Train the Trainers Workshop on Good Practices in Refrigeration
ALBANIA

National Ozone Project Implementation Unit
Ministry of Environment of Albania

Division of Technology, Industry and Economics
OzonAction Programme

Multilateral Fund for the Implementation of the Montreal Protocol

Mondial Hotel - Tirana, Albania, 9-12 March, 2004
Workshop Report

Train the Trainers Workshop on Good Practices in Refrigeration

jointly organized by the

National Ozone Project Implementation Unit
Ministry of Environment

and

United Nations Environment Programme (UNEP)
Division of Technology, Industry and Economics (DTIE)
Ozone Action Programme

Funded by the

Multilateral Fund for the Implementation of the
Montreal Protocol

Hotel Mondial - Tirana, Albania, 9-12 March, 2004
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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 Albania. Such approach is defined in the National Phase Out Plan (NPOP) of Albania, which has been approved by the Executive Committee of the Multilateral Fund to be jointly implemented by UNDP and UNEP.

The NPOP of Albania is being jointly implemented by UNDP and UNEP. 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. UNDP will be responsible for the recovery and recycling programme.

The main objective of the training programme is to reduce the CFC consumption in the refrigeration and air-conditioning service sector in Albania and to assist the country to comply with the phase-out schedule for CFCs under the Montreal Protocol. The programme consists of two phases, the train-the-trainers phase and the train-the-technicians phase. The trained trainers are expected to train the remaining technicians in the refrigeration and air-conditioning sector in Albania.

The long term result expected of the training programme is the enhancement of good servicing practices in the refrigeration sector, assisting the sector to switch over to non-CFC equipment in a smooth way without causing unnecessary burden to the consumers.

During the train-the-trainers workshop 32 professionals from industry, government and training institutes were trained on good practices in refrigeration. Training has following five Modules and four Practical sessions:

TRAINING MODULES

1. Environmental Impact of CFCs and Refrigerant Management Plan to Phase out CFCs
2. Principles of Refrigeration
3. Alternative Refrigerants to CFCs and HCFCs and their Characteristics
4. Recovery, Recycling and Reclaim of Refrigerants
5. Good Servicing Practices in Refrigeration

PRACTICAL SESSIONS

1. Study of Tools and Equipments
2. Recovery of Refrigerants
3. Good Servicing Practices
4. Retrofitting of Refrigeration Appliances to Alternative Refrigerants

The workshop covered various topics 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 and HFC refrigerants, recovery and recycling equipment and preventive maintenance practices. Lectures on retrofitting and envisioned future technological development on 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.

THEORETICAL TOPICS COVERED IN WORKSHOP

Theoretical topics covered are as follows:
- Environmental Impact of CFCs and their Alternatives
- Refrigeration Management Plan at national level to phase out ozone-depleting substances (ODSs) and the train the technicians phase
- Review of basic concepts in refrigeration
- Review of Tools and Equipments used in servicing of Refrigeration Appliances
- Alternative Refrigerants to CFCs/HCFCs and their characteristics
- Safe Handling of CFCs HCFCs and their Alternatives
- Handling of Blends
- Recovery, Recycling and Reclaim of Refrigerants
- General Good Servicing Practices in Refrigeration

PRACTICAL TOPICS COVERED IN WORKSHOP

Practical topics covered are as follows:
- Study of Tools and Equipments
- Recovery of Refrigerants
- Good Practices in Refrigeration (Hands-on session)
- Retrofitting of Refrigeration Appliances to Alternative Refrigerants (Hands-on Session)

During the last day of the workshop, the participants provided feedback on the training programme. The feedback has been analyzed and the salient features are given in Annex – A-5. The feedback was encouraging. The participants also gave some recommendations which are summarized in Annex - 4.

Overall, the training of trainers programme was successfully conducted in close co-operation with the National Ozone Project Implementation Unit under the Ministry of Environment.
1. BACKGROUND

The ozone layer, high in the stratosphere, is vital to life on Earth. It acts as a shield to prevent harmful UV-radiation from reaching the Earth. In the 1970s, scientists discovered that a number of man made chemicals damage the ozone layer. These chemicals include CFC, HCFC, methyl bromide, halons, and carbon tetrachloride chloroform.

In September 1987, nations around the world, concerned about the depletion of the ozone layer, signed the “Montreal Protocol” on Substances that Deplete the Ozone Layer”, a landmark agreement that identified the major ozone-depleting substance (ODS) and established a timetable for the reduction and eventual elimination of their production and consumption world-wide.

Developing countries are now undertaking tremendous efforts to comply with or even to exceed the phase-out schedules of the Montreal Protocol and its amendments. Phase-out can be best achieved and remain sustainable through an overall strategy that integrates national and regional technical, regulatory and policy measures.

