

WORKSHOP REPORT

National Train the Trainers Workshop on Good Practices in Refrigeration Bangladesh

Ozone Cell, Department of Environment
Ministry of Environment and Forest
Government of the People's Republic of Bangladesh



OzonAction Programme
United Nation Environment Programme



Multilateral Fund for the Implementation
of the Montreal Protocol

Dhaka, Bangladesh, 15-19 June 2003

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Jointly Organized by the

United Nations Environment Programme
OzonAction Programme

and

Ozone Cell, Department of Environment
Ministry of Environment and Forest
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Funded by the

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TABLE OF CONTENTS

Executive Summary		4
1. Background		6
2. Objectives		7
3. Expected results of the workshop		7
4. Participants		8
5. Methodology		8
6. Contents		9
7. Follow-up action plan		9
 Annexes		
Annex A- 1	Workshop Programme	11
Annex A- 2	List of Participants	15
Annex A- 3	List of Distinguished guests present during the Opening Session of the Workshop	20
Annex A- 4	List of Distinguished of Officials present during the Closing Session of the Workshop	21
Annex A - 5	List of Speakers/ Trainers	22
Annex A - 6	Workshop Recommendations	23
Annex A - 7	Evaluation by Participants	24
Annex A – 8	Results of the written test	27

EXECUTIVE SUMMARY

The Train-the-Trainers programme on Good Practices in Refrigeration is a part of a comprehensive approach to reduce the ODS consumption in the refrigeration servicing sector in Bangladesh. Such approach is defined in the Refrigerant Management Plan (RMP) of Bangladesh, which has been approved by the Executive Committee of the Multilateral Fund to be jointly implemented by UNDP and UNEP. UNEP is responsible for the implementation of the training programme on good practices in refrigeration

The main objective of the training programme is to reduce the CFC consumption in the refrigeration and air-conditioning service sector in Bangladesh 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 Bangladesh.

The long term expected result of the training programme is to enhance good service practices in the refrigeration sector hence reduce and finally phase out the use of CFCs. The training programme will also assist the sector to switch over to non-CFC appliances/ equipments in a smooth way without causing an unnecessary burden to the consumers.

During the train-the-trainers workshop 38 trainers from various training institutes from all over the country were trained on good practices in refrigeration. **The training consisted of the 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 & HCFCs and their Characteristics
4. Recovery, Recycling (R/R) and Reclamation of Refrigerants
5. Good Servicing Practices in Refrigeration

PRACTICAL SESSIONS

1. Study of Tools and Equipments for good service practices
2. Recovery and Recycling of Refrigerants
3. Recovery Recycling and Charging of Mobile air-conditioning systems
4. Good Servicing Practices

The workshop covered various topics such as harmful effects of Ozone layer depletion, the Montreal Protocol and its amendments, principles of refrigeration, CFC, HCFC and HFC refrigerants, recovery & recycling processes & equipments and preventive maintenance practices. Retrofitting of refrigeration appliances/ equipments and envisioned future technological development in refrigeration sector were also included. The participants were

provided hands-on practice on the use of recovery & recycling machines, MAC recovery, recycling charging unit and servicing of refrigeration appliances using good service practices.

The following theoretical topics were covered:

- Environmental Impact of CFCs and their Alternatives
- Refrigeration Management Plan at national level to phase out 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

The following practical topics were covered:

- Study of Tools and Equipments
- Recovery of Refrigerants
- Recycling of Refrigerants
- Good Servicing Practices in Refrigeration (Hands-on session)

On the last day of the workshop, a written test was conducted for the participants to assess their learning capability in the subject. The test result is given in Annex A-8. The participants also provided feedback on the training programme. The feedback has been analyzed and the salient features are presented in Annex A-7. The feedback was encouraging. The participants also made some recommendations, which are summarized, in Annex A-6.

Overall, the training of trainers programme was successfully conducted in close co-operation with the Department of Environment, Ministry of Environment and Forest, Bangladesh.

BACKGROUND

Bangladesh developed the Country Programme in 1994. At that time, it was consuming 240 metric tonnes of Ozone Depleting Substances (ODSs) out of which 40% was used in the RAC sector. The CFC consumption peaked in 1997 to 832 ODP tonnes. The baseline for CFCs (1995-1997 average) amounts to be 580.4 ODP tonnes. In the year 2002, CFC used in this sector was 326 ODP tonnes. Out of which almost 90% was used in servicing. A national recovery and recycling programme has already been initiated in 2002 by UNDP.

