Train-the-Trainers Workshop on Good Practices in Refrigeration

Technology, Industry and Economics

Kingston, Jamaica, 7-11 June 1999
WORKSHOP REPORT

Train-the-Trainers Workshop on Good Practices in Refrigeration

Jamaica

Organized by:

United Nations Environment Programme and the
Natural Resources Conservation Authority of Jamaica
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 Jamaica. Such approach is defined in the Refrigerant Management Plan (RMP) of Jamaica, which has been approved by the Executive Committee of the Multilateral Fund to be implemented by Environment Canada.

On behalf of Environment Canada, UNEP is responsible for the implementation of the training programme on good practices in refrigeration and the implementation of the training programme on control and monitoring of ODS imports and exports for customs officers.

The train-the-trainers workshop in Jamaica is the seventh 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 and in St Kitts & Nevis, Antigua with the participation of Dominica and St Vincent & the Grenadines in 1999.

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

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 ceremony included the Executive Director of NRCA Mr. Franklin Mc DONALD, Mr. Timothy KASTEN of UNEP/CAR RCU, Chief Technical Director of the HEART Trust training college Dr. Disreali HUTTON, Executive Director of the Consumer Affairs Commission Mrs. Fay SYLVESTER, Chairman of NRCA Mr. Milton WEISE, Deputy Executive Director of NRCA Dr. Mearle BARRETT, UTECH lecturer Mr. Earle WILSON, Group Director of Jamaica Bureau of Standards Mr. Roosevelt DACOSTA, HRAI instructor Mr. Ron VERCH and UNEP representative Mr Halvart KOEPPEN.

Two participants delivered additional presentations, Mr. Carlton RICHARDS on “Retrofitting towards a Cleaner Environment” and Mr. Glaister DEHANEY on “The Positive Impact of Refrigeration on the Society”. A site visit was organised at Harbour Cold Stores Ltd.

The workshop was well covered through the media coverage (press, radio).
During the train-the-trainers workshop 26 professionals from industry and service workshops, public health sector, defence force and the refrigeration association 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-A and 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 Jamaica and a certificate from the Canadian Heating, Refrigeration and Air-conditioning Institute. The training equipment was handed over to the local training institutes. The 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 Jamaica 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 1997, Jamaica consumed approximately 196 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, 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.

Most of Jamaica’s refrigeration technicians 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 mobile air-conditioning 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 and an effective recovery and recycling programme combined with prudent retrofitting and timely replacement are part of the overall phase-out strategy. They will assist Jamaica 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 Jamaica 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 Jamaica 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 require re-training on this aspect.
4. Participants

In total, 26 refrigeration technicians from local training institutes (10), industry and service workshops (11), public health sector (2), defence force (2) and the refrigeration association (1) participated in the train-the-trainers workshop. All participants had a strong professional background in the refrigeration sector. 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 OzonAction Programme in Paris (see Annex 10.3)

The Ozone Officer Ms Veronica Alleyne of the NRCA 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. 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 Jamaica. 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 Jamaica 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-A and 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 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 recovery and recycling of refrigerants from refrigerators and from stationary and mobile air-conditioning systems and did a retrofitting exercise.

During a site visit to Harbour Cold Store Ltd., the participants were able to see R-502 systems which had been retrofitted to HFC 404a. The retrofitting of this equipment was done by in house technicians of Harbour Storage after consultation with the equipment manufacturer.

Time was also allocated for discussions among the participants concerning the implementation of Jamaica’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 Jamaica and a certificate from the Canadian Heating, Refrigeration and Air-conditioning Institute.

The local training institutes, in co-operation with the workshop participants and the National Ozone Unit are now expected to train the remaining (approximately 300) service technicians in Jamaica 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 26 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 Jamaica 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 conclusions, recommendations and lessons learned could be drawn from the train-the-trainers workshop:

• The local organisation was excellent. The classroom was well equipped and air-conditioned and the refrigeration workshop appropriate for the practical hands-on sessions.
• Lunch for the participants was organised at the training institute, which saved time and avoided local transport.
• A cocktail was held at the end of the first workshop day.
• The equipment was complete and appropriate.
• The instructor of HRAI mentioned that hand pumps for the recovery of refrigerant are not very efficient and recommended the use of micron gauges as part of any good refrigeration practice.

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 RMP for Jamaica. 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 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 will produce follow-up reports on the status of implementation and the achievements of the training-the-technicians programme.

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. 25 out of 26 participants (96%) returned their evaluation questionnaire - 18 out of 25 participants (72%) evaluated the workshop as “excellent”, 7 participants (28%) 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 training manual should be revised. Further comments from the evaluation questionnaires include:

- The course content and the written material is excellent.
- The „training manual“ should be revised, especially the chapter 7 and the sections which deal with HFC refrigerants and compatible lubricants.
- The videos should be made available to the participants.
- More information should be provided concerning automobiles.
- The course should be extended and include more practical hands-on sessions on R&R and replacement of compressor oils.
- It was a very well organised course.
- Similar courses should provide a solution for storage and cheap and safe disposal of contaminated refrigerants.
- More time would be required in order to grasp all aspects of the training.
- The presenter was overworked and should receive more assistance in the future. Overall it was great.
• As the technology continues to develop there should be a way how to access such information.
• In some training institutes, a recovery machine from the R&R programme is available for training. However, it should be completed with a weighting scale, a vacuum pump and a micron gauge.