The refrigeration and air-conditioning sector is an important and unique sector where CFCs are not only used in new appliances/equipment but are also used for servicing the existing appliances/equipment during their useful working life. Thus the requirement of CFCs for servicing is a recurring demand and CFC emissions to the environment are just as frequent.

The amount of CFCs required for this purpose is substantial. The poor servicing procedures used by the service technicians like venting of the refrigerant, using appliance compressor for evacuation, flushing of system with refrigerant and purging of charging lines & other connecting lines result in the release of a significant quantity of CFCs directly to the environment.

Albania has a large number of refrigeration appliances like domestic refrigeration, commercial refrigeration appliances, Mobile air-conditioning units, central plants for food processing, storage and industrial refrigeration & air-conditioning. All these need CFCs for its servicing. The availability of CFCs is continuously decreasing and the cost of CFCs is also increasing in Albania. This will motivate the service technicians to adopt the good service practices.

A significant amount of CFC emissions could be avoided through the application of good practices during installation, operation, servicing and decommissioning of refrigeration and air-conditioning equipment and appliances. Good service practices include containment, avoidance of frequent failures by preventive maintenance & proper servicing, maintaining the logbook of the plant, recovery & recycling as well as safe handling of refrigerants. Good practices are easy to follow and adoption of these practices will achieve an early reduction of CFC consumption and emissions in the refrigeration sector.

Albania has a good number of technicians (in relation to the size of the population) responsible for operating and servicing the refrigeration appliances/equipment. Albania also has technical institutions, which provide formal education at different levels in RAC. There are three high schools in Albania located in Tirana (American School “Harry Fultz”), Durrës (Swiss School “Beqir Cela”) and technical school of Fieri. These schools’ curricula include
the service and maintenance of refrigerators and air conditioning. Likewise, the curriculum of the three branches of the University of Mechanical Engineering, Environmental Engineering and Chemical Engineering includes theoretical knowledge about thermodynamics design and maintenance of refrigerators and air conditioning plants.

Further training is often based on experience or on-the-job training. In addition, some of the technicians receive informal training while working with senior technicians.

The availability of CFCs in Albania is decreasing, as the Government of Albania takes measures for the early phase out of CFCs due to environmental consideration. It is essential for the CFC users to be able to reduce and subsequently phase out their CFC consumption in a well co-ordinated and most cost effective manner. Containment practices like preventive maintenance, recovery & recycling and proper charging procedures, etc. are expected to reduce the consumption/ emissions of CFCs in the service sector and meet the ODS phase out schedule.

The training on good practices in refrigeration and an effective recovery and recycling programme combined with retrofitting of refrigeration appliances/equipment using drop-in substitutes as well as timely replacements of equipment are the elements of the over all phase out strategy. These measures will assist Albania in eliminating the use of CFCs in the RAC sector and meet the obligations of the Montreal Protocol.

2. OBJECTIVES

All Parties to the Montreal Protocol must eliminate the production and consumption of ozone depleting substances (ODS). Most developing countries, including Albania, are net importers and do not produce any ODS themselves. In order to control and monitor the amount of ODS entering or leaving a country, an import/export licensing system needs to be enforced by trained customs and enforcement offices.

The main objectives of the train-the-trainers’ workshop were to improve the skills of trainers and the senior technicians from Industry and other Government organization on service practices to reduce the CFC consumption in the refrigeration and air-conditioning service sector in Albania and to assist the country to comply with the phase out schedule under the Montreal Protocol. The training provided the following:

- Introduction to the different types of ODS being used in the sector and for which applications they are used;
- Introduction to the provisions and phase-out schedules of the Montreal Protocol and its amendments;
- Increase the awareness of the participants about ozone depletion & its harmful effects, the Montreal Protocol, the environmental and economic benefits of good servicing practices and refrigerant containment as well as the concepts of Refrigerant Management Plans.
- Refining and optimising the establishment of the operational details of the monitoring and control system for ODS;
- Introduction and demonstration of procedures in eliminating refrigerant emissions during preventive and un-scheduled maintenance including recovery and recycling.
- Dissemination of information on alternative technologies to CFCs for various applications and methodology of retrofitting of existing refrigeration appliances/equipments.
• Stimulating the development of a network for information sharing throughout the sector.

3. EXPECTED RESULTS OF THE WORKSHOP

The long term results expected of the training programme is the enhancement of good servicing and business practices in the refrigeration and air-conditioning sector, enabling the sector in Albania to switch over to non-CFC technology based appliances and equipment in a relatively smooth manner without affecting business and causing any extra burden to the consumers.

