Train-the-Trainers Workshop on Good Practices in Refrigeration

Technology, Industry and Economics

Kingstown, St Vincent, 14-18 June 1999
WORKSHOP REPORT

Train-the-Trainers Workshop on Good Practices in Refrigeration

St. Vincent & the Grenadines

Organized by:

United Nations Environment Programme and the
Ministry of Health and the Environment of St Vincent & the Grenadines

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 CFC consumption in the refrigeration and air-conditioning servicing sector in St Vincent & the Grenadines. Such approach is defined in the Refrigerant Management Plan (RMP) of St Vincent & the Grenadines, which has been approved by the Executive Committee of the Multilateral Fund to be implemented by UNEP TIE.

UNEP TIE is responsible for the implementation of the training programme on good practices in refrigeration and the implementation of the training programme on control and monitoring of ODS imports and exports for customs officers.

The train-the-trainers workshop in St Vincent & the Grenadines is the eighth workshop of its kind in the Caribbean region as part of a National Refrigerant Management Plan. Similar workshops were held in St Lucia, Guyana, the Bahamas and Trinidad & Tobago in 1998. Workshops were also held in St Kitts & Nevis, in Antigua with the participation of Dominica and in Jamaica in 1999.

The main objective of the training programme is to reduce the CFC consumption in the refrigeration and air-conditioning servicing sector in St Vincent & the Grenadines 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 Vincent & the Grenadines.

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.

Presenters during the opening and closing ceremonies included Minister of Health & the Environment Hon. Dr. St Clair Thomas, the Ozone Officer of St Vincent & the Grenadines Dr. Reynold Murray, the HRAI instructor Mr. Ron Verch and the UNEP TIE representative Mr Halvart Koeppen.

During the train-the-trainers workshop, 20 professionals from industry and service workshops, local training institutes and the public sector including the police force, the coast guard and a hospital were trained on good practices in refrigeration.

The program 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 and preventive maintenance practices. Lectures on retrofitting and future technological developments in the refrigeration sector were also included. Hands-on demonstrations with recovery and recycling equipment, using actual refrigeration units as
well as stationary and mobile air-conditioning systems in need of recharge and maintenance were conducted as part of the training workshop.

During the last day of the workshop, the participants discussed details of the train-the-technicians phase and the further implementation of the RMP. There was also a discussion on strategic planning in regards to equipment replacement or retrofitting to long term substitutes. The participants agreed on a set of detailed workshop recommendations (see Annex 10.4).

After the successful completion of the workshop, all participants passed a written examination and received two certificates, a participation certificate from the Government of St Vincent & the Grenadines and a certificate from the Canadian Heating, Refrigeration and Air-conditioning Institute. The training equipment was handed over to the Ministry of Health & the Environment. The local training institutes, in co-operation with the workshop participants and the NOU are now expected to train the remaining service technicians in St Vincent & the Grenadines on good practices in refrigeration.

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 1996, St Vincent & the Grenadines consumed approximately 6.6 ODP tonnes of ozone-depleting substances (ODS) in the refrigeration and air-conditioning sector, which represents approximately 100% of all ODS consumed in the country.

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

St Vincent & the Grenadines have approximately 100 service technicians operating in the refrigeration and air-conditioning sector. Most of them received formal training in a technical training center. 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 especially in the domestic appliance sub-sector.

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 recovery and recycling are expected to ease the economic consequences of the phase-out.

Therefore, training on good practices in refrigeration combined with prudent retrofitting and timely replacement are part of the overall phase-out strategy. They will assist St Vincent & the Grenadines 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 Vincent & the Grenadines 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 St Vincent & the Grenadines are expected to incorporate a Montreal Protocol related training module on Good Practices in Refrigeration 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 local training institutes (2), major industry and service workshops (13) and the public sector including police force, coast guard and a hospital (5). 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 TIE representative was Mr. Halvart Koeppen of the OzonAction Programme in Paris (see Annex 10.3)

The Ozone Officer Dr. Reynold Murray of the Ministry of Health & the Environment 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 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. The information gained during the workshop should 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 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 Vincent & the Grenadines. The training will ensure that the technicians understand the difference and servicing will be done appropriately.

