl chloroform, methyl bromide and HCFCs. When released into the atmosphere these substances damage the stratospheric ozone layer — a shield that protects life on Earth from the dangerous effects of solar ultraviolet radiation. Nearly every country in the world — currently 170 countries — has committed itself under the Montreal Protocol to phase out the use and production of ODS. Recognising that developing countries require special technical and financial assistance in order to meet their commitments under the Montreal Protocol, the Parties established the Multilateral Fund and requested UNEP, along with UNDP, UNIDO and the World Bank, to provide the necessary support. In addition, UNEP supports ozone protection activities in Countries with Economies in Transition (CEITs) as an implementing agency of the Global Environment Facility (GEF).

Since 1991, the UNEP DTIE OzonAction Programme has strengthened the capacity of governments (particularly NOUs or “NOUs”) and industry in developing countries to make informed decisions about technology choices and to develop the policies required to implement the Montreal Protocol. By delivering the following services to developing countries tailored to their individual needs, the Programme has helped promote cost-effective ODS phase-out activities at the national and regional levels:

Information Exchange provides information tools and services to encourage and enable decision makers to make informed decisions on policies and investments required to phase out ODS. Since the 1991, the Programme has developed and disseminated to NOUs over 100 individual publications, videos, and databases that include public awareness materials, a quarterly newsletter, a web site, sector-specific technical publications for identifying and selecting alternative technologies and guidelines to help governments establish policies and regulations.

Training builds the capacity of policy makers, customs officials and local industry to implement national ODS phase-out activities. The Programme promotes the involvement of local experts from industry and academia in training workshops and brings together local stakeholders with experts from the global ozone protection community. UNEP conducts training at the regional level and also supports national training activities (including providing training manuals and other materials).

Networking provides a regular forum for officers in NOUs to meet to exchange experiences, develop skills, and share knowledge and ideas with counterparts from both developing and developed countries. Networking helps ensure that NOUs have the information, skills and contacts required for managing national ODS phase-out activities successfully. UNEP currently operates 4 regional and 3 sub-regional Networks involving more than 109 developing and 8 developed countries, which have resulted in member countries taking early steps to implement the Montreal Protocol.

Refrigerant Management Plans (RMPs) provide countries with an integrated, cost-effective strategy for ODS phase-out in the refrigeration and air conditioning sectors. RMPs have evolved to meet the specific need to assist developing countries (especially those that consume low volumes of ODS) to overcome the numerous obstacles to phase out ODS in the critical refrigeration sector. UNEP DTIE is currently providing specific expertise, information and guidance to support the development of RMPs in 40 countries.

Country Programmes and Institutional Strengthening support the development and implementation of national ODS phase-out strategies especially for low-volume ODS-consuming countries. The Programme is currently assisting more than 90 countries to develop their Country Programmes and more than 75 countries to implement their Institutional Strengthening projects.

For more information about these services please contact:

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UNEP Division of Technology, Industry and Economics
OzonAction Programme
39-43, quai André Citroën
75739 Paris Cedex 15 France
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Fax: (33) 1 44 37 14 74
Email: ozonaction@unep.fr
Web: WWW: <http://www.uneptie.org/ozonaction.html>

About the UNEP Division of Technology, Industry & Economics

The mission of UNEP DTIE is to help decision-makers in government, local authorities, and industry develop and adopt policies and practices that:

- are cleaner and safer;
- make efficient use of natural resources;
- ensure adequate management of chemicals;
- incorporate environmental costs;
- reduce pollution and risks for humans and the environment.

UNEP DTIE is composed of one centre and four units:

The International Environmental Technology Centre (Osaka) promotes the adoption and use of environmentally sound technologies with a focus on the environmental management of cities and freshwater basins, in developing countries and countries in transition.

The Production and Consumption Unit (Paris) fosters the development of cleaner and safer production and consumption patterns that lead to increased efficiency in the use of natural resources and reductions in pollution.

The Chemicals Unit (Geneva) promotes sustainable development by catalysing global actions and building national capacities for the sound management of chemicals and the improvement of chemical safety world-wide, with a priority on Persistent Organic Pollutants (POPs) and Prior Informed Consent (PIC, jointly with FAO)

Energy & OzonAction Unit (Paris) supports the phase-out of ozone depleting substances in developing countries and countries with economies in transition, and promotes good management practices and use of energy, with a focus on atmospheric impacts. The UNEP/RISØ Collaborating Centre on Energy and Environment supports the work of the Unit.

Economics & Trade Unit (Geneva) promotes the use and application of assessment and incentive tools for environmental policy and helps improve the understanding of linkages between trade and environment and the role of financial institutions in promoting sustainable development.

UNEP DTIE activities focus on:

- raising awareness
- improving the transfer of information,
- building capacity
- fostering technology co-operation
- partnerships and transfer
- improving understanding of environmental impacts of trade issues
- promoting integration of environmental considerations into economic policies
- and catalysing global chemical safety.

For more information contact:

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Annex 6: Useful contact addresses

Implementing agencies

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WWW: <http://www.unep.org/ozone/index.html>

Keep in mind ...

We hope that this support tool was useful in guiding your plans and actions. It reflects the latest developments in good practices in phasing out ozone depleting refrigerants as per the Montreal Protocol, the recent recommendations from the training evaluation and the current training expertise of the OzonAction Programme and its consultants. Training approaches and strategies as well as the knowledge on good practices are continually evolving. This tool, therefore, is not a “final” document. You may like to use it to develop your own tools for your organisation.

Much of the Montreal Protocol’s success, in fact, can be attributed to its ability to evolve over time and to reflect the latest environmental information and technological and scientific developments. Through this dynamic process, significant progress has been achieved globally in protecting the ozone layer.

As a key agency involved in the implementation of the Montreal Protocol, UNEP DTIE’s OzonAction Programme promotes knowledge management in ozone layer depletion through collective learning. There is much that we can learn from each other in organising technicians training on good practices in refrigeration.

In order to contribute to enrich this document with new information, we encourage you to share your experiences from the organisation of the technicians training in your country with the OzoneAction Programme so that we can inform others involved in these issues about the lessons learned. Send us an email, fax or letter about your experiences, difficulties encountered and successes. We will consider it as an important part of collective learning.

Based on the feedback and information received, UNEP will update this support guide for NOUs on a periodic basis to reflect the latest developments ...

So take a pen and write to us. Let us learn together to protect the ozone layer.

Mr. Rajendra Shende, Chief
UNEP DTIE Energy & OzonAction Unit