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, 7 June 1999

08:00 Registration of participants

09:00 Opening session

Welcome address and chairman
Ms. Leonie Barnaby, Director of the Environment, Ministry of Environment & Housing

Greetings
Mr. Timothy Kasten, Snr. Programme Officer, UNEP/CAR RCU

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

Workshop address
Dr. Disraeli Hutton, Chief Technical Director, Heart Trust

Greetings
Ms. Fay Sylvester, Executive Director, Consumer Affairs Commission

Workshop opening
Mr. Milton Weise, Chairman, NRCA

10:30 Environmental issues

12:00 Refrigerant Management Plan at national level to phase out ozone-depleting substances (ODSs) and the train-the-technicians phase
Ms. Veronica Alleyne, Ozone Officer

13:00 Lunch

14:00 Review of basic principles of refrigeration

17:20 Review of the day

17:30 Closure of the day

18:30 Cocktail Reception at Terra Nova Hotel

Tuesday, 8 June 1999
Train-the-Trainers Workshop on Good Practices in Refrigeration
Kingston, Jamaica, 7–11 June 1999

08:00  Site visit at Harbour Cold Stores Ltd
09:00  CFC/HFC/HC refrigerants and technologies
11:30  General trade safety
12:30  Lunch
13:30  Retrofitting Towards a Cleaner Environment
       Mr. Carlton Richards, Participant
       The Positive Impact of Refrigeration on the Society
       Mr. Glaister Dehaney
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, 9 June 1999
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, 10 June 1999
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, 11 June 1999
Train-the-Trainers Workshop on Good Practices in Refrigeration
Kingston, Jamaica, 7–11 June 1999

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
         Ms. Veronica Alleyne, Ozone Officer
         Evaluation of the workshop
         Workshop participants
15:30    Closing session
         Welcome address and chairperson
         Mr. Franklin Mc.Donald, Executive Director of NRCA
         Distribution of participation and HRAI certificates
         (PRIVATE) HRAI instructor
         Handover of training equipment
         Dr. Mearle Barrett – Deputy Executive Director, NRCA
         Vote of thanks on behalf of the participants
         Mr. Earle Wilson, UTECH lecturer
         Closing statement
         Mr. Halvart Koeppen, UNEP TIE representative
         Closing statement
         Mr. Roosevelt DaCosta, Group Director, Jamaica Bureau of Standards
         Vote of Thanks
         Mr. Franklin Mc.Donald, Executive Director of NRCA
17:00    Closure of the workshop
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Train-the-Trainers Workshop on Good Practices in Refrigeration
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ANNEX 10.3 List of Trainers & Speakers

NATIONAL OZONE UNIT

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UNITED NATIONS ENVIRONMENT PROGRAMME

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Training Officer
OzonAction Programme
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Fax: (33-1)44371474
Email: halvart.koppen@unep.fr
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HEATING; REFRIGERATION AND AIR-CONDITIONING INSTITUTE (HRAI)

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TQIP Chief Instructor
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PARTICIPANTS
In addition, the participants Mr. Carlton V. Richards and Mr. Glaister Dehaney delivered presentations.
ANNEX 10.4  Workshop Recommendations

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

1. A certification scheme for refrigeration technicians should be set up. The Jamaican Air-conditioning, Refrigeration and Ventilation Association JARVA or other industry associations should develop a standardised national examination and register the successful candidates.

2. JARVA should try to increase its membership.

3. Government and JARVA to provide adequate education and awareness raising among technicians, consumers and the general public. Especially kindergartens, schools and the church should be targeted and in order to reach all levels of people. The production of an ozone song could be considered.

4. The Government and JARVA to develop or to adopt codes of good practices in mechanical refrigeration.

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

6. Technicians and workshops should provide data on recovered and recycled refrigerant to the NOU. JARVA to encourage its members to provide such data.

7. A long-term disposal strategy at regional level to be developed for contaminated refrigerants and vacuum pump oils.

8. The retrofitting of imported CFC systems, which are seized by customs, should be either financed by the importer or through selling the retrofitted system at the domestic market.

9. Government to provide incentives for individual workshops and service technicians to recover and to recycle refrigerants in order to make R&R profitable.

10. Refrigeration technicians, wholesalers and importers to self-regulate the number of different refrigerants being imported. JARVA should co-ordinate.

11. JARVA to present its association at the network meeting of ozone officers from the Caribbean region in December 1999.
12. Government and JARVA to inform workshop owners and technicians in the refrigeration sector about the possibility of duty concessions for the import of alternative refrigeration and air-conditioning systems and R&R equipment.

13. JARVA should organise special meetings around the island.

14. Workshop participants to provide contact data of potential candidates for the train-the-technicians training.

15. Industry should have their technicians trained by recognised training institutes or instructors. The trainees should sit a standardised national examination.
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?

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 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?
Train-the-Trainers Workshop on Good Practices in Refrigeration
Kingston, Jamaica, 7–11 June 1999

WORKSHOP EVALUATION JAMAICA
(25 of 26 questionnaires returned)