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 St Vincent & the Grenadines and 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 TIE in the implementation of such treaties. The lectures also 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. Alternative refrigerants were also discussed. In addition proper procedures for refrigerant recovery and recycling was demonstrated to the participants during the practical potion of the workshop as well as retrofitting practices and standards. They also covered preventive maintenance programmes, record-keeping and safety issues.

During the hands-on sessions, the participants practised the 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 Vincent & the Grenadines’s Refrigerant Management Plan and the train-the-technicians phase.

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

The St. Vincent Technical College and other local training institutes, in co-operation with the workshop participants and the NOU are now expected to train the remaining service technicians in St Vincent & the Grenadines on good practices in refrigeration.

The workshop agenda is attached as Annex 10.1.

7. Results and Lessons Learned

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

- Training of 20 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 from the Government of St Vincent & the Grenadines 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).

The following lessons learned could be drawn from the train-the-trainers workshop:

• 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.
• 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. The recommendations from the participants are included as Annex 10.4.

8. Follow-up Action Plan

This training programme is part of the RMP for St Vincent & the Grenadines. 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 NOU and which will ensure the phase-out of virgin CFC in the refrigeration servicing sector.

It also includes the consequent training of the remaining service 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 it will produce a follow-up report on the achievements of the training programme after completion of the training-the-technicians phase.

The NOU 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. All 20 participants (100%) returned their evaluation questionnaire - 15 participants (75%) evaluated the workshop as “excellent”, 4 participants (20%) as “good”.

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A graphic analysis of the received evaluation questionnaires is included in Annex 10.5. Several participants commented that the time allocation especially for the practical hands-sessions should be increased and that the UNEP TIE training manual should be revised. Further comments from the evaluation questionnaires include:

- The course should be longer because most of these things are new to us.
- The quality of the course was of very high standards. Similar courses could be improved if there are more participants, more time and a wider range of equipment.
- The quality of the course was very good and we need much more courses like this.
- I learned a lot from the course and feel a lot safer and cleaner. We should really have more classes like this or advanced classes.
- The course provided a lot of information.
- Also people at work, in the schools and anyone else should be informed about ozone layer depletion.
• The quality of the course was of very high standard, but it should be longer. Similar courses should be organised every year.
• More Government officials should participate in such courses.
• The course should be about two weeks, so that the topics could be a bit more detailed.
• Very impressive course - more of this type should be of help for us and for the generations to come.
• The basic ground rules and regulations, which are necessary for change, were beyond that which was expected. All information and knowledge imparted was done simply, but to the highest professional standard. I do not believe any better could be provided although more time would have been nice. Additional material could be useful.

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, 14 June 1999

08:30 Registration of participants

09:00 Opening session

Welcome address and chairman
Dr. Reynold MURRAY, Ozone Officer of the Ministry of Health & the Environment

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

Workshop address
Mr. Ron VERCH, Representative of the Heating, Refrigeration and Air Conditioning Institute of Canada

10:30 Environmental issues

12:30 Lunch

13:30 Review of basic principles of refrigeration

17:00 Closure of the day

Tuesday, 15 June 1999

08:00 Review of basic principles of refrigeration

09:00 CFC/HCFC/HFC/HC refrigerants and technologies

11:30 General trade safety

12:30 Lunch

13:30 Retrofitting to alternative refrigerants
15:00  Passive and Active Recovery Methods and Application

17:00  Closure of the day
Wednesday, 16 June 1999

08:00 Operation and use of Trade Specialty Tools and Trade Safety

11:30 RMP of St Vincent & the Grenadines

   Dr. Reynold MURRAY, Ozone Officer of the Ministry of Health & the Environment

12:30 Lunch

13:30 Good practices in refrigeration

17:00 Closure of the day

Thursday, 17 June 1999

08:00 Good practices in refrigeration (hands-on session)

