Workshop Report

Train the Trainers Workshop on Good Practices in Refrigeration Nepal

Nepal Bureau of Standards and Metrology
NEPAL

Division of Technology, Industry and Economics
OzonAction Programme

Multilateral Fund for the Implementation of the Montreal Protocol

Kathmandu, Nepal, 8-11 April, 2002
Workshop Report

Train the Trainers Workshop on
Good Practices in Refrigeration

jointly organized by the

Nepal Bureau of Standards and Metrology

and

United Nations Environment Programme (UNEP)
Division of Technology, Industry and Economics (DTIE)
Ozone Action Programme

Funded by the

Multilateral Fund for the Implementation of the
Montreal Protocol

Kathmandu, Nepal, 8-11 April, 2002
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EXECUTIVE SUMMARY

The train-the-trainers programme on good practices in refrigeration is part of a comprehensive approach to reduce the ODS consumption in the refrigeration servicing sector in Nepal. Such approach is defined in the Refrigerant Management Plan (RMP) of Nepal, which has been approved by the Executive Committee of the Multilateral Fund to be jointly implemented by UNDP and UNEP.

The RMP of Nepal is being jointly implemented by UNDP and UNEP. UNEP is responsible for the implementation of the training programme on good practices in refrigeration and the implementation of the training programme on control and monitoring of ODS imports and exports. UNDP will be responsible for the recovery and recycling programme.

The main objective of the training programme is to reduce the CFC consumption in the refrigeration and air-conditioning service sector in Nepal and to assist the country to comply with the phase-out schedule for CFCs under the Montreal Protocol. The programme consists of two phases, the train-the-trainers phase and the train-the-technicians phase. The trained trainers are expected to train the remaining technicians in the refrigeration and air-conditioning sector in Nepal.

The long term expected result of the training programme is to enhance good service 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.

During the train-the-trainers workshop 41 professionals from industry, government and training institutes were trained on good practices in refrigeration. Training has following five Modules and four Practical sessions :

TRAINING MODULES :

1. Environmental Impact of CFCs and Refrigerant Management Plan to Phase out CFCs
2. Principles of Refrigeration
3. Alternative Refrigerants to CFCs and HCFCs and their Characteristics
4. Recovery, Recycling and Reclaim of Refrigerants
5. Good Servicing Practices in Refrigeration

PRACTICAL SESSIONS

1. Study of Tools and Equipments
2. Recovery of Refrigerants
3. Good Servicing Practices
4. Retrofitting of Refrigeration Appliances to Alternative Refrigerants

The workshop covered various topic on the harmful effects of ozone layer depletion and the resulting increase of UV-B radiation, the Montreal Protocol and its Amendments as well as
lectures on CFC, HCFC and HFC refrigerants, recovery and recycling equipment, preventive maintenance practices. Lectures on retrofitting and envisioned future technological development on refrigeration sector were also included. Hands-on demonstrations with recovery and recycling equipment, using actual refrigeration units as well as stationary and mobile air-conditioning systems in need of recharge and maintenance were conducted as part of the training workshop.

Theoretical Topics covered were following:

- Environmental Impact of CFCs and their Alternatives
- Refrigeration Management Plan at national level to phase our ozone-depleting substances (ODSs) and the train the technicians phase
- Review of basic concepts in refrigeration
- Review of Tools and Equipments used in servicing of Refrigeration Appliances
- Alternative Refrigerants to CFCs/HCFCs and their characteristics
- Safe Handling of CFCs HCFCs and their Alternatives
- Handling of Blends
- Recovery, Recycling and Reclaim of Refrigerants
- General Good Servicing Practices in Refrigeration

Practical topics covered were following:

- Study of Tools and Equipments
- Recovery of Refrigerants
- Good Practices in Refrigeration (Hands-on session)
- Retrofitting of Refrigeration Appliances to Alternative Refrigerants (Hands-on Session)

During the last day of the workshop, the participants provided the feed back on the training programme. The feed back has been analyzed and salient features are given in Annex – A-5. The feed back was encouraging. The participants also gave some recommendations, which are summarized, in Annex - 4.

Overall, training of trainers programme was successfully conducted in close co-operation of Bureau of Standards and Metrology Nepal.
1. **Background**

Refrigeration and air-conditioning sector is an important and unique sector where CFCs are not only used in new appliances/ equipments but are also used for servicing the existing appliances/ equipments during their useful working life. Thus the requirement of CFCs for servicing is a recurring demand and also CFC emissions to the environment.