The expected results of the workshop provide the necessary guidance and information in conducting training programmes for trainers in developing countries. It should be used together with the complimentary “Good Practice on Refrigeration” handbook, which has been translated into the Albanian language and distributed to all participants. This country-specific handbook, translated into the Albanian language, will be very useful for all the groups of refrigeration technicians.

The practice of the good services will also result in improved performance of the appliances/equipments in this sector. More specifically, the main expected results are the following:
• Minimization and elimination of uncontrolled emissions of ozone depleting refrigerants through better maintenance practices, leak prevention and recovery and recycling through training of refrigeration service technicians.
• Elimination of venting of CFC during purging and flushing of the refrigeration system.
• Early adoption of non-ODS technologies in the refrigeration sector in Albania.
• Reduction of CFC consumption/emission after prudent retrofitting and replacement of refrigeration and air-conditioning appliances/equipment.
• At least 10% reduction in ODS consumption.

4. PARTICIPANTS

The workshop was well attended by all participants and related staff during the four days from March 9 up to March 12, 2004. There were 32 participants in the workshop while the workshop was planned only for 27 participants. The participants invited were from the major refrigeration and air-conditioning installations, service workshops and the training institute. Most of the participants other than the institutes were senior technical persons involved in operation, maintenance and servicing of various types of refrigeration and air-conditioning appliances and equipment. The group was representative of all the sub-sectors like domestic refrigeration, commercial refrigeration, mobile air-conditioning, medium and large industrial and building refrigeration and air-conditioning. The participants have a very strong practical background in refrigeration and air-conditioning. The list of participants is attached as Annex –A-2.

The welcoming address was given by the Chief of Cabinet of the Ministry of Environment, Mr. Saimir HOXHA. Mr. Gjergj VELO and Mr. Ilirian Qiriazi, spokesman of Ministry, also from the Ministry of Environment, took part in the opening of the Workshop. The lead faculty for the workshop was Prof. Dr. Gazmend GJYLI and the UNEP-DTIE representative was Mr. Suresh Raj of the OzonAction Programme, Paris, France (see Annex – A-3). The
National Ozone Project Implementation Unit, headed by Prof. Dr. Gazmend GJYLI, was responsible for the local organization.

Additionally, the participants were also addressed by Prof. Dr. Gazmend GJYLI, and Mr. Suresh Raj (UNEP-DTIE) during the opening session.

5. METHODOLOGY

Global consensus supports the theory that chlorine from man-made substances, including CFC and HCFC refrigeration emitted into the atmosphere is responsible for the depletion of the ozone layer. Ozone depletion is linked with increases in ultra-violet-B (UV-B) radiation at the earth’s surface. UV-B radiation is linked to skin cancer, plant and aquatic destruction.

The international community has recognised the linkage between CFC and HCFC refrigerants and has committed to the elimination of these refrigerants in an accord named the Montreal Protocol. The Montreal Protocol calls for the cessation of CFC production by December 31, 1995 in the developed nations ad provides a 10-year grace period for the developing nations. The Protocol calls for a 65% reduction in HCFC production beginning 2004 and a complete phase out by 2030. Global Warming theory will also impact the success of the various alternative refrigerants or new technologies that can replace CFC and HCFC systems.

Refrigeration is essential to human life today and it is one of the principle tools of food transportation and preservation. Air conditioning is a key to modernisation, high productivity and the information age. Refrigeration technology has evolved over the years from ice harvesting and melting technology today – mechanical or vapour compression refrigeration.

In the early twentieth century, certain chemical manufacturers discovered the thermodynamic and thermo physical properties of CFC. This new class of refrigerants overtook better thermodynamic refrigerants like ammonia largely due to the unique combination of non-toxicity, non-flammability, non-corrosive and good thermodynamic and thermo physical properties.

The first basic principle is the understanding of heat transfer and the concept of cold. Cold is merely the absence of heat and heat is always transferred from hot to cold. The three types of heat transfer – conduction, convection and radiation are described and should be clearly explained.

The essence of this chapter is the explanation of the Mollier diagram for a refrigerant which is also known as a pressure – enthalpy (P-H) diagram. The entire vapour compression cycle can be mapped and understood simply by understanding and plotting it on a P-H diagram. Carefully plotting on a P-H diagram can often explain problems such as elevated condensing pressure due to non condensable within the system or improper suctions superheat leaving the evaporator.

The moisture within a system can “freeze-up” and stop refrigerant flow. Moisture within a system in the presence of oxygen can directly cause corrosion and moisture, refrigerant and heat can cause hydrochloric or hydrofluoric acid which can corrode copper, steel and brass.
Finally, the products of this type of corrosion forms troublesome sludge. Clearly, moisture must be avoided or removed from air conditioning and refrigeration systems.

