Train-the-Trainers Workshop on Good Practices in Refrigeration

Technology, Industry and Economics

Saint Kitts and Nevis, 24-28 May 1999
WORKSHOP REPORT

Train-the-Trainers Workshop on Good Practices in Refrigeration

St Kitts and Nevis

Organized by:

United Nations Environment Programme and the Ministry of Tourism, Culture and Environment of St Kitts and Nevis

Funded under the Multilateral Fund for the Implementation of the Montreal Protocol

UNEP TIE OzonAction Programme
# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Executive Summary</td>
<td>3</td>
</tr>
<tr>
<td>1. Background</td>
<td>4</td>
</tr>
<tr>
<td>2. Objectives</td>
<td>5</td>
</tr>
<tr>
<td>3. Expected Results</td>
<td>6</td>
</tr>
<tr>
<td>4. Participants</td>
<td>6</td>
</tr>
<tr>
<td>5. Methodology</td>
<td>6</td>
</tr>
<tr>
<td>6. Content</td>
<td>7</td>
</tr>
<tr>
<td>7. Results, Conclusions, Recommendations and Lessons Learned</td>
<td>8</td>
</tr>
<tr>
<td>8. Follow-up Action Plan</td>
<td>9</td>
</tr>
<tr>
<td>9. Evaluation by Participants</td>
<td>9</td>
</tr>
<tr>
<td>10. Annexes</td>
<td>11</td>
</tr>
<tr>
<td>Annex 10.1 Agenda</td>
<td>12</td>
</tr>
<tr>
<td>Annex 10.2 List of Participants</td>
<td>14</td>
</tr>
<tr>
<td>Annex 10.3 List of Trainers/Speakers</td>
<td>17</td>
</tr>
<tr>
<td>Annex 10.4 Workshop Recommendations</td>
<td>18</td>
</tr>
<tr>
<td>Annex 10.5 Evaluation by Participants</td>
<td>19</td>
</tr>
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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 CFC consumption in the refrigeration servicing sector in St Kitts & Nevis. Such approach is defined in the Refrigerant Management Plan (RMP) of St Kitts & Nevis, which has been approved by the Executive Committee of the Multilateral Fund to be jointly implemented by Environment Canada and UNEP.

The RMP of St Kitts & Nevis consists of three main elements, (1) the training programme on good practices in refrigeration, (2) the training programme on control and monitoring of ODS imports and exports and (3) the R&R programme.

The main objective of the training programme for refrigeration technicians is to reduce the CFC consumption in the refrigeration and air-conditioning sector in St Kitts & Nevis 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 service technicians in the refrigeration and air-conditioning sector in St Kitts & Nevis.

The train-the-trainers workshop in St Kitts & Nevis is the fifth workshop of its kind in the Caribbean region as part of a national RMP. The first workshops were held in St Lucia and in Guyana in September 1998 and in Trinidad & Tobago and the Bahamas in November 1998.

During the opening session, the Minister of Tourism, Culture & Environment, Honourable G A Dwyer ASTGAPHAN, expressed the commitment of St Kitts & Nevis to comply with the provisions and phase-out schedules of the Montreal Protocol and its amendments during the opening speech of the train-the-trainers workshop. He also indicated that he would like to see a total phase out of CFCs by 2005 thus exceeding the original date of 2010. St Kitts & Nevis is one of the 12 Parties to the Montreal Protocol which have already ratified the Montreal Amendment.

During the closing session, the Permanent Secretary of the Ministry of Tourism, Culture & Environment, Mrs Hilary Wattley, encouraged the trained trainers to pass on the gained expertise to their colleagues and to be part of the solution for ozone layer protection. The refrigeration technicians should stay in contact with the Ministry and recommend appropriate actions to successfully implement the RMP of St Kitts & Nevis.