The amount of CFCs required for this purpose is substantial. The poor servicing procedures used by the service technicians like venting out the refrigerant, using appliance compressor for evacuation, flushing of system with refrigerant and purging of charging lines & other connecting lines result in release of a significant quantity of CFCs directly to the environment.

Nepal has large number of refrigeration appliances like domestic refrigeration, commercial refrigeration appliances, Mobile air-conditioning units central plants for food processing, storage and industrial refrigeration & air-conditioning. All these need CFCs for servicing. The availability of CFCs is continuously decreasing and the cost of CFCs is also increasing in Nepal. This will motivate the service technicians to adopt the good service practices.

A significant amount of CFC emissions could be avoided through the application of good practices during installation, operation, servicing and decommissioning of refrigeration and air-conditioning equipment and appliances. Good service practices include containment, avoidance of frequent failures by preventive maintenance & proper servicing, maintaining the logbook of the plant, recovery & recycling as well as safe handling of refrigerants. Good practices are easy to follow and adoption of these practices will achieve an early reduction of the CFC consumption and emissions in the refrigeration sector.

Nepal has a good number of technicians responsible for operating and servicing the refrigeration appliances/ equipments. Nepal also has technical institutions, which provide formal education at different levels in RAC. Most of the technicians received formal training in the training Institutions.

Further training is often based on experience or training on the job. In addition, some of the technicians get trained by self-learning while working with senior technicians.

The availability of CFCs in Nepal is reducing, as Government of Nepal is taking majors for early phase out of CFCs due to environmental consideration. It is essential for the CFC users to be able to reduce and subsequently phase out their CFC consumption in well co-ordinated and most cost effective manner. Containment practices like preventive maintenance, recovery & recycling and proper charging procedures etc. are expected to reduce the CFCs consumption/ emissions in the service sector and meet the ODS phase out schedule.

The training on good practices in refrigeration and an effective recovery and recycling programme combined with retrofitting of refrigeration appliances/ equipment using drop-in substitutes as well as timely replacements of equipment are the elements of the over all phase out strategy. These measures will assist Nepal in eliminating the use of CFCs in the RAC sector and meet the obligations of the Montreal Protocol.
2. Objectives

The main objectives of the train the trainers workshop was to upgrade the skills of trainers and the senior technicians from Industry and other Government organization on service practices to reduce the CFC consumption in the refrigeration and air-conditioning service sector in Nepal and to assist the country to comply with the phase out schedule under the Montreal Protocol.

- Increasing awareness of the participants about ozone depletion & its harmful effects, Montreal protocol, the environmental and economic benefits of good servicing practices and refrigerant containment as well as the concepts of Refrigerant Management Plans.
- Introducing demonstrating procedures that eliminate refrigerant emissions during preventive and un-scheduled maintenance including recovery and recycling.
- Dissemination of information on alternative technologies to CFCs for various application and methodology of retrofitting of existing refrigeration appliances/ equipments.
- Stimulating the development of a network for information sharing through out the sector.

3. Expected Results of the Workshop

The long term expected results of the training programme is to enhance good servicing and business practices in refrigeration and air-conditioning sector assisting the sector in Nepal to switch over to non-CFC technology based appliances and equipments in a relatively smooth manner without effecting their business and any extra burden to the consumers.

The practice of the good services will also result in improved performance of the appliances/ equipments in this sector. More specific the main expected results are the following:

- Minimization and elimination of uncontrolled emissions of ozone depleting refrigerants through better maintenance practices, leak prevention and recovery and recycling through training of refrigeration service technicians.
- Elimination of venting of CFC during purging and flushing the refrigeration system.
- Early Adoption of non-ODS technologies in refrigeration sector in Nepal.
- Reduction of CFC consumption/ emission once prudent retrofitting and replacement of refrigeration and air-conditioning appliances/ equipment.

4. Participants

The workshop was well attended. There were 41 participants in the workshop while the workshop was planned only for 25 participants. The participants were invited from major refrigeration and air-conditioning installations, service workshops and the training institute. Most of the participants other than the institutes were senior technical persons involved in operation, maintenance and servicing of various types of refrigeration and air-conditioning appliances and equipments. The group was representative of all the sub-sectors of RAC like domestic refrigeration commercial refrigeration, Mobile air-conditioning medium and large industrial and building refrigeration and air-conditioning. The participants had a very strong practical
background in refrigeration and air-conditioning. The list of participants is attached as Annex – A-2.

