Train-the-Trainers Workshop on Good Practices in Refrigeration

Antigua, 31 May - 4 June 1999
WORKSHOP REPORT

Train-the-Trainers Workshop on Good Practices in Refrigeration

Antigua & Barbuda and Dominica

Organized by:

United Nations Environment Programme and the
Ministry of Commerce, Industry and Business Development of Antigua & Barbuda and the
Ministry of Agriculture and the Environment of Dominica in co-operation with Environment
Canada

Funded under the Multilateral Fund for the Implementation of the Montreal Protocol
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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 Antigua & Barbuda and in Dominica. Such approach is defined in the Refrigerant Management Plans (RMP) of Antigua & Barbuda and Dominica, which have been approved by the Executive Committee of the Multilateral Fund to be jointly implemented by Environment Canada and UNEP in Antigua & Barbuda and by UNEP in Dominica.

The objective of the training programme is to reduce the CFC consumption in the refrigeration and air-conditioning sector and to assist the countries 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.

The train-the-trainers workshop in Antigua & Barbuda and Dominica is the sixth workshop of its kind in the Caribbean region as part of a national Refrigerant Management Plan. The first workshops were held in St Lucia and in Guyana in September 1998 and in Trinidad & Tobago and the Bahamas in November 1998. In May/June 1999, workshops were held in St Kitts, Jamaica and St Vincent & the Grenadines.

The Ozone Officer Mr Dunstan SORHAINDO welcomed the participants on the behalf of the Minister of Commerce, Industry and Business Development and expressed the commitment of Antigua & Barbuda to comply with the provisions and phase-out schedules of the Montreal Protocol and its amendments. The Director of the Bureau of Standards, Ms. Ms. Dianne LALLA-RODRIGUEZ opened the workshop.

Antigua & Barbuda ratified all amendments to the Montreal Protocol except the most recent one, which was ratified by 12 out of 168 countries at the time of the workshop. Further speakers included the lead consultant Mr. Ron VERCH of the Heating Refrigeration and Air-conditioning Institute of Canada and the UNEP representative Mr. Halvart KOEPPEN.

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 manner without causing an unnecessary burden to the consumers.

During the train-the-trainers workshop 25 professionals from industry, government and technical training institutes were trained on good practices in refrigeration, including 6 participants from Dominica. 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, recovery & recycling equipment, retrofitting and preventive maintenance practices. Lectures on retrofitting and envisioned future technological development on refrigeration sector were also included. Hands-on demonstrations with recovery & 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. A site visit to the Rex Resort was organised with chillers in operation.

During the last day of the workshop, the participants discussed details of the train-the-technicians phase and the further implementation of the RMP, a discussion on strategic planning was also presented. They agreed on a set of workshop recommendations (see Annex 10.4).

After the successful completion of the workshop, the participants passed a written examination and received two certificates, a participation certificate from the Government of Antigua & Barbuda and a certificate of the Canadian Heating, Refrigeration and Air-conditioning Institute. The Ozone Officer Mr. Dunstan SORHAINDO handed over the training equipment to the local training college to be used during phase II of the training programme. The local training institute, in co-operation with the workshop participants and the National Ozone Unit of the Ministry of Commerce, Industry and Business Development are now expected to train the remaining service technicians in Antigua & Barbuda.

A similar train-the-technicians phase will be conducted in Dominica, involving the trained trainers from Dominica who participated in the workshop, and using the training equipment separately supplied to Dominica.

1. Background

The train-the-trainers programme on good practices in refrigeration is part of a comprehensive approach to reduce the CFC consumption in the refrigeration servicing sector. Such approach is defined in the Refrigerant Management Plans (RMP) of Antigua & Barbuda and Dominica.

The training programme on good practices in refrigeration and the training programme for customs officer are part of these RMPs. The RMPs of both countries were approved at the 26th Meeting of the Executive Committee, that of Dominica for implementation by UNEP and that of Antigua & Barbuda for joint implementation by Environment Canada and UNEP. UNEP co-ordinates the implementation of both training programmes in Antigua & Barbuda as part of their RMP.