Refrigeration charging is described in detail in this methodology. Good practice of applying a vacuum pump and refrigerant cylinder to refrigerant system using a refrigerant manifold is fully explained. Refrigerant oil characteristics, miscibility with refrigerants, charging and recovery methodologies are explained in this methodology.

In this training course are described the domestic refrigerators, freezers and air conditioners, small commercial air conditioning and refrigeration systems and automotive air conditioners. The essence of this methodology is to understand vapour compression as applied to these products, understand the form and function of all system components and learn about system servicing and trouble shooting.

In this training course, the domestic refrigerators and freezers, including description of typical hermetic compressors, condenser design, evaporator’s constructions and capillary tube form and functions have been explained. Proceeding from this point, other system components like accumulator filter dryer and motor controls were discussed. This section then examined the design and use of certain maintenance tools and techniques, such as, a piercing valve to gain access to the refrigerant circuit, charging a system with refrigerant and trouble shooting.

It is described in the methodology that we can reduce the need to handle refrigerant by understanding refrigerant theory, systems, applications and good service practices, but we will have failed in our mission of reducing unnecessary refrigerant releases if we don’t train every technician in the art of refrigerant handling.

Refrigerant leaks occur for three distinct reasons: 1) intrinsic leaks within the system, 2) accidental leaks (e.g. over pressuring and realise through a relief valve) and emission in refrigerant handling. The methodology describes certain system recovery information concerning domestic refrigerators, split-system air conditioners, commercial cold rooms and automotive air conditioners. The general subject of refrigerant reclamation is also described. Finally, about half of the material in this part of methodology is dedicated to manufacturer data on refrigerant recovery and recycling equipment.

The Montreal Protocol requires the eventual cessation of all CFCs and HCFCs and therefore, the air conditioning and refrigeration industry has been engaged with the chemical community for two decades establishing refrigerant substitutes and alternative technologies. Several significant alternative refrigerants are examined. Of particular note to small system is the material presented on HFC 134a, refrigerant blends and ammonia which is part of methodology and has been presented in the workshop.

Final part of the methodology touches upon the fact that there are different technologies that are gaining wide spread use and do not contain ozone depleting substances. Trainers should provide guidance to always explore new options as in many cases these new technologies are superior. Ammonia vapour compression, absorption chillers and desiccant cooling systems are a few of the technologies that should be investigated.
Refrigerant conservation is the key to reduce CFC emissions from the existing CFC based refrigeration and air-conditioning units to the environment. Appropriate training on good practices in refrigeration include containment, recovery & recycling, pressure testing & leak detection, repair and preventive maintenance as well as retrofitting using non-ODS refrigerants is crucial in order to continue to run existing equipment until the end of its economic life, to reduce the emission of ODS and to achieve the phase out in a co-ordinated, planned and cost effective manner.

The approach followed was train the trainers on good practices in refrigeration. In this workshop 32 trainers were trained. The workshop covered both theoretical and practical aspects of good service practices. There were a number of practical hands-on sessions on good practices and use of equipment. In this part of practical sessions Albanian Instructors learned a lot from the Macedonian Experts.

Participants took keen interest in practical work to acquire hands-on experience in the use of servicing equipment for recovery/recycling, evacuation, charging etc. There were very interesting discussions during the discussion sessions about use of good practices in the practical situations. These trainers will train the other technicians in the institutes or in their own installations as the case applicable to them.

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

Training manuals published by UNEP, namely “Good Practices in Refrigeration” and “Chillers and Refrigerant Management” were used as resource documents. This training manual was fully translated into the Albanian language by Dr. Besim Islami, who was also the technical leader during the training workshop. Each participant was provided a copy of the manual on good practices in the Albanian language. Other training materials in the Albanian language have also been distributed to the participants both in hard copy and in CD-ROM version. The training material was further supplemented using materials developed by Dr. Islami especially on the use of alternative refrigerants, handling of CFCs, HCFCs and their alternatives, retrofitting of appliances and equipment using alternatives to CFCs. A great help in practical training for good practices related with recovery, recycling and reclaim was done by Macedonian Experts.

6. CONTENTS

The training course also contains a brief history of refrigeration starting with block ice/convection refrigerators through the modern vapour compression refrigeration cycle. The popularity of CFC-12 is also treated here as well as an outline of the basic refrigerant handling, taxation and policy.
The training course culminates with an explanation of the general system maintenance practices and the practitioner’s leak detection tools and some typical services tools. The best methods of explaining these instruments and tools would be to have them present for demonstration.