As it can be seen, the amount of CFCs required for servicing in RAC sector 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 amount of CFCs directly to the environment.

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

Bangladesh has about 60 000 service technicians and approximately 6000-7000 servicing shops operating in the RAC sector. Many technicians have received formal training in a technical training centre. However, a large number of technicians are working in the informal sector and their training is based on *experience* or *training on the job*.

Bangladesh has large number of refrigeration appliances like domestic refrigerators, commercial refrigeration appliances, mobile air-conditioning units, and central plants for food processing & storage and industrial refrigeration & air-conditioning units. All these need CFCs for servicing. The availability of CFCs is gradually decreasing and the cost is also likely to increase. Recently, Government of Bangladesh has taken a proactive policy decision to tax CFCs and reduce the tax on alternative refrigerants. This shows the commitment of the country to phase out ODSs at the earliest and it further will motivate the service technicians to adopt good service practices.

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.

Therefore, the training on good practices in refrigeration and an effective recovery & recycling programme combined with prudent retrofitting and timely replacement are part of the overall phase-out strategy and will assist Bangladesh in meeting the control measures under the Montreal Protocol sustaining the freeze in consumption of Annex A CFCs in 1999 and 2005 & 2007 control measures.

2. Objectives

The main objective of this train the trainers workshop was to upgrade the skills of trainers who will in turn train the servicing engineers and technicians thereby assisting the country to reduce the CFC consumption in the RAC service sector and hence to comply with the phase out schedule for CFCs under the Montreal Protocol. The workshop further aimed the following:

- Increasing awareness of the participants about Ozone layer 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 Plan.
- Introducing and demonstrating the procedures that eliminate refrigerant emissions during preventive and un-scheduled maintenance including containment.
- Dissemination of information on alternative technologies to CFCs for various applications and methodology of retrofitting of existing refrigeration appliances/ equipments.
- Stimulating the development of a network for information sharing throughout the sector.
- Helping the country to achieve the phase out in a coordinated, planned and cost effective manner, allowing to run existing CFC based equipment until the end of its economic life or retrofit if economically feasible.

3. Expected Results of the Workshop

The expected result of the training programme is to enhance good servicing and technical practices in RAC sector by training 37 future trainers and subsequently 10000 to 12000 service technicians. Thereby assisting the sector to switch over to non-CFC based appliances in a relatively smooth manner without affecting their business and without causing any extra burden to the consumers. The training of remaining technicians out of 60 000 workforce will need to be addressed through the Country Programme Update and TPMP.

It also includes the consequent training of 1000-1200 service technicians operating in the formal and informal RAC 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 Bangladesh. Hence ensuring that future technicians do not need re-training on this aspect. The remaining technicians are expected to be trained through the industry associations, technical institutions including vocational training institutes. The training of technicians is expected to result in the following:

- Increased awareness regarding the harmful effects of Ozone layer depletion through reporting in the media
- Minimization and elimination of uncontrolled emissions of Ozone depleting refrigerants through better maintenance practices, leak prevention and recovery & recycling through training of service technicians.
- Elimination of venting of CFCs during purging and flushing the refrigeration system
- Retrofitting of existing appliances using drop-in environment friendly refrigerants
- Increased use of non-CFC equipments and non-CFC coolants.

4. Participants

The workshop was well attended. There were 38 participants in the workshop while the workshop was planned only for 25 participants. The participants were invited from technical institutions, who are involved in refrigeration and air-conditioning training. The trainers in turn will take up training of field engineers and service technicians in the sub-sectors of RAC like domestic refrigeration, commercial refrigeration, mobile air-conditioning, medium & large industrial refrigeration & air-conditioning. The participants had teaching experience and practical background in refrigeration and air-conditioning. The list of participants is attached as Annex A-2.

The Lead Trainer for the workshop was Dr. Radhey S. Agarwal (Indian Institute of Technology Delhi, India) and the UNEP representatives were Mr. Atul Bagai and Mr. Shaofeng Hu (UNEP/ ROAP, Bangkok, Thailand). Captain Md. Nurul Islam, Local Consultant helped in explaining in local language during the theory as well as practical sessions. (see Annex A-5). The Department of Environment, Ministry of Environment & Forest of the Republic of Bangladesh was responsible for the local organization.