The Government of Antigua & Barbuda hosted the train-the-trainers workshop on good practices in refrigeration in which refrigeration technicians from Antigua & Barbuda as well as from Dominica participated.

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 1996, Antigua and Barbuda consumed 10.5 ODP tonnes of ozone-depleting substances (ODS) in the refrigeration and air-conditioning sector which represents approximately 99% of all ODS consumed in the country. Dominica consumed 1.4 ODP tonnes in 1997 representing 100% of its total consumption.

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

Antigua & Barbuda have about 120 service technicians operating in the refrigeration and air-conditioning sector and Dominica has about 75. Many technicians received formal training in a technical training centre. However, a huge number of technicians is working in the informal sector and their training is based on “experience” or “training on the job”.

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

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

2. Objectives

The main objective of this train-the-trainers workshop is to reduce the CFC consumption in the refrigeration and air-conditioning sector in Antigua & Barbuda and Dominica 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 recovery and recycling.
- 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 recovery and recycling 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 training institutes in Antigua & Barbuda and in Dominica are expected to incorporate a Montreal Protocol related training module on good practices in refrigeration in their normal curricula. This will ensure that future technicians would not need re-training on this aspect.

4. Participants

In total, 25 refrigeration technicians participated in the train-the-trainers workshop, including 6 participants from Dominica. The participants had a strong professional background in the refrigeration sector and were coming from government, major industry companies and service workshops (20 participants) as well as instructors from local training institutes (4 participants). The list of participants is attached as Annex 10.2.

The instructor for the workshop was Mr. Ron VERCH of HRAI (Heating, Refrigeration and Air-conditioning Institute of Canada) and the UNEP representative was Mr. Halvart KOEPPEN of the UNEP TIE OzonAction Programme in Paris (see Annex 10.3).

The Ozone Officer Mr Dunstan SORHAINDO of the Ministry for Commerce, Industry and Business Development was responsible for the local organisation.
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 approach will 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. Participants had the opportunity to visit chiller plants in operation at Rex Resort.

The trained trainers are expected to train the remaining service technicians in the refrigeration and air-conditioning sector in Antigua & Barbuda and in Dominica. 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 equipment will be operated side by side. The training will ensure that the technicians understand the difference and that servicing will be done properly.

The participating training institutes are expected to incorporate this information in the training agendas for their newly graduating students.

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” may 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 Antigua & Barbuda and in Dominica 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. They covered the different types of CFC, HCFC,
HFC and non-fluorocarbon refrigerants and informed about preventive maintenance programmes, record-keeping and safety issues.

During the hands-on sessions, the participants practised the recovery and stationary and mobile air-conditioning systems and did a retrofitting exercise. The practical sessions were located at the technical workshop of Roberts Construction who offered his facility for this portion of the training.

During a site visit to one of the major hotels in Antigua & Barbuda, the Rex Resort as well as the Royal Antigua Hotel, interested participants could see chiller plants in operation and discuss its operation with technical staff. The systems were running with HCFC-22.

Time was also allocated for discussions among the participants concerning the implementation of the Refrigerant Management Plans and the train-the-technicians phases in Antigua & Barbuda and in Dominica.

After the successful completion of the workshop, all participants passed a written examination and received two certificates, a participation certificate from the Government of Antigua & Barbuda and a certificate of the Canadian Heating, Refrigeration and Air-conditioning Institute.

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 25 trainers and key service technicians on good practices in refrigeration including recovery and recycling of refrigerants.
- Distribution of two certificates to each participant – a participation certificate of the Government of Antigua & Barbuda and the HRAI certificate after passing the examination (see Annex 2).
- Site visits with chillers operating with HCFC-22
- 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).

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

- The local organisation was excellent. The classroom was located in the Royal Antigua Hotel and well equipped and air-conditioned.
• The practical hands-on sessions were held at the technical workshop of Roberts Construction where all necessary tools were available. It is a viable option to conduct the practical sessions at a private company in case the venue can not provide for a technical workshop.
• Lunch for the participants was organised at the hotel which saved time and avoided local transport.
• A cocktail was held at the end of the first workshop day and allowed the participants to get into contact. It also included several speeches and offered the opportunity to meet several important stakeholders.
• The training equipment was received complete and appropriate.