The contents were well prepared to suite such a group of trainers/technicians. During the workshop, the participants learned about the importance of ozone layer protection and the harmful effect of increase in UV-B radiation on the earth. The training included the related international agreements such as Montreal Protocol, its amendments and phase out schedule for various ODS substances. The role of UNEP in implementation of such a treaty was also discussed. The lectures reviewed the basic principles of refrigeration, tools and equipments for practicing good service practices and responded to the question on how to service refrigeration and air-conditioning equipment in order to avoid CFC emissions and which alternative refrigerants could be used for retrofitting. Alternative refrigerants for various applications were also discussed as there was a good interest among the participants. The lessons included the good practices such as recovery/recycling preventive maintenance, record keeping, safety issues and pressure testing & leak detection.

The practical sessions were designed in such a way that participants could study the tools and equipments for good practices. Hands-on practice on proper evacuation & charging procedure, recovery of refrigerant from domestic refrigerators as well as how to retrofit refrigerant appliances using alternative refrigerant. Prof. Dr. Gazmend Gjyli discussed the National Phase-Out Plan for Albania.

There were discussion sessions in between the lectures. The participants took keen interest in discussions and understanding the practical implications of good practices as well as new technologies for all the sub-sectors of refrigeration and air-conditioning.

On the last day all the participants responded individually to the questionnaire that was distributed to them. This provided information about their understanding of the subject. The detailed workshop schedule is attached in Annex – A – 1.

7. RESULTS, CONCLUSIONS, RECOMMENDATIONS AND LESSONS LEARNED

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

• Training of 32 trainers and key service technicians on good practices in refrigeration including recovery and recycling of refrigerants

• Distribution of certificate to each participant after successful completion of the training programme.

• Exchange of practical information among the participants and development of a network of personal contacts.

• Each participant was provided a copy of the Manual on good practices. The manual on good practices was disseminated in Albanian language in hard copy and in electronic files on a CD-ROM. They were also provided a photocopy of the other relevant training material as per their request.
• Recommendations of the workshop are given in Annex. A-4

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

• The local organization was exceptionally good. The classroom was well equipped with audio-visual aids. The room was air-conditioned. The hands-on sessions were conducted in the same lecture room in small groups. There were adequate facilities for hands-on demonstration/practices.
• Lunch, coffee, and tea were served in the classroom itself, which saved some time and avoided transport requirement. The lunchtime was also used to show Video presentation and free discussion between participants.
• The training equipment was complete and appropriate.
• The programme was followed on schedule during the four days. All the topics were covered in detail.

8. FOLLOW-UP ACTION PLAN

This training programme is part of the NPOP for Albania. As such it will be accompanied by other training and policy related activities as defined in the NPOP which will be co-ordinated by the National Ozone Unit (NOPIU) and which will ensure the phase-out of CFCs in the refrigeration sector.

The NOPIU 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 states of implementation and the achievements of the training-the-technicians in the time frame given in the NPOP of Albania.

The National Ozone Unit and UNEP will consider and as far as possible, implement the workshop recommendations provided by the workshop participants.

9. EVALUATION BY PARTICIPANTS

The overall evaluation of the train-the-trainers workshop by the participants was very good to excellent. A graphic analysis of the feedback received from the participants through the questionnaire is included in Annex – A – 5.

10. ANNEXES

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ANNEX – A – 1: Programme of the workshop

Lead Consultant – Dr. Eng. Besim ISLAMI
Doctor on Mechanical Engineer – Local Consultant – Tirana, Albania

Tuesday, 9 March 2004

Chairman of the First Day of the Workshop: Prof. Dr. Gazmend GJYLI

09:45 Registration of participants

10:15 OPENING SESSION
10:15 Welcome address
Mr. Saimir HOXHA, Chief of Cabinet, Ministry of Environment, Albania
10:35 Address by
Mr. Raj SURESH, Capacity building manager, OzonAction Programme, UNEP, DTIE, France
10:45 Introduction to the workshop: Project Impact
Prof. Dr. Gazmend GJYLI

11:00 Coffee-Tea Break

11:30 TRAINING MODULE – I Environmental Impact of CFCs and Refrigerant Management Plan to Phase out CFCs
Chapter One Overview: Ozone depletion - its causes and effects
Eng. Figali HILA, Environmental Institute, Ministry of Environment

12:30 TRAINING MODULE – II Refrigerant Overview
Chapter Two Overview: Refrigerant Overview
Dr. Eng. Besim ISLAMI

14:00 Lunch

15:00 TRAINING MODULE – III Basic Concepts of Refrigeration
Chapter Three: Basic Concepts of refrigeration
Dr. Eng. Besim ISLAMI