The lead faculty for the workshop was Dr. Radhey S. Agarwal (Indian Institute of Technology Delhi India) and the UNEP representative was Dr. Suresh Raj of the UNEP-DTIE Ozone Action Programme, Paris, France (see Annex – A-3). The ozone office Dr. Sitaram Joshi was responsible for the local organization.

Additionally, the opening session were addressed by Mr. Poorna P. Manandhar (Director General), Dr. Sitaram Joshi (Ozone Officer) Mr. Rabindra N. Bhattarai (Director), Mr. Suresh Raj (UNEP-DTIE).

5. Methodology

The refrigerant conservation is the key to reduce CFC emissions from the existing CFC based refrigeration and air-conditioning units to the environment. Appropriate training on good practices in refrigeration include containment, recovery & recycling, pressure testing & leak detection, repair and preventive maintenance as well as retrofitting using non-ODS refrigerants is crucial in order to continue to run existing equipment until the end of its economic life, to reduce the emission of ODS and to achieve the phase out in a co-ordinated, planned and cost effective manner.

The approach followed was train the trainers on good practices in refrigeration. In this workshop 41 trainers were trained. The workshop covered both theoretical and practical aspects of good service practices. There were number of practical sessions to have hands-on practice about the good practices and use of equipment.

Participants took keen interest in practical work to acquire hands-on experience in the use of servicing equipment for recovery/ recycling, evacuation, charging etc. There were very interesting discussions during the discussion sessions about use of good practices in the practical situations. These trainers will train the other technicians in the institutes or in their own installations as the case applicable to them.

These trained trainers/ technicians will raise the awareness in other technicians and equipment owners regarding ozone depletion issues, reduction of CFC refrigerant emissions, recovery/ recycling and new ozone friendly refrigerants. It is likely that the CFC and non-ODS based refrigeration appliances and equipments will co-exist for several years in Nepal. This training programme will help these trainers/ technicians to understand the difference in service requirements and will also educate others.

Training manuals published by UNEP on Good Practices in Refrigeration and Chillers and Refrigerant Management were used as resource document. Each participant was provided a copy of the manual on good practices. The training material was further supplemented using the material developed by the lead faculty at IIT Delhi especially on use of alternative refrigerants, handling of CFCs, HCFCs and their alternative, retrofitting of appliances, equipments using alternatives to CFCs.
6. Contents

The contents were well prepared to suit such a group of trainers/technicians. During the workshop, the participants learned about the importance of ozone layer protection and the harmful effect of increase in UV-B radiation on the earth. The training included the related international agreements such as Montreal Protocol, its amendments and phase out schedule for various ODS substances. The role of UNEP in implementation of such a treaty was also discussed. The lectures reviewed the basic principles of refrigeration, tools and equipments for practicing good service practices and responded to the question on how to service refrigeration and air-conditioning equipment in order to avoid CFC emissions and which alternative refrigerants could be used for retrofitting. Alternative refrigerants for various applications were also discussed as there was a good interest among the participants. The lessons included the good practices such as recovery/recycling preventive maintenance, record keeping, safety issues and pressure testing & leak detection.

The practical sessions were designed in such a way that participants could study the tools and equipments for good practices. Hands-on practice on proper evacuation & charging procedure, recovery of refrigerant from domestic refrigerator as well as how to retrofit a refrigerant appliances using alternative refrigerant. Dr. Sitaram Joshi discussed the Refrigerant Management Plan for Nepal.

There were discussion sessions in between the lectures. The participants took keen interest in discussions and understanding the practical implications of good practices as well as new technologies for all the sub-sectors of refrigeration and air-conditioning.

All the participants on the last day responded to the questionnaire by individually filling them. This provided us about their understanding of the subject. The detailed workshop schedule is attached in Annex – A – 1.

7. Results, Conclusions, Recommendations and Lessons Learned

The objectives of the workshop have been met and the main results are:

- Training of 41 trainers and key service technicians on good practices in refrigeration including recovery and recycling of refrigerants
- Distribution of certificate to each participant after successful completion of the training programme.
- Exchange of practical information among the participants and development of network of personal contacts.
- Each participant was provided a copy of the Manual on good practices. They were also provided a copy of the Videos and Xerox copy of the other relevant training material as per their request.
- Recommendations of the workshop are given in Annex. A-4
The following conclusions, recommendations and lessons learned could be drawn from the train-the-trainers workshop.