12:30 Lunch

13:30 Recovery of various refrigerants (hands-on session)

17:00 Closure of the day

19:00 Cocktail Party at the Cable Stone Inn

Friday, 18 June 1999

08:00 RMP concept at company level and preventative maintenance programs

09:30 Refrigeration associations and certification schemes in Canada

10:00 Wrap-up session and Examination

11:30 Adoption of workshop recommendations

   Mr. Halvart KOEPPEN, UNEP TIE Representative

12:30 Lunch

13:30 Adoption of the workshop recommendations

   Mr. Halvart KOEPPEN, UNEP TIE Representative

   Discussion on train-the-technicians programme
**Dr. Reynold MURRAY, Ozone Officer of the Ministry of Health & the Environment**

Evaluation of the workshop  
*Workshop participants*

**15:30 Closing Session**

Closing remarks  
*Dr. Reynold MURRAY, Ozone Officer of the Ministry of Health & the Environment*

Closing remarks and handover of the training equipment to the Ministry of Health & the Environment  
*Mr. Halvart KOEPPEN, UNEP TIE Representative*

Distribution of participation and HRAI certificates  
*Hon. Dr. St Clair THOMAS, Minister of Health & the Environment*  
*Mr. Ron VERCH, HRAI Instructor*

Vote of thanks on behalf of the participants  
*Workshop participants*

Closing statement of the workshop  
*Hon. Dr. St Clair THOMAS, Minister of Health & the Environment*

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

Mr. Alvin Alexander
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Mr. Joe Dublin
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Calder
Mr. Rohan Giles  
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St. Vincent  
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Mr. Michael Stoddard  
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Kingstown General Hospital  
Clare Valley  
St.Vincent  
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Mr. Cleveland Sutherland  
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Glen  
St. Vincent  
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Or: (784) 457-6675

Mr. Neale Thomas  
Refrigeration Technician  
C.D. Veira Ltd  
Singer  
Rockies  
St. Vincent
Train-the-Trainers Workshop on Good Practices in Refrigeration
St Vincent & the Grenadines, 14-18 June 1999

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Mr. Hupeto P Woods
Coast Guard Officer
Diamonds Village
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ANNEX 10.3  List of Trainers & Speakers

NATIONAL OZONE UNIT

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HEATING; REFRIGERATION AND AIR-CONDITIONING INSTITUTE (HRAI)

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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. A refrigeration association should be set up. It should liaise with international refrigeration associations.

2. The establishment of an regional refrigeration association should be considered and discussed at the next network meeting of ozone officers.

3. A certification scheme for refrigeration technicians should be set up.

4. Government should continue its efforts to raise awareness among consumers, importers, wholesalers and technicians. The training institutes, industry associations once created as well as technicians should support these efforts.

5. A long-term storage and disposal strategy at regional level to be developed for contaminated refrigerants and vacuum pump oils. All working fluids should be removed before scrapping of refrigeration appliances. Presently, there are no physical structures in place for interim storage.

6. The refrigeration association once created, wholesalers and importers should restrict the number of different refrigerants being imported and recommend the alternative refrigerants which should preferably be imported in the future.

7. Duty concessions for the import of alternative refrigerants, recovery & recycling equipment and technical literature should be provided for certified technicians.

8. Retrofitting should be done to long-term alternative refrigerants, not to interim refrigerants, whenever feasible.

9. Importers of vehicles with CFC air-conditioning systems should be obliged to retrofit before the vehicles are being sold.

10. The refrigeration association once created should receive one set of recovery equipment to make it available for major service work. The equipment should be made available for the technicians training whenever needed.

11. A code of good practice should be established.

12. Interested workshop participants meet the 14 July 1999 at the Ministry for Health & Environment to discuss the establishment of an refrigeration association.
**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.

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?