16:30 Coffee-Tea Break

17:00 Saving the Ozone Layer: Documentary Film
Dr. Eng. Besim ISLAMI
17:40 Discussion between the participants
Moderator: Prof. Dr. Gazmend GJYLI & Dr. Eng. Besim ISLAMI
18:50 Review the First Day of the Workshop
Dr. Eng. Besim ISLAMI

18:00 Closure of the day

Wednesday, 10 March 2004

Chairman of the Second Day of the Workshop: Dr. Eng. Besim ISLAMI

09:00 TRAINING MODULE – IV General Good Practice Service
Chapter Four: General Good Service Practice – First Part
Dr. Eng. Besim ISLAMI

10:30 Coffee-Tea Break

11:00 Chapter Four: General Good Service Practice – Second Part
Eng. Arben LICI
14:00  Lunch
15:00  TRAINING MODULE – V Good Practice
      Chapter Five: Good Practice
      Dr. Eng. Besim ISLAMI
17:00  Coffee-Tea Break
17:30  Discussion between the participants
      Moderator: Dr. Eng. Besim ISLAMI
18:50  Review the Second Day of the Workshop
      Dr. Eng. Besim ISLAMI
18:00  Closure of the day

Thursday, 11 March 2004
Chairman of the Third Day of the Workshop: Dr. Eng. Vladimir MARTINOVSKI

09:00  TRAINING MODULE – V Practical Training
      Chapter Five: Practical Training – First Part
      Dr. Eng. Vladimir MARTINOVSKI
10:30  Coffee-Tea Break
11:00  Chapter Five: Practical Training – Second Part
      Dr. Eng. Vladimir MARTINOVSKI
14:00  Lunch
15:00  TRAINING MODULE – V Macedonian experiences about
      Recovery and Recycling
      Chapter Five: Macedonian experiences about Recovery and Recycling
      Dr. Eng. Mitre STALIEVSKI
16:00  TRAINING MODULE - VI Recovery, Recycling and Reclaim
      Chapter Six: Recovery, Recycling and Reclaim
      Dr. Eng. Besim ISLAMI
17:00  Coffee-Tea Break
17:30  Discussion between the participants
      Moderator: Dr. Eng. Vladimir MARTINOVSKI & Dr. Eng. Mitre STALIEVSKI
18:50  Review the Third Day of the Workshop
      Dr. Eng. Vladimir MARTINOVSKI
18:00  Closure of the day

Friday, 10 March 2004
Chairman of the Third Day of the Workshop: Prof. Dr. Gazmend GJYLI &
                                      Dr. Raj SURESH - Energy and Ozone
                                      Action Unit, UNEP DTIE, France

09:00  TRAINING MODULE – IV Practical On Hand Training
      Chapter Five: Practical On Hand Training – First Part
      Dr. Eng. Vladimir MARTINOVSKI
10:30  Coffee-Tea Break
11:00  Chapter Five: Practical On Hand Training – Second Part
      Dr. Eng. Mitre STALIEVSKI
14:30  Lunch
15:30  TRAINING MODULE – VII Alternative Refrigerant and Technologies
      Chapter Seven: Alternative Refrigerant and Technologies
      Dr. Eng. Mitre STALIEVSKI
16:30  Coffee - Tea Break
17:30 Adoption of Workshop Recommendations
   Dr. Suresh Raj, UNEP TIE representative

17:45 Discussion on train-the-technicians programme
   Prof. Dr. Gazmend GJYLI

18:00 Evaluation of the Workshop
   Prof. Dr. Gazmend GJYLI

18:30 Award of Certificates to the Participants by
   Prof. Dr. Gazmend GJYLI, Dr. Suresh Raj, Mr. Samir HOXHA,
   Mr. Sidi Menad Si AHMED

19:00 Closure statement of the Workshop
   Dr. Suresh Raj, UNEP TIE representative
ANNEX – A – 2 List of Participants

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5. **Mrs. Migena Kukli**  
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ANNEX – A – 4 Workshop Recommendations

1. Equipment support to technicians for adoption of good practices.

2. Availability of alternative refrigerants to CFCs in smaller cylinders for servicing.

3. Government to consider duty concessions for the import of alternative refrigerants and also the availability of CFC-12 during the phase out period.

4. It is recommended that the subject concerning refrigeration and guidance on good practices be included in the curriculum of high technical mechanical schools.
ANNEX – A – 5 Evaluation by the Participants
The following questionnaire was given to participants to evaluate the training course. The
responses are tabled in a graph in the following page.