The workshop was formally inaugurated by Mr. Shahjahan Siraj, Hon'ble Minister, Ministry of Environment and Forest. Mr. Jafrul Islam Chowdhury, Hon'ble State Minister, Ministry of Environment and Forest Mr. Atul Bagai, Regional Officer (Networking) CAP, UNEP/ROAP, Bangkok. Mr. Mohammad Reazuddin, Director (Technical), Department of Environment also addressed the audience. The session was chaired by Dr. Md. Omar Faruque Khan, Additional Secretary, Govt. of the People's Republic of Bangladesh and Director General, Department of Environment.

5. Methodology

Refrigerant conservation is the key to reducing CFC emissions to the environment from the existing CFC based refrigeration and air-conditioning units. Appropriate training on good practices in refrigeration such as 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 the existing equipment until the end of its economic life, to reduce the emission of ODSs and to achieve the phase out in a co-coordinated, planned and cost effective manner.

The training programme used the train trainers approach on good practices in refrigeration. In this workshop 37 trainers were trained. This five-day workshop covered both theoretical and practical aspects of good service practices. There were a number of practical sessions held to have hands-on demonstrations about 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 workshop on use of good practices in the realistic situations. These trainers will train 1000-1200 service technicians in the refrigeration and air-conditioning sector in Bangladesh.

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

Training manuals published by UNEP on “Good Practices in Refrigeration” and “Chillers and Refrigerant Management” were used as resource documents. It was interesting to note that the manual and other training material was translated in the local language. 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 Trainer at IIT Delhi especially on recovery, recycling, handling of CFCs, HCFCs and their alternative, retrofitting of appliances, equipments using alternatives to CFCs. The copies of all the presentations were provided to each participant.

6. Contents

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 related international agreements such as Montreal Protocol, its amendments and phase out schedule for various ODSs. The role of UNEP in implementation of such a Multilateral Environment Agreement was also discussed. The lectures reviewed the basic principles of refrigeration, tools and equipments for good service practices and responded to the questions 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 good practices such as recovery/ recycling preventive maintenance, record keeping and safety issues.

There were continuing discussions 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. The detailed workshop scheduled is attached in Annex A-1

The practical sessions were designed in such a way that all the participants could study in detail the tools and equipments for good practices. Hands-on sessions included proper evacuation & charging, recovery of refrigerant from domestic refrigerator as well as how to retrofit the refrigeration appliances using alternative refrigerant. The participants practiced the use of recovery machines, recycling machines, MAC recovery, recycling & charging machine as well as servicing of refrigeration appliances using good service practices.

Time was also allocated for discussions among the participants concerning the implementation of the Refrigerant Management Plan at national level and the implementation of the train-the-technicians phase. On the last day all the participants also responded to a feed back

questionnaire on the workshop by individually answering the questions in it. Relevant workshop recommendations were drafted. The detailed workshop recommendations are given in Annex A-6.

During the last day of the workshop, a written test of one-hour duration was also conducted for all the participants to evaluate their learning level. Test results are given in Annex A-8.

The participants received their participation certificates during the closing session. This session was chaired by Mr. Mohammad Reazuddin, Director (Technical) & Project Director and the chief guest was Dr. Md. Omar Faruque Khan, Director General, Department of Environment.

It is also expected that the Government would introduce a certification system for accreditation of technicians undergoing such training on a continuous basis.

7. Follow-up Action Plan

This training programme was a part of the RMP for Bangladesh. It is expected that the training of technicians will start soon in the country and the results of the training will be evaluated. As such it will be accompanied by other training and policy related activities as defined in the RMP. These activities will be coordinated by the National Ozone Unit in close co-operation with the leading technical training institutes ensuring the successful phase-out of CFCs in the refrigeration sector.

The National Ozone Unit will establish a control and monitoring mechanism to ensure that the objectives of the training programme are met and will produce a follow-up report after finalisation of the training programme.