The UNEP representative Mr Halvart Koeppen emphasised that the train-the-trainers course is not only a technical training but need to be seen in the context of the RMP of St Kitts & Nevis and in the global context of the Montreal Protocol. He also explained the background of the Montreal Protocol, the Multilateral Fund, the Implementing Agencies, the phaseout schedules for different ozone depleting substances and that ozone depletion is a long-term problem. Even if all control measures of the Montreal Protocol and its amendments will be complied, the recovery of the ozone layer is expected after 2050 and the incidences of skin cancer will not be reduced to today’s level before 2100. They may peak in 2060.
Also the interim Ozone Officer Ms June Hughes and the international consultant Mr. Ron Verch welcomed the workshop participants and the invited guests.

The opening and closing sessions were well covered by the media (TV and newspapers) and will contribute to raise the awareness concerning ozone depletion issues in the general public.

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

During the train-the-trainers workshop 20 professionals from industry, government and training institutes were trained on good practices in refrigeration. The workshop included lectures 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, HFC and non-fluorocarbon refrigerants, R&R equipment and preventive maintenance practices. Lectures on retrofitting and envisioned future technological development on refrigeration sector were also included. Hands-on demonstrations with R&R 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.

Since the R&R programme will not be implemented before the import/export licensing system for ozone-depleting substances is in place and not all technicians/workshop will receive a recovery machine, the consultant Mr Ron Verch explained how to assemble recovery equipment for those who wish to use such equipment already now.

During the first workshop day, the Ozone Officer Ms June Hughes presented the RMP of St Kitts & Nevis to the participants and raised several issues for discussion. During the last day of the workshop, the participants discussed details of the train-the-technicians phase and the further implementation of the RMP.

The workshop participants agreed on a set of recommendations including the set-up of a duty-free import scheme for R&R equipment, the set-up of a certification scheme for technicians and wholesalers, the import ban of CFC-11 refrigerant, the import ban of CFC-based equipment and vehicles, the adoption of good servicing practices, the establishment of a trade register and the development of a solution for the disposal/destruction problem at regional level (see Annex 10.4).

After the successful completion of the workshop, all participants passed a written examination. A participation certificate from the Government of St Kitts & Nevis and the Canadian Heating, Refrigeration and Air-conditioning Institute was handed over to the participants during the closing ceremony. The training equipment was handed over to the Ministry of Tourism, Culture & Environment to be used during the train-the-technicians phase of the programme. The Clarence Fitzroy Bryant College, in co-operation with the
workshop participants and the National Ozone Unit expected to organise the training of the remaining service technicians in St Kitts and in Nevis.

1. Background

In general, the most important sector in developing countries in which ozone-depleting substances are used is the refrigeration sector, predominantly for the servicing of CFC-containing equipment. Yet, poor servicing procedures such as flushing and venting often lead to the release of significant quantities of CFCs directly into the atmosphere.

In 1995, St Kitts & Nevis consumed approximately 5 ODP tonnes of ozone-depleting substances (ODS) in the refrigeration and air-conditioning sector.

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, R&R 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.

St Kitts & Nevis have approximately 50 service technicians operating in the refrigeration and air-conditioning sector. Most of the technicians received formal training in the Clarence Fitzroy Bryant College. Further training is often based on “experience” or “training on the job”. In addition, self-taught entrepreneurs from the informal sector are known to operate.

An abrupt non-availability of CFC refrigerants in the future may affect the ability of industries to perform and reduce the earnings of the country. 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. Containment practices such as R&R are expected to ease the economic consequences of the phase-out.

Therefore, training on good practices in refrigeration and an effective R&R programme combined with prudent retrofitting and timely replacement are part of the overall phase-out strategy. They will assist St Kitts & Nevis in meeting first control measures under the Montreal Protocol such as the freeze in consumption of Annex A CFCs in 1999.

2. Objectives

The main objective of this train-the-trainers workshop was to reduce the CFC consumption in the refrigeration and air-conditioning sector in St Kitts & Nevis and to assist the country to comply with the phase-out schedule 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 containment as well as the concept of Refrigerant Management Plans.
• Introducing and demonstrating procedures that eliminate refrigerant emissions during preventive and unscheduled maintenance including R&R.
• Disseminating information on CFC free technologies available today and retrofitting of existing equipment.
• 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.