The workshop participants agreed on a set of separate workshop recommendations (see Annex 10.4.).

8. Follow-up Action Plan

This training programme is part of the RMPs for Antigua & Barbuda and for Dominica. As such it will be accompanied by other training and policy related activities as defined in the RMPs which will be co-ordinated by the National Ozone Units and which will ensure the phase-out of CFCs in the refrigeration sector.

The NOUs will establish a control and monitoring mechanism in their respective countries to ensure that the objectives of the programme are met and will produce follow-up reports on the status of implementation and the achievements of the training-the-technicians programmes during and after completion of the training programmes.

The National Ozone Action Units 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. 23 out of 25 participants (92%) returned their evaluation questionnaires - 19 out of 23 participants (83%) evaluated the workshop as “excellent”, 4 participants (17%) 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 trainer was excellent and the course of high quality.
- The time allocation for practical and theoretical sessions should be extended.
- More R&R equipment and refrigeration appliances should be available during the practical hands-on sessions.
- Some of the training materials should be made available on diskette or CD.
- Refresher courses should be held on an annual basis to update technicians on new developments concerning technologies and the environment.
- Future courses should address participants at different skill levels.
- If possible, female technicians should participate in the course.
- There should have been more wholesalers and retailers as well as female participants in the course.
- The course raised awareness and informed about ozone layer depletion.
- Similar courses should be more advertised.
- Awareness concerning ozone layer protection should be raised at school level.
- Course participants should receive the course materials beforehand in order to get acquainted with the subject.

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

08:00  Registration of participants

08:30  Opening session

UNEP TIE’s OzonAction Programme and the Montreal Protocol
Mr. Halvart KOEPPE, UNEP TIE representative

Welcome address
Mr. Dunstan Sorhaindo, Ozone Officer, Ministry of Commerce, Industry and Business Development

Welcome address
PRIVATE  Mr. Ron Verch, Lead Consultant, HRAI Canada

Workshop opening
Ms. Dianne LALLA-RODRIGUEZ, Director of the Bureau of Standards {tc "Government Official”}

10:00  Environmental issues

11:30  Refrigerant Management Plan at national level to phase out ozone-depleting substances (ODS) and the train-the-technicians phase
Mr. Dunstan Sorhaindo, Ozone Officer, Ministry of Commerce, Industry and Business Development

12:30  Lunch

13:30  Review of basic principles of refrigeration

16:50  Review of the day

17:00  Closure of the day

18:30  Cocktail at Royal Antigüan Hotel
Tuesday

08:00 Site visit at Rex Resort: chiller plants in operation
09:00 CFC/HCFC/HFC/HC refrigerants and technologies
11:30 General trade safety
12:30 Lunch
13:30 Participants presentation
14:00 Operation and use of trade specialty tools (hands-on session)
15:30 Methods of refrigerant recovery
16:50 Review of the day
17:00 Closure of the day

Wednesday

08:00 Operation and use of passive and active recovery devices (hands-on session)
12:30 Lunch
13:30 Good practices in refrigeration (classroom and hands-on session)
17:00 Closure of the day

Thursday

08:00 Good practices in refrigeration (hands-on session)
12:30 Lunch
13:30 Retrofitting to alternative refrigerants (hands-on session)
15:30 Creating preventive maintenance programmes and record keeping
16:50 Review of the day
17:00 Closure of the day

**Friday**

08:00 RMP concept at company level

08:30 Refrigeration associations and certification schemes in Canada

09:00 Wrap-up session (questions & answers)

11:00 Examination

12:30 Lunch

13:30 Adoption of the workshop recommendations

*Mr. Halvart KOEPPEN, UNEP TIE representative*

Discussion on train-the-technicians programme

*Mr. Dunstan Sorhaindo, Ozone Officer, Ministry of Commerce, Industry and Business Development*

Evaluation of the workshop

*Workshop participants*

15:30 Closing session

*{tc \$ 5 " HRAI instructor"}Closing statement

*Mr. Halvart KOEPPEN, UNEP TIE representative*

Closing statement and hand-over of equipment

*Mr. Dunstan Sorhaindo, Ozone Officer, Ministry of Commerce, Industry and Business Development*