ANNEX A– 1

Workshop Programme

Lead Consultant - RADHEY S. AGARWAL

Mechanical Engineering Department, Indian Institute of Technology Delhi, India

Sunday, 15 June

09:00 Registration of participants

09.00-09.30 OPENING SESSION

10 :00 **Tea**

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

11 :30 Overview of Implementation of Montreal Protocol in Bangladesh
Mr. Md.Reazuddin

12:30 Discussions

13 :00 Lunch

14 :00-17 :30 TRAINING MODULE – II **Principles of Refrigeration and
Review of Tools & Equipments**

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

15:30 Tea

15:45 Review of Tools and Equipments used in servicing of Refrigeration Appliances
Dr. R S Agarwal, IIT Delhi, India

16:345 Discussions

17:15 Review of the day

17:30 Closure of the day

Monday, 16 June

**09:00-13.00 TRAINING MODULE - III Alternative Refrigerants to CFCs
& HCFCs and Issues related to
HFCs**

09:00 Alternative Refrigerants to CFCs/HCFCs and their characteristics
R S Agarwal, IIT Delhi, India

10:00 Handling of HFCs
R S Agarwal, IIT Delhi, India

11:00 Tea

11:30 Linkages between Montreal and Kyoto Protocol
R S Agarwal, IIT Delhi, India

12:30 Discussions

13 :00 Lunch

14:00-17 :30 PRACTICAL SESSION – I Study of Tools and Equipments

14:00 Operation and use of trade specialty tools (hands-on session)

15:30 **Tea**

15:45 Operation and use of trade specialty tools (hands-on session) (cont....)

17 :15 Review of the day

17 :30 Closure of the day

Tuesday, 17 June

**9:00-13:00 TRAINING MODULE - IV Recovery, Recycling and Reclaim
of Refrigerants & Good Service
Practices**

9:00 Recovery, Recycling and Reclamation of Refrigerants
R S Agarwal, IIT Delhi, India

11:00 Tea

11:15 General Good Servicing Practices in Refrigeration
R S Agarwal, IIT Delhi, India

12:30 Discussion

13:00 Lunch

14:00-17:30 PRACTICAL SESSION - II Recovery of Refrigerants

14:00 Study of Recovery and Recycling Equipments

15:30 Tea

15:45 Operation and use of recovery equipments (hands-on session)

17 :15 Review of the day

17 :30 Closure of the day

Wednesday, 18 June

9:00-13:00 TRAINING MODULE – V Good Servicing Practices in Refrigeration

9:00 Good Servicing Practices in Refrigeration
R S Agarwal, IIT Delhi, India

11:00 Tea

11 :15 Steps for Retrofitting of Refrigeration Appliances

12 :30 Discussions

13:00 Lunch

14:00-17.30 PRACTICAL SESSION – III Good Servicing Practices

14:00 Good Servicing Practices in Refrigeration (Hands-on session)

15:30 Tea

15:45 Retrofitting of Refrigeration Appliances to Alternatives Refrigeration
(Hands-on session)

17:15 Review of the day

17:30 Closure of the day

Thursday, 19 June

9:00-14:00 TRAINING MODULE – VI Good Service Practices while HC as alternatives to CFCs and Adoption of Workshop Recommendations

9.00 Safe Handling of Hydrocarbon Refrigerants
R S Agarwal, IIT Delhi, India

9.30 Handling of Blends
R S Agarwal, IIT Delhi, India

10.00 Examination of Participants

11:00 Tea

11:15 Discussion on train-the-technicians programme

11:30 Evaluation of the workshop
Workshop participants

12:00 Adoption of the workshop recommendations
UNEP representative

13:00-14 :00 Closing Session

ANNEX A– 2

List of Participants

1. Md. Shahab Uddin Laskar
Senior Trade Instructor, (Teacher)
Vocational Training Institute, Sylhet
Bangladesh
2. Md. Hafizur Rahman
Sp. Instructor (RAC)
BGTTTC Mirpur, Dhaka-1216
Bangladesh
3. Md. Mustafizur Rahman
Jr. Instructor
Pabna Polytechnic Institute, Pabna
Bangladesh
4. Md. Ashraf Hossain
Instructor
National Refrigeration
KDA Avenue, Khulna
Bangladesh
5. Md. Ataur Rahman
Senior Instructor (RAC)
Technical Training Centre, Rajshahi
Bangladesh
6. Md. Reaz Hossain
Teacher (Junior Instructor RAC)
Vocational Training Institute, Manikganj
Bangladesh
7. Md. Asaduzzaman
Proprietor
M/s. Cooling Point Engineering Services
Dhaka, Bangladesh
8. AKM Zainul Abedin
Chief Instructor (Power)
Dhaka Polytechnic Institute, Tejgaon
Dhaka-1208, Bangladesh.