3. Expected Results

The long term 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. More specifically, the main expected results are the following:

• Raised awareness in the general public regarding the harmful effects of ozone layer depletion through reporting in the media.
• Minimisation and elimination of uncontrolled emissions of ozone depleting refrigerants through better maintenance practices leak prevention and CFC R&R through training of refrigeration service technicians.
• Elimination of venting of CFC during purging and flushing.
• Increased use of non-CFC equipment and technology and non-CFC coolants.
• Reduction in CFC consumption once prudent retrofitting and replacement of refrigeration and air-conditioning equipment begins.

Technical Clarence Fitzroy Bryant College in St Kitts and other training institutions are expected to incorporate a Montreal Protocol related training module on good practices in refrigeration is in their normal curricula. This would ensure that future technicians would not require re-training on this aspect.

4. Participants

In total, 20 refrigeration technicians participated in the train-the-trainers workshop. All participants had a strong professional background in the refrigeration sector and were representing major industry companies and service workshops (15), local training institutes (3), Government (1) and supply companies (1). The list of participants is attached as Annex 10.2.
Participants were coming from St Kitts (13) and Nevis (7).

The instructor for the workshop was Mr. Ron VERCH of HRAI and the UNEP representative was Mr. Halvart KOEPPEN of the OzonAction Programme in Paris (see Annex 10.3)

The interim Ozone Officer Ms June Hughes of the Ministry of Tourism, Culture and Environment was responsible for the local organisation of the workshop.

5. Methodology

Appropriate training on good practices in refrigeration including containment, recovery, recycling, leak detection, repair, preventive maintenance, retrofitting and new technologies is crucial in order to run existing equipment until the end of its economic life. This should help reduce the emissions of ODS, and achieve the planned phase-out in a co-ordinated, planned and cost-effective manner.

The five-day training used the train-the-trainers approach, where in a first phase a number of trainers were trained on good practices in refrigeration. The workshop consisted of both theoretical presentations and practical “hands-on” demonstrations. This will enable the trained trainers to incorporate this information in the training agendas for their newly graduating students and to conduct training courses to upgrade the existing refrigeration technicians. The trained trainers are expected to train the remaining service technicians in the refrigeration and air-conditioning sector in St Kitts & Nevis.

The subsequent training of the remaining refrigeration technicians will raise the awareness regarding ozone depletion issues, emission reduction of CFC refrigerants, and regarding new ozone friendly refrigerants. There will be several years during which CFC and non-CFC based equipment will be operated side by side in St Kitts & Nevis. The training will ensure that the technicians understand the different requirements for each type of refrigerant used.

UNEP’s “Training Manual on Good Practices in Refrigeration” was used as resource document. The “Guidebook for Implementation of Codes of Good Practice in the Refrigeration Sector” aims to help the National Ozone Unit to initiate the establishment of a national code of good practice in the refrigeration and air-conditioning sector. A “Trainer’s Presentation Guide” has been prepared by HRAI, based on the above training materials and taking into account the specific training needs in St Kitts & Nevis as well as new technology developments. This guide is also to be used as training kit for the train-the-technicians workshops.

6. Content
During the five-day workshop, the participants learned about the importance of ozone layer protection and the harmful effect of an increased UV-B radiation. The training included the related international agreements such as the Montreal Protocol and its amendments and explained the role of UNEP in the implementation of such treaties. The lecture reviewed the basic principles of refrigeration and responded to the question on how to service refrigeration and air-conditioning equipment in order to avoid refrigerant emissions and which alternative refrigerants could be used for retrofitting. The course covered the different types of CFCs, HCFC, HFC and non-flour refrigerants and informed about preventive maintenance programmes, record-keeping and safety issues.

During the hands-on sessions, the participants practised R&R of refrigerants from refrigerators and from stationary and mobile air-conditioning systems and did a retrofitting exercise.