- The local organization was exceptionally good. The classroom was well equipped with audio-visual aids. The room was air-conditioned. The practicals were conducted in the same lecture room in groups. There were adequate facilities for hands-on demonstration/practices.
- Lunch and tea were served in the classroom itself, which saved some time and avoided transport requirement. The lunchtime was also used to show Video presentation.
- The training equipment was complete and appropriate.
- The duration of the workshop had to be reduced to four days because the last day being holiday. However the programme was run as scheduled by extended time on other four days. All the topics were covered in detail.

8. Follow-up Action Plan

This training programme is part of the RMP for Nepal. As such it will be accompanied by other training and policy related activities as defined in the RMP which will be co-ordinated by the National Ozone Unit (NOU) and which will ensure the phase-out of CFCs in the refrigeration sector.

The NOU will establish a control and monitoring mechanism to ensure that the objectives of the programme are met and will produce follow-up reports on the states of implementation and the achievements of the training-the-technicians in the time frame given in the RMP of Nepal.

The National Ozone Action Unit and UNEP will consider and as far as possible, implement the workshop recommendations provided by the workshop participants.

9. Evaluation by Participants

The overall evaluation of the training-the-trainers workshop by the participants was very good to excellent.

A graphic analysis of the feedback received from the participants through the questionnaire is included in Annex – A – 5.

10. Annexes

- Annex A – 1 – Programme of the workshop
- Annex A – 2 – List of Participants
- Annex A – 3 – List of Speakers/Trainers
- Annex A – 4 – Workshop Recommendations
- Annex A – 5 – Evaluation by Participants
- Annex A – 6 – About OzonAction Programme UNEP DTIE
ANNEX – A – 1

Programme of the workshop

Lead Consultant - RADHEY S. AGARWAL
Mechanical Engineering Department, Indian Institute of Technology Delhi, India

Monday, 8 April

08:00 Registration of participants

09.00-10.0 OPENING SESSION

9.00-10.0 Welcome address
Dr. Sitaram Joshi, Chief Metrologist, Ministry of Industry, Commerce and Supplies, Nepal Bureau of Standards and Metrology, Balaju, Kathmandu, Nepal

9.10 Address by
Mr. Suresh, Raj, Training Manager, Energy and Ozon Action Unit, UNEP DTIE, France

9.25 Introduction to the workshop
Prof. R.S. Agarwal, IIT Delhi

9.40 Address by
Prof. Rabindra N. Bhattarai, Director, Center for Pollution Studies, Tribhuvan University

9.50 Inaugural Address by
Mr. Poorna P. Manandhar, Director General, Nepal Bureau of Standards and Metrology, Balaju, Kathmandu, Nepal

10.00 Vote of Thanks
Dr. Sitaram Joshi

10:30-13:00 TRAINING MODULE – I Environmental Impact of CFCs and Refrigerant Management Plan to Phase out CFCs

10:30 Environmental Impact of CFCs and their Alternatives
R S Agarwal, IIT Delhi, India

12:00 Refrigeration Management Plan at national level to phase out ozone-depleting substances (ODSs) and the train the technicians phase
Dr. V. Joshi, Ozone Officer

13:00 Lunch

1400-1730 TRAINING MODULE – II Principles of Refrigeration

14:00 Review of basic concepts in refrigeration
Dr. R S Agarwal, IIT Delhi, India

15.30 Tea Break
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16:00  Review of Tools and Equipments used in servicing of Refrigeration Appliances
       Dr. R S Agarwal, IIT Delhi, India

17:00  Discussions

17:20  Review of the day

17:30  Closure of the day

18:30  Reception at (venue awaited from Dr. Joshi)

Tuesday, 9 April

08:00-13.00  TRAINING MODULE - III  Alternative Refrigerants to CFCs and HCFCs and their Characteristics

08:00  Alternative Refrigerants to CFCs/HCFCs and their characteristics
       R S Agarwal, IIT Delhi, India

10:00  Discussions

10:30  Tea Break

11:00  Safe Handling of CFCs HCFCs and their Alternatives
       R S Agarwal, IIT Delhi, India

11:45  Handling of Blends
       R S Agarwal, IIT Delhi, India

12:00  Discussions

12:30  Lunch

13:30-15:30  PRACTICAL SESSION – I  Study of Tools and Equipments

13:30  Operation and use of trade specialty tools (hands-on session)