9. Mohammad Waziullah
Junior Instructor (RAC)
Vocational Training Institute, Munshiganj
Bangladesh
10. Syed Ahsan Ali
Junior Instructor
Khulna Polytechnic Institute
Khulna-9000, Bangladesh
11. Md. Mahbubur Rashid Talukdar
Junior Instructor (Power)
Bogra Polytechnic Institute
Bogra, Bangladesh
12. Anisur Rahman
Instructor (RAC)
DLPA Technical Training Centre
Dhaka- 1218, Bangladesh.
13. Syed Dosh Mohammad
Assistant Instructor (RAC)
Rabita Vocational Training Institute
Kalyanpur, Dhaka
Bangladesh.
14. Md. Alamgir Hossain
Teacher, Junior Instructor (RAC)
Vocational Training Institute, Narayanganj
Bangladesh
15. Md. Mujib Alam
Teacher, Junior Instructor (RAC)
Vocational Training Institute, Bhola
Bangladesh
16. Md. Monir Hossain
RAC Engineers
General Secretary SRADEB, Dhaka
Bangladesh
17. Amal Krishan Chokraborty
Teacher Junior Instructor (Power)
Polytechnic Institute Sylhet

- Sylhet, Bangladesh
18. Md. Didarul Alam
Instructor (Power)
Polytechnic Institute Barisal
Barisal, Bangladesh
 19. Rabati Kumar Biswas
Instructor
Technical Training Centre,
Mirpur, Dhaka, Bangladesh
 20. Md. Shah Alam
Trade Instructor (RAC)
Vocational Training Institute Pabna
Pabna, Bangladesh
 21. Abdus Sobhan Patwary
Businessman
M/s. Ashraf Techno Concern
Dhaka, Bangladesh
 22. Sachin Saha
Instructor
Jabu Union Sangstha
Khulna, Bangladesh
 23. Md. Ali Hossain
Chief Instructor (RAC)
Vocational Training Institute
Hobiganj, Bangladesh
 24. Arabinda Kumar Bordhan
Chief Instructor (R & AC)
Vocational Training Institute
Rangpur, Bangladesh
 25. Sarder Sharif Ahmed
Instructor
UCEP Bangladesh
Mirpur-2, Dhaka- 1216
Bangladesh
 26. Md. Solaiman
Instructor (RAC)
Dhaka Polytechnic Institute

- Dhaka, Bangladesh
27. Kazi Monowar Hossain
Serviceman
Bangladesh Cable Shilp Ltd. Khulna
Bangladesh
 28. Md. Saiful Islam
Instructor (RAC)
Vocational Teacher's Training Institute
Bogra, Bangladesh
 29. Md. Monrul Islam
Instructor (RAC)
Technical Training Centre
Mymensingh, Bangladesh
 30. Md. Mowazzem Hossain
Teacher, Instructor (Power)
Bogra Polytechnic Institute
Bogra, Bangladesh
 31. Md. Rabiul Islam
Instructor
Bangladesh Institute of Marine Technology
Narayanganj, Bangladesh
 32. Md. Shahidul Islam
Junior Instructor (RAC)
Vocational Training Institute
Dinajpur, Bangladesh
 33. Mohammad Ali
Assistant Engineer (E/M)
Bangladesh Shilpakala Academy
Dhaka, Bangladesh
 34. Mohammad Siddiqur Rahman
Teacher, Jr. Instructor (Power)
Faridpur Polytechnic Institute
Faridpur, Bangladesh
 35. Md. Mahbubul Haque
Craft Instructor
Faridpur Polytechnic Institute
Faridpur, Bangladesh

36. Md. Radwanoor Rahman
Teacher (Instructor)
Polytechnic Institute Mymensingh
Bangladesh

37. Md. Abu Jafor
Teacher, MOWTS
1-C/1-A Pallabi
Mirpur, Dhaka- 1216
Bangladesh.

38. Md. Shafiqul Islam
Assistant Engineer
Bangladesh Power Development Board
Dhaka, Bangladesh.

ANNEX A- 3

List of Distinguished Guests present during opening inaugural session of the workshop