Time was also allocated for discussions among the participants concerning the implementation of St Kitts & Nevis’ Refrigerant Management Plan and the train-the-technicians phase.

After the successful completion of the workshop, all participants received their participation certificate from the Government. Eighteen participants attended and passed a written examination and received the HRAI certificate. The training equipment was handed over to the Ministry of Tourism, Culture & Environment to be used for the train-the-technicians phase.

The Clarence Fitzroy Bryant College and other local training institutes, in co-operation with the workshop participants and the National Ozone Unit are now expected to train the remaining service technicians in St Kitts & Nevis on good practices in refrigeration.

The workshop agenda is attached as Annex 10.1.

7. Results, Conclusions, Recommendations and Lessons Learned

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

- Training of 20 key service technicians including 3 professional instructors on good practices in refrigeration including R&R of refrigerants.
- Distribution of two certificates to the participant – a participation certificate of the Government of St Kitts & Nevis and the HRAI certificate after passing the examination (see Annex 2).
- Exchange of information and experiences between the participants and development of a network of personal contacts.
- Trainer’s Presentation Guide to be used for the further training of technicians.
- Detailed workshop recommendations by the participants (see Annex 10.4).
• Provision and hand-over of training equipment to the Ministry of Tourism, Culture and Environment to be used during the train-the-technicians phase of the programme.

The following conclusions, recommendations and lessons learned could be drawn from the train-the-trainers workshop:

• The local organisation was excellent. The classroom as well as the refrigeration workshop for the practical hands-on sessions was appropriate.
• The training equipment was similar to the equipment, which UNEP had previously purchased for the training programmes in the Bahamas, and in St Vincent & the Grenadines. It was complete and appropriate.
• All training documents from HRAI and UNEP were available for the training. Additional documents were display only and could be ordered in case of interest.
• Domestic refrigeration and air-conditioning appliances including air-conditioned vehicles were available for the practical hands-on sessions.
• A cocktail reception was held at the end of the first day, which was a good opportunity to get to know each of the participants.
• Lunch for the participants was organised at the training institute, which saved time and avoided local transport.
• The event was well covered by the media. However, in addition to the opening and closing ceremony, the media should also be invited to attend the non-technical sessions on “Environmental Effects” and on the “Refrigerant Management Plan” to better understand the issues.
• During the preparatory meeting with the customs department concerning the training programme for customs officers, which is part of the RMP, it became evident that they are not fully aware of the need for ozone layer protection and to control the imports/exports of CFC refrigerants and appliances. Therefore, they should be invited to attend the opening sessions as well the sessions on Environmental Impacts” and the “Refrigerant Management Plan”.
• In order to draft the workshop recommendations, it worked out well to use a combined strategy, requesting the participants to prepare their written recommendations as well as conducting small group discussions and individual interviews (Annex 10.4).

8. Follow-up Action Plan

This training programme is part of the RMP for St Kitts & Nevis. 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 and which will ensure the phase-out of CFC in the refrigeration sector.

It also includes the consequent training of the remaining technicians operating in the refrigeration air-conditioning sector.
The NOU will establish a control and monitoring mechanism to ensure that the objectives of the programme are met and will produce two follow-up reports on the status of implementation and the achievements of the training-the-technicians programme 12 and 24 months after completion of the train-the-trainers workshop.

The National Ozone Action Unit and UNEP 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 stakeholders and politicians (see Annex 10.4).

9. Evaluation by Participants

The overall evaluation of the train-the-trainers workshop by the participants was very good. 16 out of 20 participants (80%) returned their evaluation questionnaires - 12 out of 16 participants (75%) evaluated the workshop as “excellent”, 4 participants (25%) as “good”.