QUESTIONNAIRE TO EVALUATE THE TRAINING COURSE BY PARTICIPANTS

1. What is your overall evaluation of the course?
   ? 1- Poor  ? 2 Average  ? 3 Good  ? 4 Very Good  ? 5 Excellent

2. Did the course provide the information you expected?
   ? 1- Poor  ? 2 Average  ? 3 Good  ? 4 Very Good  ? 5 Excellent

3. Was the communication between participants possible and useful?
   ? 1- Poor  ? 2 Average  ? 3 Good  ? 4 Very Good  ? 5 Excellent

4. Was the composition of the audience adequate?
   ? 1- Poor  ? 2 Average  ? 3 Good  ? 4 Very Good  ? 5 Excellent

5. As far as the contents of the presentation are concerned, did you find them adequate in explaining:
   (a) Environmental issue
   ? 1- Poor  ? 2 Average  ? 3 Good  ? 4 Very Good  ? 5 Excellent

   (b) Basic principles of refrigeration
   ? 1- Poor  ? 2 Average  ? 3 Good  ? 4 Very Good  ? 5 Excellent

   (c) CFC/HCFC/HFC/HC refrigerants and technologies
   ? 1- Poor  ? 2 Average  ? 3 Good  ? 4 Very Good  ? 5 Excellent

   (d) General trade safety
   ? 1- Poor  ? 2 Average  ? 3 Good  ? 4 Very Good  ? 5 Excellent

   (e) Operation and use of trade specialty tools
   ? 1- Poor  ? 2 Average  ? 3 Good  ? 4 Very Good  ? 5 Excellent

   (f) Operation and use of passive and active recovery devices
   ? 1- Poor  ? 2 Average  ? 3 Good  ? 4 Very Good  ? 5 Excellent

   (g) Good refrigeration practices
   ? 1- Poor  ? 2 Average  ? 3 Good  ? 4 Very Good  ? 5 Excellent

   (h) Retrofitting to alternative refrigerants
   ? 1- Poor  ? 2 Average  ? 3 Good  ? 4 Very Good  ? 5 Excellent

   (i) Creating preventive maintenance programmes and record-keeping
   ? 1- Poor  ? 2 Average  ? 3 Good  ? 4 Very Good  ? 5 Excellent

   (j) RMP concept at company level
   ? 1- Poor  ? 2 Average  ? 3 Good  ? 4 Very Good  ? 5 Excellent

6. Has the recovery issues been adequately draft with in the practical hands-on sessions?
   ? 1- Poor  ? 2 Average  ? 3 Good  ? 4 Very Good  ? 5 Excellent

7. Did the training provide you with relevant information regarding the RMP in your country?
   ? 1- Poor  ? 2 Average  ? 3 Good  ? 4 Very Good  ? 5 Excellent

8. Did the training course provide you with the relevant information regarding the train-the-
technicians phase and your role in it?
   ? 1- Poor  ? 2 Average  ? 3 Good  ? 4 Very Good  ? 5 Excellent

9. Did the training course provide appropriate training material as a basis for the train-the-technicians
   phase to be carried out by yourself in your country (please indicate under 11 whether additional
   material could be useful)?
   ? 1- Poor  ? 2 Average  ? 3 Good  ? 4 Very Good  ? 5 Excellent
Results of Evaluation of Training the Trainers Programme

- Training programme was very good but practical contents need to be increased. In the second phase it is recommended practical aspects to have more time. It will be very good if in the training practical tool to have also a complete automatic unit ariazone type.
- All hand- outs should be provided.
- Overall training course is very beneficial, more courses of this type be conducted.
- The training is very useful and necessary in this period of phase out of CFCs.
- Practical contents should be increased.
- Training programme was excellent.
- The training programme was excellent, regular additional training material be provided as far as possible.
- The quality of training was very good and the participants group was large.
- All the technicians be provided equipments and also the training. The training provided will be very helpful.
- The quality of the course is very good and training method is also very good.
- The type of training programme should be done at least once a year.
- To follow the good service practices, the tools and other related equipments should be made easily available in the market.
Train the Trainers Workshop on Good Practices in Refrigeration
Mondial Hotel - Tirana, Albania, 9-12 March, 2004

UNEP DTIE OzonAction Programme
Prepared by Dr. Eng. Besim ISLAMI
Under the *Montreal Protocol on Substances that Deplete the Ozone Layer*, countries worldwide are taking specific, time-targeted actions to reduce and eliminate the production and consumption of man-made chemicals that destroy the stratospheric ozone layer, Earth’s protective shield. Over 180 governments have joined this multilateral environmental agreement and are taking actions to phase out ozone depleting substances (ODS), which include CFCs, halons, methyl bromide, carbon tetrachloride, methyl chloroform, and HCFCs.