1. Mr. Shahjahan Siraj
Hon'ble Minister,
Ministry of Environment and Forest
Govt. Of Bangladesh
2. Mr. Jafrul Islam Chowdhury
Hon'ble State Minister,
Ministry of Environment and Forest
Govt. Of Bangladesh
3. Dr. Md. Omar Faruque Khan
Additional Secretary
Govt. of Bangladesh
and
Director General
Department of Environment
4. Mr. Md. Reazuddin
Director (Technical) and Project Director
Training Programme on Good Practices in Refrigeration
Bangladesh
5. Mr. Atul Bagai
Regional Officer (Networking) CAP,
UNEP/ROAP, Bangkok
6. Mr. Shaofeng Hu
UNEP/ ROAP,
Bangkok, Thailand.
7. Dr. R.S. Agarwal
Indian Institute of Technology Delhi
India
8. Capt. (Retd.) Md. Nurul Islam
Local Consultant
RMP Monitoring project

ANNEX A– 4

List of Distinguished Officials present during the closing session of the workshop

1. Dr. Omar Faruque Khan
Additional Secretary
Govt. of Bangladesh
and
Director General
Department of Environment
2. Dr. Mahfuzul Haque
Deputy Secretary (Environment)
Ministry of Environment and Forest
4. Mr. Md. Reazuddin
Director (Technical) and Project Director
Training Programme on Good Practices in Refrigeration
Bangladesh
5. Capt. (Retd.) Md. Nurul Islam
Local Consultant
RMP Monitoring project
6. Dr. S.K. Purkayastha
Senior Officer, Ozone Cell
Department of Environment
7. Mr. Shaofeng Hu
UNEP/ ROAP,
Bangkok, Thailand.
8. Dr. R.S. Agarwal
Indian Institute of Technology Delhi
India

ANNEX A- 5

List of Speakers/ Trainers

National Ozone Unit

Md. Reazuddin
Director (Technical) and Project Director
Training Programme on Good Practices in Refrigeration

Dr. S.K. Purkayastha
Senior Officer, Ozone Cell
Department of Environment

Capt. (Retd.) Md. Nurul Islam
Local Consultant
RMP Monitoring project

United Nations Environment Programme

Mr. Atul Bagai
Regional Officer (Networking) CAP,
UNEP/ROAP, Bangkok

Mr. Shaofeng Hu
Programme Officer (RMP Implementation)
UNEP/ ROAP,
Bangkok, Thailand.

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– 6

WORKSHOP RECOMMENDATIONS

- 1 The training of technicians is very important for promotion of good practices in the refrigeration-servicing sector. However, the government also needs to enact regulation/policies for the technicians to apply the code of good practices.
- 2 Refrigerant dealers or government agencies should be required to provide the technicians/workshops with the short pamphlet for the ozone layer protection and good practices issues.
- 3 Public awareness should be raised through multimedia, such as TV, newspaper, and radio for the Ozone issues to mobilize the actions of both public and the technicians.
- 4 Certificate should be required for the technicians to be hired by the workshop and/or for the workshop to be in operation.
- 5 Certificates to technicians should be issued jointly by DoE and the refrigeration association.
- 6 Workshops (2-3 days) for the training of technicians should be organized by polytechnic school, vocational institutes, technical training center and RAC associations. The basic infrastructure for conducting training should be taken into consideration when design the phase II training.
- 7 The polytechnic school, vocational institutes and technical training centers will adopt the good practices including the R/R into their curriculum for their regular training programmes to sustain the training programme. DoE needs to closely follow up on this and get it done properly.
- 8 DoE may assume the responsibility of the monitoring the good practices application by technicians. The trainer who was trained during this workshop need to help DoE on this task.
- 9 The economic incentive of R/R is the motivation for the technicians to conduct the R/R.
- 10 As 80% of the owner of the workshops are technicians themselves , they should first be trained as part of the programme, so that they could manage to train their own people.
- 11 The recovered refrigerant should be collected by designated agencies with pay back the recovered refrigerant;
- 12 20 of 40 trained trainers by this workshop can make their own R/R equipment. But can not make the recycling. The best recycling should be provided by the project under MLF.
- 13 The government should encourage the local manufacturing of the R/R equipments.

ANNEX A– 7

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.