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The questions of the evaluation questionnaire and the graphical analysis of the completed questionnaires are included in Annex 10.5. Several participants commented that the time allocation should be increased, especially for the practical hands-on sessions with the R&R equipment and that refresher courses should be organised in the future. Further comments from the evaluation questionnaires include (but to not necessarily represent the view of the UNEP representative):
• “The training course was a success and educated me more about the harmful effects that the CFC refrigerants cause to the environment.”
• “The course was very productive. The time was limited but the package was well put together. Similar courses can be improved by more hands-on and practical training.”
• “The course was too short to cover everything.”
• “The course was a very high level technical course. It informed on less costly methods of carrying out refrigeration practices. It also proved the refrigeration business could be environmentally safe.”
• “This course was very beneficial. More training equipment should be available.”
• “The quality of the course was very important for this island. I am going to work along with the Environment Department to make sure that we get rid of the CFCs.”
• “More time for workshop practices and continued training is needed.”
• “The hands-on sessions using the R&R equipment can be longer because of the number of participants involved.”
• “Not much improvement can take place.”
• “The training has broadened my scope of knowledge in relation to refrigeration. I was exposed to new and up-to-date technology, which has enhanced my methods of work presentation to students.”
• “The course provided me with the hands-on experience on recovery and ozone protection. The course was of a very high quality.”

10. Annexes

Annex 10.1 Agenda
Annex 10.2 List of Participants
Annex 10.3 List of Trainers/Speakers
Annex 10.4 Workshop Recommendations
Annex 10.5 Evaluation by Participants
ANNEX 10.1 Agenda

Lead Consultant: Mr. Ron Verch
Heating Refrigeration and Air-conditioning Institute of Canada (HRAI)

Monday, 24 May 1999

08:00 Registration of participants

Opening Ceremony – Ocean Terrace Hotel

08:30 Opening session

Welcome address
Ms. June HUGHES, Ozone Officer, Department of Environment

UNEP TIE’s OzonAction Programme and the Montreal Protocol
Mr. Halvart KOEPPEN, UNEP Representative

Workshop address
Mr. Ron VERCH, International Consultant HRAI

Workshop opening address
The Honourable G.A. Dwyer ASTAPHAN, Minister of Tourism, Culture and Environment

10:00 Workshop overview
Mr. Ron VERCH, HRAI Instructor

12:00 St Kitts & Nevis Country Programme to phase-out ozone-depleting substances
Ms. June Hughes, Ozone Officer, Department of the Environment

12:30 Lunch

13:30 Review of basic principals of refrigeration

17:00 Closure of the day

19:30 Cocktail - Bird Rock Beach Hotel

Tuesday, 24 May 1999
08:00  Refrigerants CFCs, HCFCs and HFCs
11:30  General trade safety
12:30  Lunch
13:30  Operation of trade specialty tools
15:30  Methods of refrigerant recovery
17:00  Closure of the day

Wednesday, 26 May 1999

08:00  Operation and use of passive and active recovery devices
10:00  Good practices in refrigeration
12:30  Lunch
13:30  Good practices in refrigeration
17:00  Closure of the day

Thursday, 27 May 1999

08:00  Practical session on good practices
12:30  Lunch
13:30  Retrofitting to alternative refrigerants
15:30  Practical session on good practices
17:00  Closure of the day

Friday, 28 May 1999

08:00  Record keeping and creating maintenance programmes
Train-the-Trainers Workshop on Good Practices in Refrigeration
St Kitts and Nevis 24 – 28 May 1999

09:00 Factors that affect decisions for replacement or retrofitting of existing equipment

10:30 Review of weeks activities

11:00 Examination

12:00 Evaluation of workshop

12:30 Lunch

13:30 Discussion of workshop recommendations

14:30 Discussion on train-the-technicians programme

15:30 Closing Session - Bird Rock Beach Hotel

Closing remarks and hand-over of the training equipment to the Ministry of Tourism, Culture & Environment
Mr. Halvart KOEPPEN, UNEP Representative

Closing statement
Mrs. Hilary WATTLER, Permanent Secretary, Ministry of Tourism, Culture and Environment

Distribution of certificates
Mrs. Hilary WATTLER, Permanent Secretary, Ministry of Tourism, Culture and Environment
Mr. Ron VERCH, HRAI Instructor