15:30  Tea Break

16:00-17:00  TRAINING MODULE - IV  Recovery, Recycling and Reclaim of Refrigerants

16:00  Recovery, Recycling and Reclaim of Refrigerants

16:45  Review of the day

17:00  Closure of the day

Wednesday, 10 April

08:00-12:30  PRACTICAL SESSION - II  Recovery of Refrigerants

09:00  Operation and use of passive and active recovery devices (hands-on session)

12:00  Discussions
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<th>Time</th>
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<tr>
<td>12:30</td>
<td>Lunch</td>
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<tr>
<td>13:30-17:00</td>
<td>TRAINING MODULE – V Good Servicing Practices in Refrigeration</td>
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<tr>
<td>13:30</td>
<td>General Good Servicing Practices in Refrigeration</td>
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<td>R S Agarwal, IIT Delhi, India</td>
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<tr>
<td>14:30</td>
<td>Tea</td>
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<td>15:00-16:30</td>
<td>Good Servicing Practices in refrigeration (Contd.)</td>
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<td>14:30</td>
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<td>16:30</td>
<td>Discussions</td>
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<td>Closure of the day</td>
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**Thursday, 11 April**

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<td>PRACTICAL SESSION – III Good Servicing Practices</td>
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<tr>
<td>08:00</td>
<td>Good Practices in Refrigeration (Hands-on session)</td>
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<td>10:00</td>
<td>Tea</td>
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<tr>
<td>10:30</td>
<td>Steps for Retrofitting of Refrigeration Appliances</td>
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<td>R S Agarwal, IIT Delhi, India</td>
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<td>11:00-12:30</td>
<td>PRACTICAL SESSION IV Retrofitting of Refrigeration Appliances to Alternative Refrigerants</td>
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<td>11:00</td>
<td>Retrofitting of Refrigeration Appliances to Alternative Refrigerants (Hands-on Session)</td>
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<td>12:30</td>
<td>Lunch</td>
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<td>13:30-17:00</td>
<td>Adoption of Workshop Recommendations</td>
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<td>13:30</td>
<td>Adoption of the workshop recommendations</td>
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<td><em>Mr. Suresh Raj, UNEP TIE representative</em></td>
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<td>Discussion on train-the-technicians programme</td>
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<td><em>Dr. Joshi, Ozone Officer</em></td>
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<td>Evaluation of the workshop</td>
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<td><em>Workshop participants</em></td>
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<td>15:30</td>
<td>Closing session</td>
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Address by
Dr. Sitaram Joshi, Chief Metrologist, Ministry of Industry, Commerce and Supplies, Nepal Bureau of Standards and Metrology, Balaju, Kathmandu, Nepal (Ozone Officer)

Address by
Prof. Rabindra N. Bhattarai, Director, Center for Pollution Studies, Tribhuvan University

Address by
Prof. R.S. Agarwal, Indian Institute of Technology Delhi, India
Award of Certificates to the Participants by
Mr. Poorna P. Manandhar, Director General, Nepal Bureau of Standards and Metrology, Balaju, Kathmandu, Nepal

Valedictory Address by
Mr. Poorna P. Manandhar, Director General, Nepal Bureau of Standards and Metrology, Balaju, Kathmandu, Nepal

Vote of thanks on behalf of the participants
Dr. Sitaram Joshi, Chief Metrologist, Ministry of Industry, Commerce and Supplies, Nepal Bureau of Standards and Metrology, Balaju, Kathmandu, Nepal (Ozone Officer)

Closing statement
Mr. Suresh Raj

Vote of Thanks

17:00  Closure of the workshop
ANNEX – A – 2

List of Participants

1. Mr. Janga Bahadur Nemkul
   CAAN
   Nepal

2. Mr. Badri Prasad Ghimire
   CAAN
   Nepal

3. Mr. Hari Gopal Shrestha
   CAAN
   Nepal

4. Mr. Sunil Kumar Choudhary
   Technician
   A to 2 Repairing Cener
   Maa Enterprises
   Nepal

5. Mr. Nar Bahadur Shrestha
   Hotel Himalaya
   Nepal

6. Mr. Gir Bahadur K.C.
   Birendra International Convention Centre
   New Baneshwar
   Kathmandu, Nepal

7. Mr. Hari Snaran Pathak
   Birendra International Convention Centre
   New Baneshwar
   Kathmandu, Nepal

8. Mr. Dipak Pokhrel
   Sonu Maintenance and Servicing Centre
   Nepal

9. Mr. Krishna Mani Adhikari
   Suite Hotel & Health Resort (P) Ltd.
   GPO-6126 KTM
   Nepal
10. Mr. Madhav Pd. Ghimire  
   Cooling System  
   Nepal