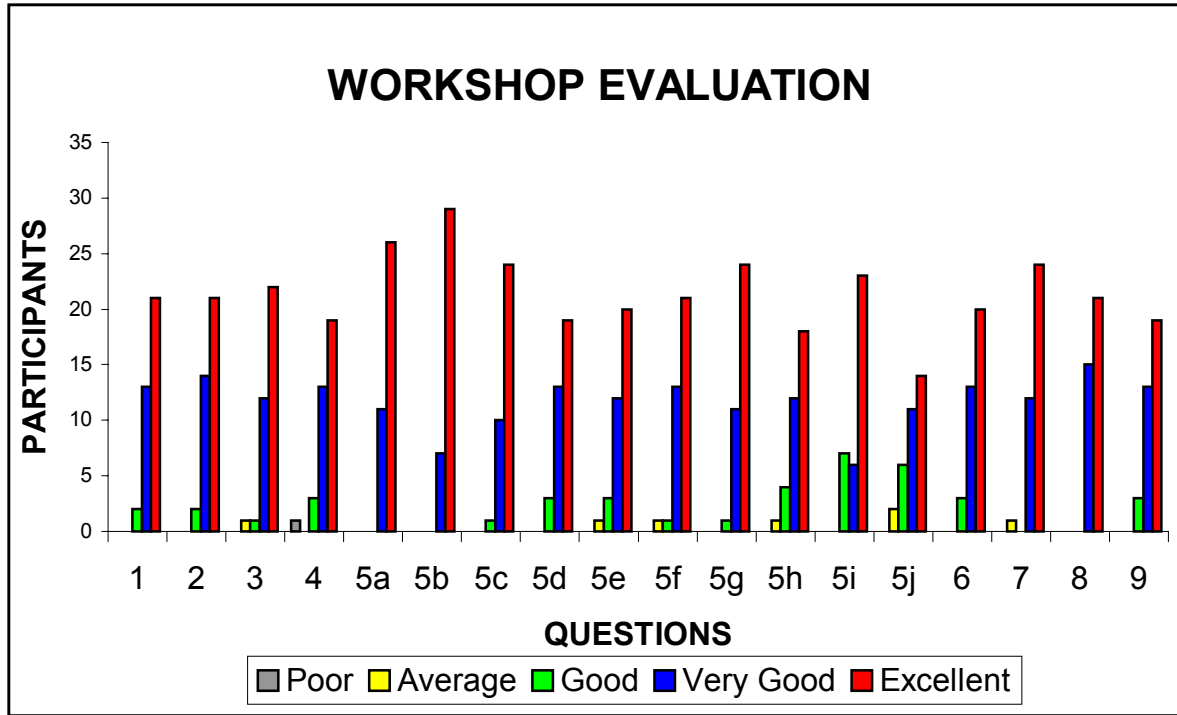
1. What is your overall evaluation of the course?
2. Did the course provide the information you expected?
3. Was the communication between participants possible and useful?
4. Was the composition of the audience adequate?
5. As far as the contents of the presentation are concerned, did you find them adequate in explaining:
 - (a) Environmental issue
 - (b) Basic principles of refrigeration
 - (c) CFC/HCFC/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)?
10. Please give additional comments about the quality of the course and how similar courses could be improved.

Results of Evaluation Bangladesh

Questions	1 Poor	2-Average	3-Good	4-Very Good	5- Excellent
1			11	11111111111111	11111111111111111111
2			11	11111111111111	11111111111111111111
3		1	1	11111111111111	11111111111111111111
4	1		111	11111111111111	11111111111111111111
5a				11111111111111	11111111111111111111111111
5b				11111111	111111111111111111111111111111
5c			1	1111111111	11111111111111111111111111
5d			111	11111111111111	111111111111111111111111
5e		1	111	11111111111111	111111111111111111111111
5f		1	1	11111111111111	111111111111111111111111
5g			1	11111111111111	11111111111111111111111111
5h		1	1111	11111111111111	111111111111111111111111
5i			11111111	11111111	11111111111111111111111111
5j		11	11111111	11111111111111	111111111111111111111111
6			111	11111111111111	111111111111111111111111
7		1		11111111111111	11111111111111111111111111
8				11111111111111111111	1111111111111111111111111111
9			111	11111111111111	111111111111111111111111
10					

Results of Evaluation of Training the Trainers Programme

- Training programme was excellent but it should be for a longer duration
- More emphasize should be given on practical sessions
- More tools/ machines should be provided to learn their use in better way
- These programmes are very useful. Similar workshops should be organized at different levels
- The training should be spread throughout the country
- All the technical training centers should be provided these machines/ equipments for better learning of new generation
- These machines/ equipments should be easily available
- Course structure should be further simpler
- Short repair maintenance leaflet should be distributed



ANNEX A- 8