The Parties to this agreement established a Multilateral Fund that provides developing countries with the technical and financial assistance needed to comply with the Protocol. UNEP, UNDP, UNIDO and the World Bank are the Fund’s Implementing Agencies.

The objective of UNEP’s OzonAction Programme is to assist developing countries and Countries with Economies in Transition to achieve compliance with the control measures of the Montreal Protocol. Since 1991, the Programme has met this goal by strengthening National Ozone Units (NOUs) and facilitating regional and international responses to the ozone depletion challenge by providing the following need-based services:

**Information Clearinghouse**, which provides need-based information services that help decision-makers take informed decisions on policies and technologies required to phase out ODS. The clearinghouse has provided over 100 publications and other information aids, including guidelines, videos, CD-ROMs, public awareness materials, a newsletter, sector-specific publications, and a web site.

**National and Regional Training**, which builds the capacity of policy-makers, customs officers and local industry to implement national ODS phase-out activities. UNEP promotes the involvement of local experts from industry and academia in training workshops and brings together local stakeholders with experts from the global ozone protection community. To date, OzonAction has conducted 70 training programmes for customs officers and 62 for refrigeration technicians.

**Regional Networking of ODS Officers**, which provides a regular forum for those officers to exchange experiences, develop skills, and share ideas with counterparts from both developing and developed countries. Networking helps ensure that NOUs have the information, skills and contacts required to successfully manage their national ODS phase-out strategies. UNEP currently operates 8 regional/sub-regional Networks involving 115 developing and 9 developed countries.

**Refrigerant Management Plans**, which provide countries with integrated, cost-effective strategies for ODS phase out in the refrigeration and air conditioning sectors. RMPs assist developing with overcoming the numerous obstacles to phase out ODS in the critical refrigeration sector. UNEP currently provides specific expertise, information and guidance to support the development of RMPs in 67 countries.

**Country Programmes** and **Institutional Strengthening**, which support the development and implementation of national ODS phase-out strategies, especially for low-volume ODS-consuming countries. The Programme has assisted about 100 countries to develop their CPs and 96 countries to implement their IS projects.
In 2002, UNEP restructured OzonAction to better respond to the evolving needs of developing countries during the compliance period. Its overall vision and work strategy was reoriented into the Compliance Assistance Programme (CAP). A major feature of the CAP strategy is to move away from a disparate project management approach towards integrated and direct implementation of the programme using a team of professionals with appropriate skills and expertise. UNEP has now regionalised the delivery of the programme and services by placing its Regional Offices at the forefront to assist the countries in the region.

Primarily funded by the Multilateral Fund, the OzonAction Programme also receives support from the Global Environment Facility, the Government of Sweden, the Government of Finland, and other bilateral sources.

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About the UNEP Division of Technology, Industry and Economics

The mission of the UNEP Division of Technology, Industry and Economics is to help decision-makers in government, local authorities, and industry develop and adopt policies and practices that:

- are cleaner and safer;
- make efficient use of natural resources;
- ensure adequate management of chemicals;
- incorporate environmental costs;
- reduce pollution and risks for humans and the environment.

The UNEP Division of Technology, Industry and Economics (UNEP DTIE), with the Division Office in Paris, is composed of one centre and five branches:

/ The International Environmental Technology Centre (Osaka), which promotes the adoption and use of environmentally sound technologies with a focus on the environmental management of cities and freshwater basins, in developing countries and countries in transition.

/ Production and Consumption (Paris), which fosters the development of cleaner and safer production and consumption patterns that lead to increased efficiency in the use of natural resources and reductions in pollution.

/ Chemicals (Geneva), which promotes sustainable development by catalysing global actions and building national capacities for the sound management of chemicals and the improvement of chemical safety worldwide, with a priority on Persistent Organic Pollutants (POPs) and Prior Informed Consent (PIC, jointly with FAO).

/ Energy and OzonAction (Paris), which supports the phase-out of ozone depleting substances in developing countries and countries with economies in transition, and promotes good management practices and use of energy, with a focus on atmospheric impacts. The UNEP/RISØ Collaborating Centre on Energy and Environment supports the work of the Branch.

/ Economics and Trade (Geneva), which promotes the use and application of assessment and incentive tools for environmental policy and helps improve the understanding of linkages between trade and environment and the role of financial institutions in promoting sustainable development.

/ Coordination of Regional Activities Branch (Paris), which coordinates regional delivery of UNEP DTIE's activities and ensures coordination of DTIE's activities funded by the Global Environment Facility (GEF).

UNEP DTIE activities focus on raising awareness, improving the transfer of information, building capacity, fostering technology cooperation, partnerships and transfer, improving understanding of environmental impacts of trade issues, promoting integration of environmental considerations into economic policies, and catalysing global chemical safety.

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