11. Mr. Ishwar Dalral  
   Quality Repairing  
   Nepal

12. Mr. Shyam Sunder Balami  
   S.S. Services  
   Nepal

13. Mr. Sandesh Tanrakar  
   Delta Repairing Centre/ Pulchowk  
   Nepal

14. Mr. Abhaya Kant Chaudhary  
   A to 2 Refrigeration Workshop  
   Nepal

15. Mr. Tulsi B. Nemkul  
   Skill/ Nepal, Jawalakhel, Lalitpur  
   Nepal

16. Mr. Dipendra Kumar Chaudhary  
   Dimpendra Refrigeration & Electrical Workshop  
   Nepal

17. Mr. Rajendra Lama  
   Lama Àpere International  
   Nepal

18. Mr. Subash Pd. Bhattara  
   Dairy Dev. Corporation  
   Nepal

19. Mr. Satish Gorkhali  
   Dairy Dev. Corporation  
   Nepal

20. Mr. Rajesh Shrestha  
   Continental Refrigeration Traders  
   Dillibahar Kathmandu  
   Nepal
21. Mr. Mahesh Raj Karnitkar  
Sigma Refrigeration  
Nepal

22. Mr. Aditya Raj Bhattarai  
Hotel Sherpe  
Nepal

23. Ms. Manju Ratna Shahi  
Nepal Telecom Corporation  
Nepal

24. Mr. Mohan Raj Dhakal  
GRUL  
Nepal

25. Mr. Bijay Rajbhandari  
Hotel Del’ Annapurna, Kathmandu  
Nepal

26. Mr. Bimal Roudel  
Maintenance of Servicing Centre  
Nepal

27. Mr. Siddna Bahadur Dahal  
Hotel Shanyni-la  
Nepal

28. Mr. Krishna Bhakta Maharjan  
Hotel Sherpa Durbar marg, Kathmandu  
Nepal

29. Mr. Yuba Raj Dulal  
Hotel Shangri-la  
Nepal

30. Mr. Babu Ram Adhikari  
Himal Refrigeration & Electrical Industries Pvt. Ltd. Tripureshwar  
Nepal

31. Mr. Gyanendra Karke  
Purwanchal Engg. Campus, Dharan  
Nepal
32. Mr. Sambhu Pokharel  
P.K. Servicing Centre  
Nepal

33. Mr. Om Krishna Manadnar  
Refrigeration DHAKU  
Nepal

34. Mr. Iswar Lal Shrestha  
Soulttee Crowne Plaser  
Kathmandu – 272555  
Nepal

35. Mr. Bal Purushotam Shakya  
Institute of Engineering (Pukhowk Campus)  
Nepal

36. Mr. Biswo Ram Shrestha  
Shrestha Electric Repairing Centre  
Nepal

37. Mr. Health Man Shakya  
Master Refrigeration and Electric Works  
New Road, Kathmandu  
Nepal

38. Mr. Keshav Nath Upadhaya  
S.S. Repairing Center  
Nepal

39. Mr. Shyam Shakya  
Aahakya Refrigerator Works  
Nepal

40. Mr. Gyan Bhakta Maharajan  
SKILL/ Nepal Jawalakhel  
Nepal

41. Mr. Sadan Tamrokur  
Alpha Repairing Centre  
Nepal
ANNEX – A – 3

List of Speakers/ Trainers

Nepal Ozone Unit

Mr. Poorna P. Manandhar
Director General
Nepal Bureau of Standards and Metrology
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Train the Trainers Workshop on Good Practices in Refrigeration  
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Indian Institute of Technology Delhi

Dr. R S Agarwal  
Prof. of Mechanical Engineering Department  
Indian Institute of Technology Delhi  
New Delhi – 110016, India  
Tel: 91-11-659 1120  
Fax: 91-11-652 6645  
Email: rsarwal@mech.iitd.ernet.in
ANNEX – A – 4

Workshop Recommendations

1. Equipment support to technicians for adoption of good practices.

2. Availability of alternative refrigerants to CFCs in smaller cylinders for servicing.

3. Government to consider duty concessions for the import of alternative refrigerants and also the availability of CFC-12 during the phase out period.
ANNEX – A – 5

Evaluation by the Participants

Evaluation Questionnaire

The following questionnaire was given to participants to evaluate the training course. The responses are tabled in a graph in the following page. 1 represents the worst and 5 the best possible ratings.