Closing statement

*{PRIVATE }Mr. Ron Verch, Lead Consultant, HRAI Canada*

Distribution of certificates

17:00 Closure of the workshop
ANNEX 10.2    List of Participants

<table>
<thead>
<tr>
<th>PARTICIPANTS FROM ANTIGUA</th>
<th>Tel:</th>
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<tbody>
<tr>
<td>Mr. Randy Aska</td>
<td>461-3633</td>
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<tr>
<td>Byett Street</td>
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<tr>
<td>Villa Area</td>
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<tr>
<td>St John’s, Antigua</td>
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<tr>
<td>Mr. Irvin Baptiste</td>
<td>461-2863 or 462-0256</td>
</tr>
<tr>
<td>Golden Grove</td>
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<tr>
<td>St John’s, Antigua</td>
<td>560-2132 or 462-3733</td>
</tr>
<tr>
<td>Mr. Cesil Gonsalves Barriero</td>
<td>461-2661</td>
</tr>
<tr>
<td>Bendals Road</td>
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<tr>
<td>St John’s, Antigua</td>
<td>460-7070</td>
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<tr>
<td>Mr. Oswald Gonsalves Barriero</td>
<td>462-6596</td>
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<tr>
<td>C/o Carlton Albert</td>
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<tr>
<td>Mr. Peter Benjamin</td>
<td>460-5969</td>
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<tr>
<td>Upper Tindale Road</td>
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<tr>
<td>St John’s, Antigua</td>
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<tr>
<td>Mr. Philmore Benjamin</td>
<td>463-1280 or 462-3121</td>
</tr>
<tr>
<td>Tanner Street</td>
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<tr>
<td>St John’s, Antigua</td>
<td>462-3479</td>
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<tr>
<td>Mr. Felix B Douglas</td>
<td>460-1546 or 462-0256</td>
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<tr>
<td>27 Steven Street</td>
<td></td>
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<tr>
<td>Villa Area</td>
<td>462-0271</td>
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<td>St John’s, Antigua</td>
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</table>
Email: mailed@candw.ag

Mr. Winston Michael
Creekside
St John’s, Antigua
Tel: 461-4754
Fax: 462-0890

Mr. Radcliffe Rawlins
Fitzroy Road
St Johnstoun’s Village, Antigua
Tel: 461-0110 or 461-1878

Mr Ernie Rogers
Turtle Bay
English Harbour, Antigua
Tel: 464-1712 or 460-1690
Email: diegodog@hotmail.com

Mr. Barrymore Simpson
Potters Village
P.O. Box 1462
St John’s, Antigua
Tel: 462-3473
Fax: 462-3473
Email: techcare@candw.ag

Mr. Vince Thomas
Parham, Antigua
Tel: 460-7762 or 462-1687/4648

Mr. Edward Wilson
Wireless Road
St John’s, Antigua
Tel: 460-5565

PARTICIPANTS FROM DOMINICA

Mr. Swinburne Anselm
Grand Bay
Madouche, Dominica
Tel: 446-3353 or 448-3229

Mr. Reynold Bunche
P.O. Box 1857
Roseau, Dominica
Tel: 449-2529
Tel: 448-2401 ext.3494/96

Mr. Julius George
61 Housing Scheme
Canefield, Dominica
Tel: 449-1431
Email: juligalvin@hotmail.com

Mr. Eddie Andrew Oscar
P.O. Box 2234
78 Victoria Street
Dominica
Tel: 448-3492
Fax: 448-7879

Mr. Curtis Victorin
28 Elliot Avenue
Pottersville
Roseau, Dominica
Tel: 449-6530 or 449-8880

Mr. Earl Williams
13 King Bird Drive
Canefield, Dominica
Tel: 449-2186 or 448-0692
Tel: 448-2401 Ext.3496/94
ANNEX 10.3 List of Trainers & Speakers