Closure of the workshop
Ms. June HUGHES, Ozone Officer, Department of the Environment
ANNEX 10.2  List of Participants

Mr. Kevin Adams  
Service Technician  
St Kitts Refrigeration Services  
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Mr. Bevis Brooks  
Service Technician  
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Mr. Mark Caesar  
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Mr. Terry Hanley  
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Mr. Laurie Mason  
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Train-the-Trainers Workshop on Good Practices in Refrigeration
St Kitts and Nevis 24 – 28 May 1999

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Mr. Gregory Wattley
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Nevis
Tel: 469-1111

Mr. William Wilkinson
Technician
T D C Ltd
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ANNEX 10.3  List of Trainers / Speakers

ST KITTs & NEVIS OZONE UNIT

Ms. June Hughes
Ozone Officer
Department of Environment
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UNITED NATIONS ENVIRONMENT PROGRAMME

Mr. Halvart Koeppen
Training Officer
OzonAction Programme
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HEATING; REFRIGERATION AND AIR-CONDITIONING INSTITUTE (HRAI)

Mr. Ron Verch
TQIP Associate Assistant
Instructor Refrigeration HVAC Department
British Columbia Institute of Technology
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ANNEX 10.4  Workshop Recommendations

The following workshop recommendations were discussed and approved by all participants during the last workshop day.

1. Government to set up a duty-free scheme for the import of R&R equipment until the year 2005 to promote HFC technology and to offset the currently higher cost.

2. Government to set up a certification scheme for technicians or wholesalers who are responsible to purchase R&R equipment and to import/sell/purchase/handle refrigerants.

3. Government to immediately ban the import of CFC-11 which is mostly used for cleaning purposes and which is not needed.

4. Government to ban the import of CFC equipment.

5. Adopt good servicing practices, e.g. in form of a code of good practice, requiring refrigeration technicians:
   - Not to vent or flush with CFC refrigerants
   - To remove refrigerants before disposal/scraping of vehicles, refrigerators or other appliances (solid waste management should be enforced)
   - To intermediately store mixed/contaminated refrigerants until final disposal
   - To return used/contaminated vacuum pump oil to the wholesalers
   - Encourage the use of long-term refrigerants and avoid the use of interim refrigerants
   - Etc.

6. Government to set up a public awareness scheme through the media to inform the public about the importance of ozone layer protection and how ozone layer protections will affect the country and its refrigeration technicians/wholesalers.

7. National Ozone Unit and refrigeration technicians to put a small committee in place to define the criteria for the use and distribution of the R&R equipment received by the Multilateral Fund for the Implementation of the Montreal Protocol.

8. Owners and refrigeration technicians should up-date their skills on a regular basis, e.g. through evening courses or an refrigeration association.

9. Importers, wholesalers and technicians should be accountable for refrigerant imports and establish a trade register of their customers and keep track of the amount of imported refrigerants. Refrigerant should only be sold to certified technicians/customers and the data of the trade register should be made available to the National Ozone Unit.
10. The solution for the disposal/destruction problem of contaminated refrigerants should be developed at regional level.
Train-the-Trainers Workshop on Good Practices in Refrigeration
St Kitts and Nevis 24 – 28 May 1999
ANNEX 10.5   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. The rating “1” stands for poor performance and the rating “5” for excellent performance represents the poor and 5 the best possible ratings.

1. What is your overall evaluation of the course ?

2. Did the course provide the information you expected ?

2. 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 issues
   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 use of passive and active recovery devices
   g) Good refrigeration practices
   h) Retrofitting to alternative refrigerants
   i) Creating preventive maintenance programs and record-keeping
   j) RMP concept at company level.

6. Has the recovery issue been adequately dealt with in the practical hands-on sessions ?

7. Did the training course 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 ?
Workshop Evaluation St. Kitts & Nevis
(16 of 20 questionnaires returned)

1=POOR
2
3
4
5=EXCELLENT