1. What is your overall evaluation of the course?  
2. Did the course provide the information you expected?  
3. Was the communication between participants possible and useful?  
4. Was the composition of the audience adequate?  
5. As far as the contents of the presentation are concerned, did you find them adequate in explaining:
   (a) Environmental issue  
   (b) Basic principles of refrigeration  
   (c) CFC/HFC/HFC/HC refrigerants and technologies  
   (d) General trade safety  
   (e) Operation and use of trade specialty tools  
   (f) Operation and user of passive and active recovery devices  
   (g) Good refrigeration practices  
   (h) Retrofitting to alternative refrigerants  
   (i) Creating preventive maintenance programmes and record-keeping  
   (j) RMP concept at company level

6. Has the recovery issues been adequately draft with in the practical hands-on sessions?  
7. Did the training provide you with relevant information regarding the Refrigerant Management Plan in your country?  
8. Did the training course provide you with the relevant information regarding the train-the-technicians phase and your role in it?  
9. Did the training course provide appropriate training material as a basis for the train-the-technicians phase to be carried out by yourself in your country (please indicate under 11 whether additional material could be useful)?
Results Evaluation Nepal

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<th>Questions</th>
<th>1- Poor</th>
<th>2 Average</th>
<th>3 Good</th>
<th>4 Very Good</th>
<th>5 Excellent</th>
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Results of Evaluation of Training the Trainers Programme

- Training programme was very good but the training should be for a longer period (about one month). Practical contents to be increased.
- All handouts should be provided.
- Overall training course is very beneficial, more courses of this type be conducted.
- The training is very useful and necessary in this period of phase out of CFCs.
- Practical contents should be increased.
- Training programme was excellent.
- The training programme was excellent, regular additional training material be provided as far as possible.
- The quality of training was very good but the participants group was large.
- All the technicians be provided equipments and also the training. The training provided will be very helpful.
- The quality of the course is very good and training method is also very good.
- The training is good; the Government should give all types of materials, which are used, in the practical field.
- The type of training programme should be done at least once a year.
- To follow the good service practices, the tools and other related equipments should be made easily available in the market.
WORKSHOP EVALUATION

QUESTIONS

PARTICIPANTS

1 Poor 2 3 4 5a 5b 5c 5d 5e 5f 5g 5h 5i 5j 6 7 8 9

1 2 3 4 5a 5b 5c 5d 5e 5f 5g 5h 5i 5j 6 7 8 9

1 Poor 2 □ 3 □ 4 □ 5

UNEP DTIE OzonAction Programme
Annex A -6 About the OzonAction Programme UNEP DTIE

Nations around the world are taking concrete actions to reduce and eliminate production and consumption 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 183 countries — has committed itself under the Montreal Protocol to phase out the use and production of ODS. Recognizing 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 National Ozone Units 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 OzonAction Programme has helped promote cost-effective 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 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 8 regional/sub-regional Networks involving 114 developing and 9 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 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 60 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 90 countries to develop their Country Programmes and 76 countries to implement their Institutional-Strengthening projects.

For more information about these services please contact:

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About the UNEP Division of Technology, Industry and Economics

The mission of the UNEP Division of Technology, Industry and Economics 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.

The UNEP Division of Technology, Industry and Economics (UNEP DTIE), with the Division Office in Paris, is composed of one centre and five branches:

/ The International Environmental Technology Centre (Osaka), which 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.

/ Production and Consumption (Paris), which 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.

/ Chemicals (Geneva), which 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 and OzonAction (Paris), which 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 Branch.

/ Economics and Trade (Geneva), which 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.

/ Coordination of Regional Activities Branch (Paris), which coordinates regional delivery of UNEP DTIE's activities and ensures coordination of DTIE's activities funded by the Global Environment Facility (GEF).

UNEP DTIE activities focus on raising awareness, improving the transfer of information, building capacity, fostering technology cooperation, partnerships and transfer, improving understanding of environmental impacts of trade issues, promoting integration of environmental considerations into economic policies, and catalysing global chemical safety.