NATIONAL OZONE UNITS

Mr. Dunstan Sorhaindo
Ozone Officer / Industrial Commissioner
Ministry for Commerce, Industry and Business Development
Redcliffe Street
St Johns, Antigua, West Indies
Tel: (1-268)4621542
Fax: (1-268)4621625
Email: dsorhaindo@hotmail.com

Mr. Gerard Hill
Ozone Officer
Sustainable Development Council
PO Box 293
Valley Road
Roseau, Dominica, West Indies
Tel: (1-767)4482045 or 4498653
Fax: (1-767) 4485840
Email: sdchill@cwdom.dm

UNITED NATIONS ENVIRONMENT PROGRAMME

Mr. Halvart Koeppen
Training Officer
OzonAction Programme
Tour Mirabeau
39-43, quai André Citroën
75739 Paris Cedex 15, France
Tel: (33-1)44371432
Fax: (33-1)44371474
Email: halvart.koppen@unep.fr
WWW: www.unepie.org/ozonaction/html

HEATING; REFRIGERATION AND AIR-CONDITIONING INSTITUTE (HRAI)

Mr. Ron Verch
TQIP Chief Instructor
Refrigeration HVAC Department
British Columbia Institute of Technology
3700 Willingdon Avenue
B.C. Canada V5G 3H2
Tel: (1-604) 451 - 6861
Fax: (1-604) 439-0426
Email: rverch@bcit.bc.ca
WWW: www.bcit.bc.ca
ANNEX 10.4 Workshop Recommendations

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

1. Government and refrigeration technicians to set up a refrigeration association. Representatives of such associations should be trained, e.g. in the framework of a regional workshop in the Caribbean, on how to set up such associations and how to manage it.

2. Government to set up a duty-free scheme for the import of R&R equipment and HFC refrigerants to promote HFC technology and to offset the currently higher cost. This should not apply to wholesalers. Refrigeration technicians should group together to negotiate better prices.

3. Government to set up a certification scheme for refrigeration technicians allowing them to import/sell/purchase/handle refrigerants. The scheme should be on a mandatory and regulatory basis and implemented either by the technical college or an industry association once created. In the long term, the national schemes should be recognised at regional level.

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

5. Government to ban the import of stationary CFC refrigeration equipment. If vehicles with CFC air-conditioning are imported, retrofitting in the country is mandatory.

6. Government to gradually increase the CFC prices by establishing a licensing system for the import of CFC refrigerants in order to control their import.

7. Government or the refrigeration association once created to provide adequate education and awareness raising among technicians and the general public (TV, radio, posters, newspapers etc).

8. Government and the refrigeration association once created to introduce mandatory codes of good practices in refrigeration as well as regulations calling for recovery of all refrigerants from any type of refrigeration system, and enforce them through field inspectors. Such codes of good practices may require refrigeration technicians:
   - Not to vent or flush with CFC refrigerants
   - To remove refrigerants before disposal/scraping of vehicles, refrigerators or other CFC equipment
   - Any CFC equipment in need of major repair should be retrofitted
   - To intermediately store mixed/contaminated refrigerants until final disposal
• To encourage the use of long-term refrigerants and to avoid the use of interim refrigerants
• To keep the number of alternative refrigerants entering the country to a minimum.
• Etc.

9. Adopt a code book and standards for mechanical refrigeration such as the code book B52-95 of the Canadian Standards Association or other code books.

10. Importers/wholesalers should be accountable for refrigerant imports and establish a trade register of their customers and keep track of the amount of imported refrigerants.

11. A disposal strategy at regional level needs to be developed for contaminated refrigerants. As an example The possibility of a mobile incineration plant for the Caribbean region, based on a ship could be investigated.

12. Ozone Officer and refrigeration association once created to organise follow-up meetings to this workshop and to ensure that all relevant technicians and stakeholders participate.

13. Multilateral Fund Secretariat to request Japan not to export anymore cars equipped with CFC air-conditioning systems to the Caribbean region.

14. If not yet done, Antigua & Barbuda and Dominica should inscribe to the list of the MFS that they do not wish to import any CFC equipment.
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.

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 ANTIGUA & BARBUDA AND DOMINICA
(23 of 25 questionnaires returned)